

University of Missouri-Columbia

Bulletin

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1979



Description of Courses

University of Missouri-Columbia Calendar

First Semester

New Student Orientation and Registration
Registration
Classwork begins, 7:40 a.m.
Labor Day Recess
Preregistration (Winter) begins
Preregistration (Winter) ends
Thanksgiving Recess Begins, 5:30 p.m.
Classwork resumes, 7:40 a.m.
First Semester Classwork ends, 5:30 p.m.
Stop Day
Final Examinations begin
First Semester closes, 5:00 p.m.

1979

Thurs., Aug. 23
Fri., Aug. 24
Mon., Aug. 27
Mon., Sept. 3
Mon., Oct. 22
Wed., Oct. 31
Tues., Nov. 20
Mon., Nov. 26
Tues., Dec. 11
Wed., Dec. 12
Thurs., Dec. 13
Thurs., Dec. 20

Second Semester

New Student Orientation
Registration
Classwork begins, 7:40 a.m.
Preregistration (Summer & Fall) begins
Preregistration (Summer & Fall) ends
Spring Recess begins, 12:30 p.m.
Classwork resumes, 7:40 a.m.
Second Semester Classwork ends, 5:30 p.m.
Stop Day
Final Examinations begin
Second Semester closes, 5:30 p.m.
Annual Commencement

1979

Thurs., Jan. 11
Fri., Jan. 12
Mon., Jan. 15
Mon., March 19
Fri., March 23
Sat., March 24
Mon., April 2
Wed., May 2
Thurs., May 3
Fri., May 4
Fri., May 11
Sat., May 12

1980

Thurs., Jan. 10
Fri., Jan. 11
Mon., Jan. 14
Wed., April 2
Tues., April 8
Sat., March 22
Mon., March 31
Wed., April 30
Thurs., May 1
Fri., May 2
Fri., May 9
Sat., May 10

Summer Session

Eight-Week Session

Registration and Orientation
Classwork begins, 7:30 a.m.
Summer Welcome begins
Independence Day Recess
Summer Welcome ends
Summer Session closes, 5:00 p.m.
Summer Commencement

Mon., June 11
Tues., June 12
Sun., June 17
Wed., July 4
Tues., July 17
Fri., Aug. 3
Fri., Aug. 3

Mon., June 9
Tues., June 10
Fri., July 4
Fri., Aug. 1
Fri., Aug. 1

Four-Week Session I

Registration and Orientation
Classwork begins, 7:30 a.m.
Independence Day Recess
Session I closes, 5:00 p.m.

Mon., June 11
Tues., June 12
Wed., July 4
Fri., July 6

Mon., June 9
Tues., June 10
Fri., July 4
Thurs., July 3

Four-Week Session II

Registration
Classwork begins, 7:30 a.m.
Session II closes, 5:00 p.m.
Summer Commencement

Mon., July 9
Tues., July 10
Fri., Aug. 3
Fri., Aug. 3

Mon., July 7
Tues., July 8
Fri., Aug. 1
Fri., Aug. 1

University of Missouri-Columbia Bulletin (USPS 651-820)

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University of Missouri-Columbia

Description of Courses

Revised to November 1, 1978

The University of Missouri is an Equal Opportunity/Affirmative Action institution and is nondiscriminatory relative to race, religion, color, national origin, sex, age and qualified handicapped.

All statements in this publication are announcements of present policies only and are subject to change at any time without prior notice. They are not to be regarded as offers to contract.

University System

The University of Missouri is one university with four campuses—Columbia, Kansas City, Rolla and St. Louis. Established in 1839 at Columbia (the oldest and largest of the four campuses), the University is recognized as the first state university west of the Mississippi River and was designated a land-grant university in 1870. In addition to its traditionally assigned tasks of teaching and research within the campus settings, the University has extended its educational benefits to all sections of the state of Missouri.

The University is governed by the Board of Curators. The president of the University and his staff administer programs for the University system. The chancellors are the chief academic and administrative officers for their respective campuses.

UMC Catalog

The University of Missouri-Columbia catalog consists of three separate *Bulletin* publications: *General Information*, containing information on administration, facilities, regulations, requirements for admission and the degree programs of the various schools and colleges; *Description of Courses*, listing descriptions of all courses offered by the academic departments at UMC; and *Graduate School*, containing general information about graduate programs and requirements for admission to the Graduate School.

School and College *Bulletins* discuss specific courses offered and detailed material on requirements and degrees. Each student upon registration receives an *M Book*, which includes valuable information on regulations, procedures, services and activities at UMC.

Prior to the opening of each semester a *Schedule of Courses* is published which lists the specific courses to be offered for that semester with the time of meeting, the building, and room number of each course.

An application for admission may be obtained from most UMC *Bulletins* or by writing: Office of Admissions, 130 Jesse Hall, University of Missouri, Columbia, Mo. 65211.

UMC reserves the right to cancel, without notice, any course listed in the *Description of Courses* and/or the *Schedule of Courses* for any semester, or to withdraw any course which does not have an adequate enrollment at the close of the registration period.

Course Listings

Courses offered at UMC are listed in the *Description of Courses* by department or field of learning in alphabetical order.

Course Numbers

Each course bears a distinguishing number which identifies it within the department and indicates its academic level, according to the following table.

Course Number	Type of Course
1 to 99	primarily for freshmen and sophomores.
100 to 199	primarily for undergraduates, no graduate credit.
200 to 299	for undergraduates, appropriate professional students, and graduate students except those whose graduate major is in the department in which the course is offered.
300 to 399	for undergraduates, appropriate professional students and graduate students.
400 to 499	primarily for graduate students and appropriate professional students. Undergraduate students are admitted to 400-level courses only with the approval of the dean of the division in which the course is offered.

The letter L, M or V following a course number indicates that it is a professional course in the School of Law, Medicine or Veterinary Medicine, respectively. These courses are not open to graduate students.

The letters MT or P before a course number designate Medical Technology or Physical Therapy, respectively.

The letters GH and EH following a course number designate General Honors and Education Honors, respectively. These courses are restricted to undergraduate students who qualify for admission to the Honors College or to the College of Education Honors courses.

Credit

The unit of credit at UMC is the semester hour, which represents a subject pursued one class period weekly for the entire semester. In general, a course valued at three semester hours meets three periods weekly for one semester.

The number of credit hours for a course is given in parentheses following the course



title. If the credit is to be fixed in consultation with the instructor, the fact is shown by "(cr. arr.)", credit arranged, or by "(2-8)", minimum credit allowed two hours, maximum eight hours.

Prerequisites

Often, prior to enrolling in a certain course, other courses must be completed or other requirements fulfilled. These prerequisites are listed after the course description.

If the prerequisite course is in the department being described its number will be given. The prerequisite of Accountancy 37 is Accountancy 36 and is shown "Prerequisite: 36." Prerequisite courses from other UMC departments are listed by the name of the department and course number. One of the prerequisites for Accountancy 457 is Mathematics 60. It is shown "Prerequisites: Math 60," etc.

General prerequisites are listed "Prerequisite: 10 hours organic chemistry", meaning the student must have earned at least 10 semester credit hours in organic chemistry classes.

An academic standing prerequisite is stated by class. "Prerequisite: junior standing" means the student must be a member of the junior class.

A minimum grade requirement in a prerequisite course is specified by a capital letter and the course designation. "Prerequisite: C in Agronomy 201"

means a grade of C or better must be earned in Agronomy 201.

GPA refers to grade point average.

Courses listed as "Corequisite" or "Concurrent with" are to be taken in the same semester as the course desired. Nursing 159 lists "Corequisites: 140, 158, 160" so a student should enroll in 140, 158, 159 and 160.

Semester Offered

The lower case letters following the credit hours or at the end of a course description indicate which semester the course is generally offered. When no letter follows the course description, the course may be offered during any session. *f* indicates the course usually is offered in the first or fall semester; *w* indicates the second or winter semester; *s* indicates the summer session; and *ss* indicates the intersession, a period between regular sessions.

The abbreviations *alt. f.* or *alt. w.* indicate the course will be offered during alternate fall or alternate winter semesters. The year is indicated by *odd yrs.* or *even yrs.* "alt. w., odd yrs." means the course is offered during the winter semesters of odd numbered years.

Courses by Correspondence

The abbreviation *cor.* following a course listing indicates it is also available through the Center for Independent Study Through Correspondence.

Accountancy

Courses 36, 37, 136GH and 137GH regularly accepted in the College of Arts and Science; other courses accepted with approval of an area adviser and the Dean.

36 Accounting I (3). Introduces field of accounting; fundamentals of financial accounting. Prerequisite: sophomore standing. cor.

37 Accounting II (3). Fundamentals of managerial accounting. Introduces taxation, governmental accounting and data processing systems. Prerequisite: 36. cor.

136GH Honors Accounting I (3). Accounting theory and techniques used in the measurement and disclosure of accounting data to meet needs of investors and business managers. Prerequisite: sophomore standing, grade point average of 3.3 or higher or Honors College.

137GH Honors Accounting II (3). Continuation of 136GH. Prerequisite: C or better in 136GH.

200 Independent Readings (1-3). Independent readings and examination under supervision of an accountancy professor. Prerequisite: supervising professor's consent.

210 Professional Dimensions of Accountancy (2). Disciplines and profession of accountancy; emphasizes communication, organization, control, legal responsibilities, accounting bibliography, and specialized areas of practice. Prerequisite: junior standing with GPA of 2.6 or higher, or Director's consent.

236 Financial Accounting I (4). Concepts and procedures of measurement and disclosure of accounting information in published financial statements. Prerequisite: junior standing with GPA of 2.6 or higher, or Director's consent. cor.

237 Cost Accounting (3). Job, process, standard and variable costing systems and procedures; emphasis on measurement and internal control of manufacturing costs. Prerequisite: 236 & 258 (or 258 concurrently).

246 Financial Accounting II (3). Continuation of 236. Prerequisite: 137 GH or 236.

258 Computer-Based Data Systems (3). Introduces computer and computer-based systems. Includes historical background, systems design, programming concepts and business applications. Prerequisite: junior standing.

268 Accounting Information Systems (3). Methods of processing accounting information, starting with manual production of basic financial statements and extending to complex computer-based managerial accounting applications. Prerequisites: 236 & 258.

273 Introduction to Taxation (3). Survey of various types of taxes affecting both individual and business entities, with emphasis on the federal income tax. Prerequisite: 37, 137GH or 236.

301 Problems in Accounting (1-3). Independent investigations, reports on approved topics. Prerequisite: supervising professor's consent.

304 Managerial Accounting Concepts (3). Introduces accounting concepts, terminology, measurements and reports; emphasizes management uses. Prerequisite: graduate standing, senior standing in College of Engineering or instructor's consent.

305 Financial Accounting Concepts (3). Current issues in the financial reporting of business corporations to external parties. NOT open to accountancy majors. Prerequisite: 37 or 304.

310 Managerial Accounting (3). Financial and cost accounting concepts. Processes for collecting, recording and summarizing financial and cost data. Use of accounting data for position reporting, income determination, planning and control. Prerequisite: M.B.A. or M.S.P.A. candidate, or Director's consent.

316 Accounting Principles I (3). Fundamental accounting principles and techniques; emphasizes financial accounting. Prerequisite: M.S. candidate or graduate standing, with Director's consent.

317 Accounting Principles II (3). Continuation of 316, with emphasis on managerial accounting principles and techniques. Prerequisite: 316.

325 Governmental Accounting and Budgeting (3). Principles of fund accounting, financial reporting and budgeting control in nonprofit organizations; Program-Planning-Budgeting Systems; governmental and institutional auditing; special problems. Prerequisite: 237 or Director's consent.

336 Advanced Financial Accounting (3). Consolidated statements, partnerships, price level changes and other financial accounting topics. Problems and case studies. Prerequisite: 246.

337 Managerial Accounts and Statistics (3). Accounting and other measurement and communication techniques applied to management problems of analysis, planning, and control. Prerequisite: 137GH, 237 or Director's consent.

358 EDP Systems Analysis and Design (3). Problems of installing and managing EDP systems; impact of EDP on decision-making functions and simulation models; evaluates recent developments; case studies. Prerequisite: 258.

368 EDP Systems Management and Control (3). Theory and practice of planning, administering and controlling the information systems function; special emphasis on systems evaluation and computer audit packages. Prerequisite: 268.

373 Intermediate Taxation (3). Introduction to tax research methodology; in-depth study of corporate income taxation. Prerequisite: 273.

384 Auditing (3). Nature, history and social role of auditing; fundamentals of contemporary auditing theory and practice; emphasis on audit reports and collection and evaluation of audit evidence. Prerequisite: 15 hours accountancy.

390 CPA Review (4). Study of representative problems from CPA examinations. Course will not satisfy hour requirements of the undergraduate or graduate accountancy degrees. Prerequisites: 21 hours accountancy, excluding data processing courses, and 6 hours business law.

401 Problems in Accounting (1-3). Independent investigations, reports on approved topics. Prerequisite: supervising professor's consent.

403 Controllership (3). Cost accounting systems and role of the controller in providing meaningful information to management. Open to M.S. students and other graduate students with Director's consent. Prerequisite: 317.

406 Advanced Accounting Practice (3). Principles and procedures relating to accounting changes, funds flow, tax allocation, partnerships, branch accounting, consolidations, asset revaluations and fiduciaries. Open to M.S. students and other graduate students with Director's consent. Prerequisite: 317.

407 Tax Theory and Practice (3). Survey of various taxes with emphasis on federal income tax of individuals and business entities. Open to M.S. students and other graduate students with Director's consent. Prerequisite: 317.

408 Current Topics in Data Processing (3). Administration and control of EDP systems; data management systems; development of information systems; computer project management. In-depth analysis with current emphasis on systems literature. Prerequisite: 258.

409 Auditing Theory and Practice (3). Accepted standards and procedures applicable to an audit examination. Open to M.S. and other graduate students with Director's consent. Prerequisites: 403 & 404.

423 Advanced Taxation I (3). An in-depth study of selected income tax problems relating primarily to business entities. Prerequisite: 6 hours of tax.

425 Accounting for Governments and Other Non-Profit Entities (3). Role of accounting information systems in planning, managing, and controlling non-business organizations; reporting to external parties; concepts of governmental auditing. Prerequisite: 325 or instructor's consent.

428 Advanced Business Programming (3). Business computer programming using the full scale ANSICOBOL language, business simulation programming and operating systems manipulations. Prerequisite: 258.

436 Financial Accounting Theory I (3). Concepts and theory of current financial accounting practice. Prerequisite: 246.

437 Advanced Cost Accounting (3). Development and application of current concepts in cost accounting; role of cost accounting in the organization and relationships with financial accounting. Prerequisite: 337.

444 Seminar in Auditing (3). Role of auditing in society; auditor's responsibilities; auditing methodology, techniques and procedures; organization and planning; collection and evaluation of evidence; reporting; and new audit directions and perspectives. Prerequisite: 384 or 409.

446 Application of Financial Accounting Pronouncements (3). Development, content and application of authoritative pronouncements in financial accounting. Problems and case studies. Prerequisite: 336.

448 Seminar in Data Processing (3). Selected topics regarding accountancy and the computer; integrated data processing and information systems; simulation using the accountancy model; computer systems for decision making and control. Prerequisite: 268, 358 or 408.

450 Accounting Policy (3). Enterprise-level case studies to integrate accountancy measurements and disclosure decisions. Prerequisite: 12 hours graduate professional accountancy requirements.

453 Advanced Taxation II (3). An in-depth study of selected income, estate and gift tax problems relating primarily to family units. Prerequisite: 6 hours of tax.

455 Seminar in Governmental Auditing (3). Topics related to external and internal auditing of governmental organizations and programs. Prerequisite: 384 or 409 & 425, or instructor's consent.

457 Quantitative Methods in Accounting (3). Applies mathematics and statistics to managerial and financial accounting problems. Prerequisite: 337, Math 60 & Math 61, & Statistics 234 or Statistics 250.

460 Research Methods in Accounting (3). Principles for planning, conducting and reporting research projects in accounting. Each student prepares a research proposal. Prerequisite: 24 hours graduate study.

466 Financial Accounting Theory II (3). Theories and concepts underlying alternative accounting approaches to income measurement and asset valuation. Prerequisite: 436.

467 Advanced Managerial Accounting (3). Conceptual framework and practical methods which characterize the managerial accounting field. Problems and cases. Prerequisite: 337.

468 Advanced Accounting Systems (3). Examines advanced systems concepts and how accounting information is processed in an advanced system. Emphasizes analysis, design and control features. Prerequisite: 368.

489 Cultural Significance of Accounts (3). Orientation to the cultural situation which gives importance to modern accounting. Critical appraisal of trends in theory and functions of current accounting. Prerequisite: 12 hours accountancy.

491 Research in Accounting (cr. arr.) Each student is under direction and guidance of a staff member in writing a dissertation. Monthly seminar to discuss research projects.

Aerospace Studies (See R.O.T.C.)

Agricultural Economics

50 Agricultural Economics (5). Introduces certain fundamental principles of economics; emphasis on application to agriculture. Adjustment to forces by farmers, businessmen in planning, producing and marketing products. Prerequisite: 16 hours completed. f,w.

200 Problems (cr. arr.) Supervised study in specialized phase of agricultural economics. Prerequisite: introductory course in agricultural economics.

220 General Agricultural Marketing (3). Analysis of farm products marketing system from industry and firm viewpoint. Prerequisite: 50. f,w. cor.

225 Statistical Analysis (3). Elementary statistical inference. Prerequisite: Math 10 or equivalent. f,w.

230 Farm Programs (3). Study and analysis of past and present government farm programs affecting the agricultural economy. Prerequisite: 50. f.

241 Cooperative Business Organizations (3). Cooperative business organizations; importance; principles; economic problems. Organizational procedures. Operational practices. Prerequisite: 220. w.

250 Economics of Agricultural Production and Distribution (3). Examines current national and international issues affecting agriculture. Applies economic principles to agricultural problems. Prerequisite: 50 or Economics 51 & Math 10 or equivalent. f,w.

251 Agricultural Prices (3). Variations in prices of agricultural products; underlying factors. Prerequisites: 225 & 250. w.

260 General Farm Management (3). Economic and management principles applied to planning and operating farm businesses. Includes enterprise combinations, resource acquisition, water management, profit maximizing techniques and annual adjustments to changing conditions. Prerequisite: 50. Cannot also take 261. f,w.

261 Farm Management (3). Principles and decision tools applied to practical farm problems. Budgeting and linear programming emphasized. Resource acquisition and growth strategies evaluated. Economic aspects of new technologies analyzed. Prerequisites: 250 & Accountancy 36. Cannot also take 260. w.

270 Resources and Economic Development (3). An introductory survey of theory, policies and institutional arrangements for domestic and regional economic development. Application made to problems in development of rural areas and use of region's resources. Prerequisites: 250 & Economics 229. f.

271 International Agricultural Development (3). Examines world food problem; analyzes its causes; economic and non-economic policy alternatives for modernizing agriculture in less-developed countries. Prerequisite: 50 or Economics 51 & junior standing. w.

280 Financing the Farm Business (3). Financial management of farm business. Operational methods of credit institutions serving agriculture. Prerequisites: 50 & Accountancy 37. f.

290 Marketing Farm Commodities: Theory and Practice (1). Economic theory, practices in marketing farm commodities. Relation of theory and practice. General course prerequisite to courses 291, 292, 294 & 295—marketing of indicated commodities. Prerequisite: 220. w. first ½ semester.

291 Marketing Farm Commodities: Livestock and Livestock Products (2). Theory, practice in marketing livestock, livestock products. Prerequisite: 290. w. middle ½ & last ½ semester.

292 Marketing Farm Commodities: Poultry Products (1) (same as Poultry Husbandry 292). Theory, practice in marketing eggs, poultry, poultry products. Prerequisite: 290. w. middle ½ semester.

294 Marketing Farm Commodities: Grain Crops (2). Theory, practice in marketing grain and soybeans with consideration of both cash and futures markets. Prerequisite: 290. w. middle ½ & last ½ semester.

295 Marketing Farm Commodities: Milk and Dairy Products (1). Theory, practice in marketing milk, dairy products. Prerequisite: 290. w. last ½ semester.

299 Topics in Agricultural Economics (1). Lectures and discussions on current topics. Employment opportunities, procedures discussed. Prerequisite: senior standing. f.

310 In-Service Course in Agricultural Economics (2-10).

- A. Profit Maximizing Principles
- B. Farm Planning
- C. Farm Records and Analysis
- D. Business Management
- E. Using Computers in Farm Management Decision Making

Basic principles of farm management. Applications of principles and subject matter in successful classroom presentation primarily for high school teachers. Course is offered in sections A-E, as listed, for 2 hours each. Prerequisite: 10 credits in Agricultural Economics, including 260 or 261, or instructor's consent.

312 Planning the Farm Business (3). Economics, management theories and principles applied to farm business organization. On-the-farm planning experience, emphasizing budgets, farm and farmstead layout and other planning techniques. Prerequisite: 260. f.

314 Farm Business Analysis (3). Techniques of analyzing a farm business. Methods of resource acquisition, record analysis, tax management principles and organizational structure of the farm business are principal topics covered. Prerequisite: 260 or 261. w.

320 Agricultural Business Management (3). Study of the managerial process including the organization and methods of effective management at various levels in agricultural business firms. Prerequisite: senior standing. 220 & 280 or equivalent. w.

321 Economic History of Agriculture (3). Emphasizes Europe and U.S. historical interpretation; usefulness in evaluating present and probable future developments in agriculture. w.

332 Agricultural Policy (2). Four-week summer session for professional agricultural workers. Governmental policies, programs, relating to agriculture with a view to understanding their purposes, effects, problems, prospect of improvement. s.

333 Agricultural Law (3). Statutes, cases, administrative regulations affecting agriculture. Court systems, contracts, deeds, easements, adverse possession, condemnation, fences, nuisances, irrigation rights, liability for employees, trespassers, dogs, bailments, partnerships, corporations, estate planning, income taxation. Prerequisite: junior standing or instructor's consent. f,w.

338 Rural Real Estate Appraisal (3) (same as Agronomy 338, Agricultural Engineering 338). Principles, techniques, practices of rural real estate appraisal. Field trips. Prerequisite: 260 or 261 & Agronomy 100. f.

342 Problems of Cooperative Firms (2). Four-week summer session for professional agricultural workers. Principles of cooperative business organization. Economic theory of cooperation. Legal aspects; tax policies; public relations; relation of cooperatives to agriculture and private business. Prerequisite: 220. s.

344 Management of Cooperative Firms (3). Economic basis for cooperative action; structure of cooperative associations. Problems of membership, public relations, personnel, tax policies, financing, integration, administrative policies. Prerequisite: 241 or instructor's consent. w.

345 The Economics of Collective Action in Agriculture (3). Organization/mechanics of collective bargaining. Organization theory, institutional economics, significance of farmer movements, cooperative systems approach to group action in agriculture. Prerequisite: 220 or 290 or instructor's consent. alt. w. odd yrs.

355 Economics of Agricultural Production and Distribution (3). Applies economic principles to agricultural production: classical theory, limited resources, uncertainty, capital theory. Prerequisite: senior or graduate standing. f.

364 Correlation and Regression Analysis (3). Regressions, correlation techniques for two or more variables. Emphasizes computational procedures, interpretation of results. Prerequisite: 225. f.

381 Intermediate Marketing (2). Four-week summer session for professional agricultural workers. Functions, costs, channels, institutions involved in marketing farm commodities. Evaluates effects of public policies on marketing, new developments in system. Current problems in marketing farm and food products.

386 Development and Management of Natural Resources (3). Economic rationales for public natural resource policies, group decision making in the public interest and public controls and investments in natural resources use. Prerequisite: 250 or Economics 251. f.

390 Field Training (cr. arr.) Combines study, observation and employment in a public agency or private firm in marketing, farm management, or credit. Staff supervision and evaluation. Reports required. Prerequisite: 75 hours & instructor's consent. s.

400 Problems (cr. arr.) Supervised study, research in specialized phase of agricultural economics. Prerequisite: instructor's consent.

410 Seminar (1). Lectures, reports on economic problems in agriculture. f,w.

420 Theory of Markets (3). Development of theories of monopolistic, oligopolistic competition; application to agricultural markets. Market structure influence on price, nonprice competition in buying, selling of farm products and inputs. Prerequisite: 16 hours economics. w.

422 Organizing and Adjusting the Farm Business (3). Applies principles of economics and management in organizing and adjusting farm business units to keep abreast of changing conditions. Normally offered at selected off-campus locations. Prerequisite: instructor's consent.

423 Business Logistics (3) (same as Marketing 423). Emphasis on food firms. Analysis and design of integrated logistics systems with in-depth study of components—demand forecasting; production planning; inventory control and traffic planning; warehousing; materials handling and management information systems; their trade-off alternatives.

424 Advanced Production Economics (3). Production function analyses. Linear programming; advanced theory of the firm. Applications to analysis of agricultural production problems. Prerequisite: 225 & 250 & Math 205 or instructor's consent. w.

430 Advanced Price Analysis (3). Analytical methods for agricultural product prices. Prerequisites: 251 & Statistics 385. f.

435 Advanced Farm Management (3). Recent changes in agriculture and their impacts on farm management. Techniques in farm management research, teaching, and extension; new theories; selected current literature analyzed. Prerequisite: 312 or 314. alt. f. even yrs.

440 Economics of Marketing Milk and Milk Products (3). Producer's, processor's, consumer's viewpoint in dairy marketing; price determination; role of government regulations. Prerequisites: 220 & 250. f.

450 Research (cr. arr.) Independent investigation of advanced nature. Report required.

451 Economics of Marketing Livestock and Livestock Products (3). Current economic problems in marketing livestock and livestock products. Methods of solving marketing problems. Prerequisite: 220 & 250. w.

454 Welfare and Consumption Economics (3). Introduces welfare economic principles; application to problems of resource allocation. Appraises economic policies, programs; consumer's choice; measurement of consumption; living standards; household decisions and markets relation. Prerequisite: 12 hours economics.

458 Economics of Marketing (3). Advanced principles of agricultural economics from standpoint of market system; theory of the firm in imperfect competition; applications such as bargaining theory/marketing in economic development. Prerequisite: Economics 351 or equivalent or instructor's consent. f.

465 Current Economic Aspects of Agriculture (3). Current economic agricultural problems; proposed solutions. Prerequisite: 16 hours economics. w.

468 Resource Economics and Development (3). Methods and criteria of choice in public investment decisions; emphasizes natural resource development. Temporal allocation of resources and its relation to economic development. Prerequisite: 12 hours economics & introductory calculus course. alt. w. even yrs.

472 Advanced Land Economics (3). Examines physical, economic and institutional aspects of natural resource use. Emphasizes domestic land resource problems and agrarian reform, and other aspects of economic development in underdeveloped countries. Paper required. Prerequisite: 12 hours economics. w.

475 Econometrics I (3) (same as Economics 475).

476 Econometrics II (3) (same as Economics 476).

480 Research Methodology (3). Research methods; sources of information; manner of collecting, analyzing, expressing results. Research project outline required. f.

485 Advanced Topics in Economics (3). Analyzes economic logic problems. Current agricultural economic problems. Prerequisite: graduate standing. w.

490 Research (cr. arr.) Independent investigation of advanced nature, leading to dissertation.

60 Shop Tools and Processes (2). Basic processes and tools used in repair, maintenance and construction of farm equipment. Emphasis on power tools and machines. Prerequisite: 20 & Math 10, or equivalent.

103 Planning Farm Buildings (3). Functional requirements of farm buildings. Farmstead and building planning. Materials, sanitation, ventilation, convenience. Prerequisite: Math 10.

117 Experimental Course. Designed for sophomore-level students. Content and number of credit hours listed in *Schedule of Courses*.

164 Agricultural Mechanization Seminar (1). Selected topics of personal and professional interest. Discusses employment opportunities and procedures. Prerequisite: senior standing or instructor's consent. f.

165 Farm Tractor Hydraulics I (2). Basic hydraulic theory. Hydraulic systems components—reservoirs, filters, hoses, connectors, pumps, motors, seals, valves, fluids. Hydraulic systems on farm tractors—blocked return, open-center, closed-center. Application of accumulators. Hydraulic system testing. Prerequisite: sophomore standing.

166 Farm Tractor Hydraulics II (1). Hydraulic power transmission devices—torque converters, hydrostatic drives, hydraulic assist for mechanical transmission. Prerequisite: 165.

198 Pesticide Application Equipment (3). Principles of pesticide application; sprayer hydraulics and spray atomization; calibration, mixing calculations and compatibility of tank mixes; personal and environmental protection; pesticide labels and regulations.

201 Farm Water Management (3). Place of water management practices in maintaining soil productivity. Farm surveying. Design and layout of terrace systems. Prerequisites: Math 10 & junior standing.

202 Agricultural Practices and Pollution Control (3). Applies physical, chemical and biological principles to control soil, air and water pollution arising from production and processing of agricultural products. Prerequisites: course in general inorganic chemistry & junior standing.

210 Advanced Shopwork (2). Primarily for students majoring in agricultural education. Applies shop principles to the design and construction of projects. Prerequisite: 60 or equivalent.

215 Electricity on the Farm (3). Home and farm electricity; emphasizes use in productive farm enterprises. Prerequisite: junior standing.

240 Farm Machinery (3). Principles of construction and operation of field and farmstead machinery. Selection and management of equipment. Prerequisite: junior standing.

250 Physical Principles for Food Processing (3) (same as Food Science & Nutrition 250). Engineering principles and machine operation principles applicable to food processing. Prerequisites: Math 10 & Physics 11.

300 Problems (1-5). Problems assigned or approved by instructor.

306 Crop Drying and Conditioning (3). Systems and equipment for crop drying. Control of grain quality by aeration in storage. Prerequisite: junior standing.

Agricultural Engineering

Primarily for Agriculture Students

1 Farm Power (3). Engines and tractors. Mechanisms, cycles, fuels and combustion, injection systems, electrical systems, performance, annual costs.

20 Welding (2). Principles and practices in electric and oxyacetylene welding.

310 In-Service Course in Agricultural Mechanization (1-8).

- A. Farm Power and Machinery
- B. Farm Buildings and Conveniences
- C. Soil and Water Management.
- D. Rural Electrification and Processing
- E. Agricultural Construction and Maintenance

Basic principles relating to latest developments and advanced technology in farm power and machinery, farm buildings and conveniences, soil and water management, rural electrification and processing, and agricultural construction and maintenance. Application of principles and subject matter in successful classroom presentation at high school level. Prerequisite: 10 credit hours from courses 1, 20, 60, 103, 201, 210, 215 & 240; a B.S. degree in Agriculture or instructor's consent.

320 Farm Drainage and Irrigation (3). Soil, water, plant relationships. Design and layout of farm drainage and irrigation systems. Prerequisite: 201.

330 Human Safety in Agriculture (3). Physical and economic effects of agricultural accidents. Product design for various man-machine-environmental relationships. Voluntary and involuntary standards. Manufacturer and owner liability. Prerequisites: junior standing & one behavioral science course.

338 Rural Real Estate Appraisal (3) (same as Agricultural Economics 338, Agronomy 338).

363 Mechanization Systems Management (2). Managing farm mechanization systems. Includes field efficiency, field capacity, selection and replacement of system components, field operation costs and custom rates. Prerequisite: junior standing. If no farm experience, should have completed 240.

386 Mechanized Feed Handling (3). Detailed analysis and development of mechanical systems to feed and care for livestock. Building arrangement. Waste removal. Prerequisite: senior standing.

452 Advanced Machinery Management Topics (3). Digital computer application of techniques for machine replacement and scheduling of operations; analysis of farm equipment manufacturers' distribution and servicing systems; current trends in field machinery. Prerequisite: 363 or equivalent.

Primarily for Engineering Students

17 Experimental Course. Designed for freshman-level students. Content and number of credit hours listed in *Schedule of Courses*.

117 Experimental Course. Designed for sophomore-level students. Content and number of credit hours listed in *Schedule of Courses*.

195 Professional Practice in Agricultural Engineering (1). Professional opportunities and responsibilities in agricultural engineering. Prerequisite: junior standing.

196 Ecological Aspects of Agricultural Engineering (1). Study of effects of agricultural engineering decisions on the environment and how resource constraints may change agricultural engineering practices. Prerequisite: Chemistry 5.

203 Environmental Control of Farm Buildings (3). Building design for environmental control. Heat and moisture relationships, ventilation, insulation. Prerequisite: Engineering 99.

221 Soil Conservation Engineering (3). Factors affecting runoff and erosion from agricultural lands. Design and layout of soil conservation practices. Prerequisites: Civil Engineering 113 & Civil Engineering 251 or Mechanical & Aerospace Engineering 251.

241 Analysis of Farm Machines (3). Tillage, planting, harvesting and crop handling machinery. Construction, selection and economic requirements of farm machines. Prerequisites: Physics 123 & computer programming.

301 Topics in Agricultural Engineering (3). Current and new technical developments in agricultural engineering. Prerequisite: instructor's consent.

302 Design of Livestock Waste Management Systems (3). Development and application of design criteria to the design of agricultural waste management facilities. Prerequisite: Chemistry 5, Civil Engineering 251 or instructor's consent.

303 Farm Buildings Design (3). Analysis, design, and synthesis of buildings for agriculture and light industry, including functional planning. Prerequisite: Engineering 195.

305 Agricultural Engineering Measurements (3). Use of instruments and techniques for agricultural engineering measurements. Prerequisite: junior standing in engineering or instructor's consent.

315 Farm Electrification Engineering (3). Electric power distribution on the farm. Wiring and lighting of farm buildings; motors and controls; farm electrical equipment. Prerequisite: Engineering 124.

316 Crop Processing (3). Methods and equipment for processing farm crops and products. Emphasis on grain drying and storage. Prerequisite: junior standing in engineering.

321 Irrigation and Drainage Engineering (3). Soil, water, plant relationships. Surface and sprinkler irrigation. Open ditch and tile drainage. Prerequisite: 221.

340 Advanced Farm Power and Machinery (3). Analytical study of construction and operating characteristics of engines, tractors, selected farm machines. Use of instruments, experimental apparatus. Prerequisites: Math 304 & computer programming.

350 Honors Thesis Research (2-4). Open only to Honors students in agricultural engineering. Independent investigation in agricultural engineering as a thesis.

390 Agricultural Engineering Design (3). Design of agricultural devices or systems. Prerequisites: Engineering 195, Civil Engineering 251 or Mechanical & Aerospace Engineering 251 & 9 hours course work in agricultural engineering.

400 Problems (cr. arr.) Supervised individual study.

401 Advanced Topics in Agricultural Engineering (1-3). Study of advanced developments in agricultural engineering.

403 Advanced Farm Buildings (3). Advanced study of farm buildings and building design. Prerequisites: 303 & graduate standing.

410 Seminar (1). Recent investigations in agricultural engineering and related fields. Discussion of current literature; preparation and presentation of papers.

412 Research Methods (1). Review of literature; planning research projects; publication procedures. Prerequisite: graduate standing.

416 Agricultural Processing Engineering (3). Applies thermodynamics, fluid mechanics and heat transfer to problems in processing farm crops.

421 Water Management Theory (3). Advanced studies in erosion control, irrigation and drainage. Water resources engineering. Prerequisite: 321.

435 Similitude in Engineering (3). Principles of dimensional analysis. Use of structural and fluid flow models in design. Prerequisites: Engineering 195 & Civil Engineering 251 or Mechanical & Aerospace Engineering 251.

440 Mechanical Farm Equipment (3). Advanced study of special topics. Prerequisite: 340 or equivalent.

490 Research (cr. arr.) Independent investigation as a thesis.

Agricultural Extension

(See Extension Education)

Agriculture

6 Basic Environmental Studies (3) (same as Biological Sciences 6).

12 Animal Science (5) (same as Animal Husbandry 12, Poultry Husbandry 12, Dairy Husbandry 12). Principles of animal production including importance of animal agriculture and animal products, genetics, anatomy, physiology, nutrition, and animal diseases and public health. f,w.

150 Agricultural Travel Course (cr. arr.) General travel course designed to broaden perspective of agricultural students. Prerequisites: one course in each of following areas: agricultural economics, animal science, plant science & instructor's consent. Cost of course is borne by student. s.

180 Principles of Pest Management (3) (same as Pest Management 180).

181 Pesticide Chemicals (3) (same as Entomology 181).

199 Agriculture Careers and Placement Seminar (1). Identifies careers in agriculture and related industries. Instruction in how to obtain careers and development of communication skills. Exposure to employment opportunities. Graded *S/U*. Prerequisite: instructor's consent. w.

Agronomy

30 Plant Science (5) (same as Horticulture 30). Principles of production and management of crop plants based on their nature, function, adaptation and utilization. Recommended: a college course in a biological science. f,w.

100 Soil Systems (3 or 5). Nature and functions of soils in soil-biosphere-atmosphere systems; emphasis upon those interactions between water, air, organisms and soil minerals important in consideration of land use, management. Prerequisite: Chemistry 1 or 5 or 11. f,w.

111 Seed Analysis (2). Seed identification and analyses for purity and viability. Prerequisite: 30. f,s.

130 Undergraduate Seminar (1). Discusses assigned or selected topics in agronomy. Prerequisites: 30, 100. f,w.

202 International Agronomy (2). Agronomic and inter-related factors and conditions associated with world food production problems and the transition from traditional to modern agricultures. w.

213 Soil Testing and Evaluation (2). Lecture/lab in methods of evaluating nutritional status of soils and interpreting results of soil tests and plant analysis. Prerequisites: 30, 100.

220 Soil as a Natural Resource in Land Use Management (4). Prerequisite: 100 or instructor's consent. w.

225 Basic Plant Genetics (3). Basic concepts of plant genetics relevant to agriculture. Emphasizes breeding, production and protection against pathogens. Prerequisite: 30 or equivalent.

230 Crops and Soils Management (3). Integrates crop and soil sciences into principles of agronomy. Basic plant-soil-climate relationships used in solving management problems of current and future production systems. Prerequisites: 30, 100. w.

300 Problems (cr. arr.) Not accepted as substitute for any regularly scheduled course. Problems arranged. f,w,s.

302 Fertilizers (2). Constituents, manufacture, proper use of various fertilizers. Prerequisite: 100. f.

303 Forage Crops (3). Principal forage crops, pasture production, preservation and utilization. Prerequisite: 30. w.

304 Grain Crops (3). Principles of production and utilization of major crops. Prerequisite: 30. f.

305 Advances in Crop Science (2). Recent developments in field crops research; application to crop production. Prerequisite: 30. alt. s. odd yrs.

306 Weed Control (3). Identification of weeds; cultural, chemical methods of control; influence on production management. Prerequisite: 30. f.

307 Physical Properties of Soils (5). Physical constitution of soils in relation to soil structure, consistency, water relationships, aeration, temperature. Prerequisites: 100 & college physics. f.

308 Soil Conservation (3). Conservation of soils with respect to fertility, erosion and deterioration. Prerequisite: 100. Recommended: Agricultural Engineering 201. f.

310 Cotton and Other Fiber Crops (2). Relationships of morphology and physiology of cotton and other fiber crops to production practices. Prerequisite: 30. w.

312 Soil Microbiology (3). Micro-organic life of soil in relation to soil fertility. Prerequisites: 100 & general bacteriology. w.

313 Soil Fertility and Plant Nutrition (3). Considers selected soil properties related to mineral nutrition and plants; practical aspects of evaluating, maintaining and improving soil fertility. Prerequisites: 30 & 100. w.

314 Soil Fertility and Plant Nutrition Laboratory (2). Lab procedures related to evaluating selected soil properties for improving soil fertility and plant nutrition. Prerequisite: concurrent or previous enrollment in 313. w.

315 Crop Physiology (3). Basic course in crop growth and development; emphasis on role of crop physiology and morphology in management decisions. Prerequisite: 30. w.

319 Soil Chemistry (3). Chemical processes which determine the nature and properties of soils. Prerequisites: 100, Chemistry 12 & Chemistry 205 or Biochemistry 110. f.

320 Soil Genesis, Mapping and Classification (4). Identification of soils and soil systems in the natural landscape and factors determining their nature. Prerequisite: 100. f.

325 Field Crop Breeding (3). Principles underlying economic breeding of crop plants. Methods of breeding major field crops. Prerequisite: 30. f.

330 Plant Breeding Theory (3). Designed to provide a logical application of genetic concepts to mating and selection theory in general plant improvement. Prerequisite: 225 or equivalent.

338 Rural Real Estate Appraisal (3) (same as Agricultural Engineering 338, Agricultural Economics 338).

343 Evolution of Genetic Concepts (2) (same as Biological Sciences 343). Discusses major hypotheses and evidences leading to development of current fundamental concepts. Prerequisite: 225 or equivalent. alt. w. odd yrs.

350 Special Readings (1-3). Individual study of assigned topics.

351 Soil Management Problems (2-3). Recent developments in soils research; application to soil management. Credit variable with extra readings. Prerequisite: 10 hours soil or equivalent. alt. s. even yrs.

384 Cytogenetics (3) (same as Biological Sciences 384). Chromosome cytogenetics, mitosis, meiosis, aberrations, polyploidy, aneuploidy and regulation of chromosome pairing. Prerequisite: 12 hours in biology including some genetics and cytology, or instructor's consent. w.

385 Cytogenetics Laboratory (1) (same as Biological Sciences 385). Practical aspects of subjects dealt with in 384. Prerequisite: 384 or instructor's consent; may take 384 & 385 concurrently. w.

400 Problems (cr. arr.) Advanced studies not expected to terminate in thesis.

401 Isotopes in Soil Studies (5). Isotopes, radiochemistry. Emphasis on use of soil, plant nutrition and other agricultural applications. Prerequisite: 313 or Biological Sciences 313. w.

407 Soil Physics (3) Physical characteristics of soil (fracture mechanics, volume changes, soil aeration and temperature) and principles underlying flow and distribution of water in soils. Prerequisites: 307, physics, integral and differential calculus. alt. w. even yrs.

410 Seminar (1). Development in depth of advanced aspects of crop and soil sciences through reviews of results of research in progress and of current scientific publications. f,w.

414 Advances Soil Fertility (3). Concepts of field crop nutrition and maintenance of soil fertility. Prerequisites: 313 or equivalent & Biological Sciences 313 or equivalent. alt. f. odd yrs.

415 Advanced Crop Physiology (3). Advanced course in crop growth and development. Emphasis on physiology and morphology of plant communities and how they are related to improvement and management of agronomic crops. Prerequisites: 315 & Biological Sciences 313 or equivalent. f.

419 Physical Chemistry of Soils (3). Theoretical basis for applying physical, inorganic and electro-chemical concepts to soil systems. Prerequisites: 319 or Geology 342, & Chemistry 230. alt. w. even yrs.

420 Topics in Agronomy (cr. arr.) Instruction in specific subject matter areas in agronomy. Prerequisites: graduate standing & instructor's consent. f,w,s.

425 Development of Plant Breeding Concepts (3). Concepts, theories, practices underlying economic breeding of crop plants; based on readings of original literature. Prerequisites: 225, 325. alt. w. odd yrs.

440 Applied Quantitative and Statistical Genetics (3). Application of genetic mating systems to agronomic crops to derive estimates of genetic parameters; interpretation of parameters in improving crops. Prerequisites: 325, Statistics 395, & Poultry Husbandry 423, or equivalents. alt. w. even yrs.

445 Cytogenetics in Crop Breeding (3). Application of principles and techniques of cytogenetics in crop breeding programs. Chromosomal aberrations, euploidy, aneuploidy, mutations, apomixis, interspecific hybridization and cytoplasmic inheritance. Prerequisite: 384. alt. f. odd yrs.

450 Research (cr. arr.) Research not expected to terminate in dissertation.

490 Research (cr. arr.) Original investigation in crop and soil sciences in support of theses for master's and doctoral candidates.

Air Force R.O.T.C.
(See R.O.T.C.)

American Archaeology
(See Anthropology)

Anatomy

201 Elementary Anatomy Lecture (3). Fundamentals of human embryology, gross and microscopic anatomy. For students in nursing and other colleges and schools of the University. Prerequisite: 5 hours biological science or equivalent.

202 Elementary Anatomy Laboratory (2). Observes and discusses anatomical materials in the lab. Prerequisite: must be taken concurrently with 201.

205M Medical Gross Anatomy (8). Gross anatomy of human body including dissection. f.

206M Medical Developmental Anatomy (2). A study of normal and abnormal human development from conception through birth. f.

207M Medical Histology (4). Microscopic structure of cells, tissues and organs. w.

208M Medical Neuroanatomy (3). Structure of human central nervous system, emphasizing correlation of structure and function. w.

300 Problems (cr. arr.) Regions or systems which may include developmental, microscopic and gross anatomy.

301 Human Gross Anatomy (8). General principles of systemic anatomy. Gross anatomy and dissection of back, upper and lower extremities, head and neck, thorax, abdomen and pelvis. Prerequisite: 201, comparative anatomy or equivalent and instructor's consent. f.

303 Human Developmental Anatomy (2). Human embryology and teratology from conception to birth. Prerequisites: vertebrate embryology and instructor's consent. f.

304 Human Histology and Organology (4). Detailed study of cytology, histology and microscopic anatomy. Prerequisites: 10 hours of biology & instructor's consent. w.

305 Anatomy of the Human Nervous System (3). A comprehensive consideration of the morphology of the nervous system, emphasizing correlation of structure and function. Prerequisites: 201, comparative anatomy or equivalent, & instructor's consent. w.

306 Autonomic Nervous System (2). A comprehensive consideration of the autonomic nervous system in man, with emphasis on morphology. Prerequisites: 201, comparative anatomy or equivalent, & instructor's consent. f.

308 Hematopoietic Organs (2). Morphological and functional relationships of the blood and blood-forming organs. Prerequisites: basic histology & instructor's consent. w.

312 Biology of the Endocrine Organs of Man I (2). Principles of endocrinology; integrates developmental, structural and functional aspects of endocrine system. Neuroendocrinology, metabolic control. Prerequisites: advanced standing in biological sciences, instructor's consent. f.

313 Biology of the Endocrine Organs of Man II (2). Endocrinology of the reproductive system; integration of developmental, structural and functional aspects. Prerequisites: 312, instructor's consent. w.

405 Mammalian Reproduction (3). Reproduction in mammals, with emphasis on hormones involved in reproductive process; biosynthesis, biologic actions, role. Prerequisites: graduate standing in one of animal, biologic, medical or veterinary sciences, instructor's consent, Biochemistry 304 or equivalent. w.

410 Seminar (1). Presentation and discussion of original investigations and current literature. f,w.

Anesthesiology

Anesthesiology Elective (10). Junior and Senior Students. Goals: to provide students (a) an understanding of certain truths associated with the anesthetic state (e.g., inability of a person to protect himself from the environment; concomitant and common depression of systems of the body other than the nervous system); (b) an opportunity to learn to think and react quickly and correctly in times of stress; (c) to develop knowledge and skills at maintaining artificial ventilation and circulation; (d) to develop technical skills (e.g., insertion of endotracheal catheters, intravenous infusions); (e) to understand some of the rationale in the choice of an anesthetic agent or technique; (f) to relate the morbidity and mortality of anesthesia to surgical patients; (g) to inform students of

the functions of anesthesiologists in the care of nonsurgical patients (e.g., respiratory therapy, pain problems); and (h) to attract students to the speciality of anesthesiology. Eight-week periods are preferred although four-week electives are available. Actual participation in anesthetic evaluation and administration for surgical procedures is combined with close individual supervision. Arrange electives with department chairman.

Postgraduate Instruction. Formal training is established and accredited. The residency is of two or three years duration. Goals: an understanding of certain truths associated with the anesthetic state; an opportunity to learn to think and react quickly and correctly in times of stress; to develop knowledge and skills at maintaining artificial ventilation and circulation; to develop technical skills; to understand some of the rationale in the choice of an anesthetic agent or technique; to relate to morbidity and mortality of anesthesia to surgical patients; to inform students of the functions of anesthesiologists in the care of nonsurgical patients. Objectives are reached by close supervision by the staff during administration of anesthesia by students to patients undergoing surgery, by preoperative discussion of anesthetic management for every patient. Didactic lectures and morbidity and mortality conferences. Exposure to visiting professors and anesthesia-oriented research, with directed reading and adequate time for study.

Animal Husbandry

12 Animal Science (5) (same as Poultry Husbandry 12, Dairy Husbandry 12, Agriculture 12). f.w.

20 Livestock and Meat Science (5) (same as Food Science & Nutrition 20). Livestock and meat industry, basic principles of livestock production, live animal-carcass comparisons, slaughter techniques, meat as a food, meat inspection, processing, storage, preservation, identification. f.w.

101 Livestock Judging (3). Comparative judging and evaluation; various classes of farm animals; particular reference to utility. Reference reading; illustrated lectures. Prerequisite: 20. f.

191 Advanced Livestock Selection and Evaluation (2). Evaluation and selection of breeding and market animals of four farm species (swine, beef cattle, sheep, horses); emphasizes production records and carcass data. Prerequisite: 101. w.

199 Horse Science (3). Nutrition, feeding, management, reproduction, breeds and their uses, psychology, and methods of training horses. Prerequisite: 12 or instructor's consent. w.

200 Problems (1-2). Library or laboratory study of assigned problems in animal breeding, nutrition, physiology, or production and management. Planning, conduct and reporting to be in consultation with instructor. Prerequisite: instructor's consent.

202 Principles of Animal Nutrition (3). Fundamentals of animal nutrition; application to livestock production. Prerequisites: Biochemistry 110 or Chemistry 205 or 210 & Math 10. f.w.

204 Advanced Meats (3) (same as Food Science & Nutrition 204).

212 Applied Nutrition (3). Feed composition and utilization, ration formulation, feed evaluation and identification, practical problems. Prerequisite: 202.

214 Meat Classification, Grading, Judging (2) (same as Food Science & Nutrition 214).

300 Problems (cr. arr.) Current problems in animal breeding, nutrition, livestock production and management, meats. Assigned topics. In some cases student may undertake a project by outlining objectives, planning work, keeping records and summarizing results in written report.

303 Physiology of Reproduction (3). Principles of animal reproduction with emphasis on endocrine control of reproductive processes. Prerequisites: 12 & Biological Sciences 1 & 2. f.w.

313 Genetics of Livestock Improvement (3). Applies genetic principles to improvement of domestic animals. Considers methods available to breeder; their effectiveness. Prerequisite: 12. f.w.

321 Beef Production and Management (3). Systems of beef production: breeding, feeding, management of commercial and purebred beef cattle. Prerequisites: 202 & 212. f.

323 Applied Animal Genetics (3). Applies genetic principles to the improvement of farm animals. Lab periods designed to provide experience in the development and use of statistics important in breeding programs. Prerequisite: 313. w.

331 Sheep Production and Management (3). Systems of sheep and wool production: breeding, feeding, management of commercial and purebred sheep. Prerequisites: 202 & 212. w.

341 Pork Production and Management (3). Systems of pork production: breeding, feeding, management of commercial and purebred swine. Prerequisites: 202 & 212. w.

390 Internship in Animal Science and Technology (1-3). Off-campus training to develop technical skills and understanding of an area of animal science. Written report and examination required. Prerequisites: junior standing, two 300-level animal husbandry courses & instructor's consent.

391 Field Instruction in Animal Science (1-3) (same as Dairy Husbandry 391, Poultry Husbandry 391). On-site instruction in technical or scientific aspects of animal production for selected, qualified advanced student. Prerequisites: junior standing, at least two advanced courses in animal sciences or equivalent, & instructor's consent.

400 Problems (1-2). Advanced independent studies in fields not directly related to thesis or non-thesis degree research program. Prerequisites: graduate standing & instructor's consent.

401 Livestock Production and Management Research Methods (3). Techniques of experimentation, with application to livestock production and management. Exercises in methods of planning, conducting, analyzing, evaluating and reporting research. Prerequisite: graduate standing, Statistics 207 or equivalent or instructor's consent. f.

402 Animal Nutrition (3) (same as Nutrition 402). More important works contributing to knowledge of animal nutrition. Prerequisites: 202 & one course in biochemistry. f.

410 Seminar (1). Critical consideration of research and other selected subjects in animal breeding, animal nutrition and livestock production and management. Students indicate at enrollment the area of study. f.w.

411 Livestock Feeding Investigations (2). Assigned readings of significant papers. Special reports. Prerequisite: 402. alt. s. even yrs.

413 Reproductive Biology Seminar (1) (same as Biochemistry 413).

423 Genetics of Populations (4) (same as Poultry Husbandry 423, Biological Sciences 423).

430 The Development, Growth and Organization of Colleges of Agriculture (1). Additional guest speakers/material, assigned readings, reports. Prerequisite: must be Ph.D. candidates.

432 Ruminant Nutrition (3) (same as Nutrition 432). Physiology, chemistry, microbiology, pathology of ruminants. Emphasizes digestion, absorption, metabolism, utilization of nutrients. Lecture, lab, assigned readings. Prerequisite: 402 or equivalent. alt. w. odd yrs.

440 Topics in Animal Husbandry (cr. arr.) Prerequisites: graduate standing & instructor's consent.

450 Research (cr. arr.) Investigations in animal breeding, animal nutrition, livestock production and management. Written report required.

490 Research (cr. arr.) Investigations in animal breeding, animal nutrition, livestock production and management. Thesis required.

Anthropology

1 General Anthropology (3). General survey course in fields of anthropological concern: archaeology, cultural anthropology, physical anthropology; emphasizes underlying concepts, principles. Examples from nonliterate peoples of world. f.w. cor.

2 Anthropological Materials (2-3). Analyzes and discusses materials of anthropology data collection: movies, tape and phonograph recordings, artifacts, models, ethnographies, fossils. Prerequisite: 1 (which may be taken concurrently) or instructor's consent.

50 Deviance: A Cross-Cultural Perspective (3). Cross-cultural studies of problem behavior with emphasis on violence, suicide, sexual misconduct, drug use and mental disorder.

110 Civilization of India (3) (same as History 110, South Asia Studies 110). Substance of Indian civilization as seen from traditional Indian and Western perspectives; Indian viewpoints emphasized.

142 Introduction to Field Research Archaeology (1-6). Techniques of field research and lab analysis through field experience. Prerequisites: 3 hours anthropology or declared major field of study in anthropology; instructor's consent. s.

143 Museum Methods (2-3). Introduces museum techniques of handling and preservation of collections; exhibit design and evaluation; role of anthropological museum. cor.

150 Introduction to Physical Anthropology (3). Principles of evolution, evolution of lower primates, and human evolution. Production and significance of human variation and adaptive aspects of human racial biology. Prerequisite: 1 or junior/senior status.

151 Introduction to Laboratory Methods in Physical Anthropology (2). Emphasizes human skeleton. Aging and sexing of human skeleton, anthropometry, blood typing and other techniques used in field of physical anthropology. Recommended: departmental majors take concurrently with 150.

152 Introduction to Archaeology (3). Introduces prehistory of man. Surveys early cultural development throughout the world; emphasizes techniques, interpretation and theories of development. Prerequisite: 1 or junior/senior status.

153 Introduction to Cultural Anthropology (3). Development of culture; emphasis on constant and variable factors at different levels of complexity, processes of contact between cultures and cultural determinations of individual behavior. Prerequisite: 1 or junior/senior status.

154 Introduction to Anthropological Linguistics (3) (same as Linguistics 154). Language in relation to other aspects of human behavior. Introduction to description and analysis of the basic units of language. Emphasis on non-Indo-European and preliterate languages. Prerequisite: 1 or junior/senior status.

185 Undergraduate Research (2-8). Prerequisite: instructor's consent.

198 Honors in Anthropology (3).

199 Honors in Anthropology (3).

235 Cultures of Native America (3). Survey of culture areas of the American Indian at the time of the first contact with western civilization (North, Middle and South America). Prerequisite: 1 or instructor's consent.

240 Ancient American Civilization (3). Origin of man and beginnings of Indian cultures in the Americas. Archaeological cultures and the development of American civilization prior to 1500 A.D. Prerequisite: 1 or instructor's consent.

250 Cultural Ecology and Human Adaptation (3). Systematic survey of the relationship and interrelation between the environment, human behavior and cultural patterns in the process of adaptation and survival. Prerequisite: 1 or junior/senior status.

253 Cultures of the World (3). Surveys culture types; systematic description and ordering of living world cultures from hunting and gathering bands to nation-states. Prerequisite: 1 or 153 or junior/senior standing.

260 The Third World: An Anthropological Perspective (3) (same as Peace Studies 261). Considers problems in developing nations—neo-colonialism, peasant revolutions, overpopulation, under-industrialization—in the context of cultural change. Prerequisite: 1 or junior/senior status.

265 Male and Female (3). Comparative anthropological findings of the male and female in politics, subsistence, art, etc. in primitive, peasant and modern cultures. Cultural and biological theories about sexually defined roles. Behavioral evolution of monkeys, apes, humans.

269 Anthropological Populations (3). Ecological setting, population structure and biocultural interactions of small, usually isolated human populations studied as possible models for human adaptation before recent explosive growth and migrations of our species. Prerequisite: 1 or Biological Sciences 1.

270 Culture as Communication (3). Study of cultural systems as communicative devices. Examines topics such as space and gesture from an evolutionary and cross-cultural perspective. Emphasizes increased sensitivity to the cultural messages conveyed by different societies.

306 Sociolinguistics (3) (same as Linguistics 306). Studies covariation of linguistic structure and society; surveys current sociolinguistic literature; topics: multilingualism, Black English, social factors in language change, social dialectology—its methods and theory, etc. Prerequisites: a course in linguistics & instructor's consent.

308 Historical Linguistics (3) (same as Linguistics 308). Methods of tracing history of languages by glottochronology and by comparative and internal reconstructions; cultural and linguistic implications of such reconstructions and of areal linguistics. Prerequisite: 154 or instructor's consent.

323 Medical Anthropology (3). Cross-cultural study of belief systems concerning health and illness, practices of diagnosis and treatment, and roles of patients and practitioners. Several "non-Western" health care systems are studied in detail. Prerequisite: nine hours upperclass behavioral sciences.

324 Preindustrial Technology (3). Technological pursuits of non-literate peoples: stone working, basketry, pottery, metallurgy, etc. Description, analysis of technical, economic, social aspects. Prerequisite: 1 or instructor's consent.

326 Advanced Cultural Anthropology (3). Nature of culture. Critical examination of varying uses made of the concept of culture by social scientists; implication of these concepts for anthropological method and theory. Prerequisite: 153 or instructor's consent.

327 Anthropology of Religion (3). Religion as a cultural system and its relation to social structure. Prerequisite: junior/senior standing or instructor's consent.

- 328 Psychological Anthropology (3).** Examines cross-cultural approaches to the study of perception, cognition and personality; methods for gathering and validating data; examples from non-western societies. Prerequisite: 1 or Psychology 1 or Psychology 2.
- 329 Cultures of Asia (3).** Survey of peoples, cultures of Asia; emphasis on native societies of area. Prerequisite: 1 or instructor's consent.
- 330 Cultures of Africa (3).** Survey of Negroid peoples, cultures of Africa south of the Sahara. Prerequisite: 1 or instructor's consent.
- 331 Cultures of Oceania (3).** Survey of peoples, cultures of Pacific island world, including Australia. Sources, development, characteristics of native cultures of area. Prerequisite: 1 or instructor's consent.
- 332 Comparative Social Organization (3).** Cross-cultural comparison, analysis of social structures. Role of kinship, age, sex, locality, economics, religion and other factors in determining relations between individuals in groups in non-literate societies. Prerequisite: 1.
- 334 Cultures of Mexico and Guatemala (3).** Surveys contemporary populations in Mesoamerica; emphasizes village life, culture change and stability, and current problems of anthropological interest. Prerequisite: 1 or instructor's consent.
- 335 North American Indian Culture (3).** Comparative study of American Indian tribes north of Mexico; emphasizes eastern United States. Prerequisite: 1, 153, or 235.
- 336 Zooarchaeology (3).** Faunal identification and analysis of mammals, birds, reptiles, etc. recovered archaeologically. Interpretation of cultural and climatic significance. Prerequisite: 152 or equivalent.
- 339 Field Research in Historical American Archaeology (3).** Stresses specialized field techniques in location, identification and excavation of features common to historical sites; correlates historical data with approach to and products of excavation. Prerequisite: 142.
- 340 North American Archaeology (3).** Ancient man and development of American Indian culture; archaeology of Missouri. Prerequisite: 1, 152, or 240.
- 341 Archaeology of South America (3).** Surveys development of culture in South America from the Pleistocene to 1492 A.D. Prerequisite: 1, 152, or junior/senior standing.
- 342 Field Methods in Archaeology (1-8).** Techniques of archaeological excavation; field surveying, recording, care and interpretation of materials. Prerequisites: 142 or equivalent, & instructor's consent.
- 343 Environment and Archaeology (3).** Methodological base for study of quaternary environments and cultural systems. Focuses on North American records emphasizing the climate and biologic components of regional ecosystems and on regional environmental reconstruction. Prerequisite: 152 (for non-majors, Geology 127 or equivalent).
- 344 Prehistory of Mexico (3).** Surveys development of culture in Mexico prior to European contact. Prerequisite: 1 or 152 or junior/senior status.
- 346 Language and Culture (3)** (same as Linguistics 346). Interrelations between language, thought, culture and society; role of language in cognition; methods and concepts of linguistics in cultural analysis. Prerequisite: 154 or equivalent.
- 348 Far Eastern Prehistory and Archaeology (3).** Surveys prehistory and early cultures of Asia excluding the Near East. Emphasizes prehistoric cultures of Northern Asia, China, Japan, Southeast Asia, India. Prerequisites: 1 & 152.
- 349 Topics in Anthropology (3).** Problems, topics, issues or review of research; experimental development of new content areas. Specific content varies depending on needs of faculty or students and is announced in advance. Prerequisite: instructor's consent.
- 350 Special Readings in Anthropology (cr. arr.)** Directed reading in ethnology, linguistics, archaeology or physical anthropology not leading to thesis. Prerequisites: two courses in anthropology & instructor's consent.
- 353 Prehistory of the Maya (3).** Surveys pre-Hispanic development of Indian cultures in Guatemala and adjacent areas, emphasizing rise and decline of Maya civilization. Prerequisite: 1 or 152 and junior/senior status.
- 357 Pre-Pleistocene Primate Evolution (3).** Primate evolution from the Paleocene to end of Pliocene; discusses contributions from comparative anatomy, postnatal growth, biochemistry, cytogenetics and ethology. Prerequisite: 150 or instructor's consent.
- 359 Cultures of South Asia (3).** Examines traditional and contemporary cultures of India, Pakistan, Sri-Lanka (Ceylon), Bangladesh. Prerequisite: 153 or instructor's consent.
- 360 Cultures of Southeast Asia (3).** Survey of cultures of mainland and island areas; discusses influences from India and China; development of Southeast Asian states. Prerequisite: 1 or 153 or instructor's consent.
- 361 Cultures of Europe (3).** Examines ethnic, linguistic and folk cultural background of contemporary Europe, the articulation of local sociocultural units with national society and culture. Prerequisite: 1 or instructor's consent.
- 362 Cultural Change (3).** The processes of culture: innovation, diffusion, integration, patterning, acculturation and others, examined in literate and non-literate contexts. Prerequisite: 1, 153, or instructor's consent.
- 363 Theories in Social Anthropology (3).** Critical examination of the theories of selected French, British and American social anthropologists. Prerequisite: three courses in anthropology and/or sociology.
- 364 Human Origins (3).** Surveys fossil hominids from the Villafranchian to the Neolithic. Prerequisite: 150 or instructor's consent.
- 365 Economic Anthropology (3).** Examines social and economic organization of a variety of non-western cultures; discusses economic theory in anthropology; analyzes ecological, economic and social factors in culture change. Prerequisite: 9 hours anthropology or instructor's consent.
- 366 Living Races of Man (3).** Elements of population genetics as applied to man; origins and continuing development of racial variation with emphasis on adaptive characteristics. Present human distribution. Anthropometry. Prerequisite: 150 or instructor's consent.
- 367 Ethnographic Methods (3).** Relation of problems to techniques; surveys techniques of gathering data; discusses their limitations and potentials. Prerequisite: 9 hours anthropology or instructor's consent.
- 368 Old World Prehistory (3).** Beginnings of culture in the Old World, through the early Iron Age. Prerequisite: 1, 152, or instructor's consent.
- 369 Primate Social Behavior (3).** Communicative behavior and group social dynamics of non-human primates. Prerequisite: 150 or instructor's consent.
- 370 Primate Growth (3).** Normal biological changes during the postnatal growth period of man and non-human primates. Prerequisite: 150 or instructor's consent.
- 371 Introduction to General Linguistics (3)** (same as Linguistics 371, Romance Languages 371).
- 372 Linguistic Analysis (3)** (same as Linguistics 372, Romance Languages 372).

- 373 Phonology (3)** (same as Linguistics 373, Romance Languages 373).
- 374 Syntax (3)** (same as Linguistics 374, Romance Languages 374).
- 376 Applied Anthropology (3)**. Applies theories and methods of anthropology to the solution of practical problems in the modern world. Prerequisite: 153 or instructor's consent.
- 393 Field Methods in Linguistics (4)** (same as Linguistics 393). Intensive training in collection and analysis of data taken from a native speaker of non-Indo-European language. Prerequisites: 6 hours linguistics & instructor's consent.
- 400 Problems (cr. arr.)** Directed research not leading to thesis or dissertation. Prerequisite: departmental approval.
- 420 Independent Readings in Preparation for the Comprehensive Examination for the Ph.D. (1-8)**. Open only to Ph.D. candidates who have completed all but final semester of course work. Prerequisite: consent of major adviser.
- 436 Seminar in Anthropological Methods (3)**. Prerequisite: 9 hours anthropology or instructor's consent. May repeat to 9 hours maximum.
- 437 Seminar in Ethnohistory (3)**. Prerequisite: instructor's consent.
- 442 Field Problems in Archaeology (2-8)**. Prerequisite: 342.
- 443 Seminar in Theory and Methods in Archaeology (3)**. Application of theory and conceptual frameworks to archaeological studies drawn from both Old and New Worlds. Prerequisites: 1 & 152 or 153. May repeat to 6 hours maximum.
- 444 Seminar in Archaeological Research (3)**. Readings and critical evaluation of selected problems in archaeological research. Prerequisite: 12 hours anthropology. May repeat to 9 hours maximum.
- 446 Seminar in Anthropological Linguistics (3)** (same as Linguistics 446). Topics: ethno-linguistics, linguistic prehistory, Pidgin and Creole languages, linguistic theories and cultural analysis, French structural anthropology. May repeat for 9 hours maximum when content varies. Prerequisite: either 308 or 346 or instructor's consent.
- 449 Topics in Anthropology (3)**. Problems, topics, issues or review of research; experimental development of new content areas. Specific content varies depending on needs of faculty or students and is announced in advance. Prerequisite: instructor's consent.
- 450 Research (cr. arr.)** Original research not leading to the preparation of a dissertation. Prerequisite: instructor's consent.
- 451 Problems in Physical Anthropology (2-8)**. Concentrated work upon the definition and solution of problems in physical anthropology and human biology, with origination of or participation in research projects. Prerequisite: 366 or instructor's consent.
- 452 Seminar in Physical Anthropology (3-6)**. Readings and discussion concerning current problems in human and infra-human primate evolution, with emphasis on taxonomy, morphology and behavior. Prerequisite: 366 or instructor's consent.
- 453 Seminar in Classic Questions in Physical Anthropology (3)**. Considers classic literature and problems in physical anthropology. Prerequisites: 150, 151, 366.
- 461 Seminar in Psychological Anthropology (3)**. Focuses on developments in psychological anthropology, cross-cultural psychology. Special attention on cognition, perception, socialization, personality assessment, psycho-cultural change, psycho-linguistics, psychometrics, within cross-cultural contexts. Prerequisite: instructor's consent. May repeat to 6 hours maximum.
- 462 Seminar in Cultural Dynamics (3)**. Prerequisite: 326 or 362 or instructor's consent. May repeat to 6 hours maximum.
- 463 Seminar in Comparative Social Organization (3)**. Prerequisite: 332 or instructor's consent. May repeat to 6 hours maximum.
- 465 Seminar in Ethnological Theory (3)**. Prerequisite: 6 hours anthropology or instructor's consent. May repeat to 9 hours maximum.
- 466 Seminar in Ecological Adaptation (3)**. Relationships and interactions between man and his environments; physical and cultural adaptations to environment emphasized. May repeat to 9 hours maximum. Prerequisites: 8 hours anthropology & instructor's consent.
- 468 Seminar in Old World Archaeology (3)**. Intensive studies in application of anthropological concepts to problems in Old World archaeology and prehistory. Prerequisite: previous course in cultural anthropology & in Old World archaeology. May repeat to 12 hours maximum.
- 469 Seminar in Formal Anthropological Research Design (3)**. Methods of fitting statistical and formal research designs to quantitative and qualitative data discussed and illustrated, with research by participants. Prerequisite: introductory course in statistics. May repeat to 9 hours maximum.
- 490 Research (cr. arr.)** Advanced work leading to thesis or dissertation.
- 492 Structure of a Language and Language Typology (3)** (same as Linguistics 492). Studies phonological, grammatical and semantic structures of an unfamiliar language in reference to language typology and universals. Prerequisite: 6 hours linguistics.
- 493 Advanced Phonology (3)** (same as Linguistics 493, Romance Languages 493).
- 494 Seminar in Advanced Syntax (3)** (same as Linguistics 494). Surveys various theories of syntax; closely examines the theory of generative transformational grammar and reviews the relevant literature. Prerequisite: a course in syntactic theory.

Archaeology (See Anthropology; Art History & Archaeology)

Architecture

(See Art History & Archaeology)

Army R.O.T.C. (See R.O.T.C.)

Art

(See also Art History & Archaeology)

2 Introduction to Art (3). Basic practice in drawing, painting, design. Exploratory course for beginners. Prerequisite to all other studio courses except 55 & 60. f.w.

3 Appreciation of Art (2). Illustrated discussion with examples from varied historic and contemporary art fields on nature of art, functions, methods of creative expression. f.w.

Design

20 Basic Design I (3). Basic study of line, shape and texture; their use and control according to the basic variables and the principles of design. Two dimensional exercises employing a variety of tools and materials. Prerequisite: 2. f,w.

21 Basic Design II (3). Continuation of 20 with concentration on the elements of value and color and control of implied space. Prerequisite: 20. f,w.

120 Color Theory (3). An investigation of various color systems and their application to art. Prerequisite: 21. f or w.

220 Beginning Spatial Design (3). Preliminary studies of the elements of three-dimensional form as they are embodied in a variety of structural materials. Prerequisite: 20. f,w,s.

222 Graphic Design I (3). Investigations of origins and structure of letter-forms; application of lettering to graphic design problems such as book covers, posters, advertisements. Prerequisite: 20. f,w.

320 Space, Form and Structure (3). Advanced study of three-dimensional form; basic structural systems and machine production emphasized. Prerequisite: 220. f.

321 Space, Light and Color (3). Advanced study of three-dimensional form with emphasis upon spatial effects of light and color. Prerequisite: 220. w.

322 Advanced Spatial Design (3). Advanced study of three-dimensional design; practical application of theories of spatial design. Prerequisites: 320 and 321. May repeat to 15 hours maximum. f,w.

323 Graphic Design III (3). Surveys historical and contemporary illustration. The illustrator's function in graphic design. Studio problems in various techniques and media. Prerequisite: 322.

324 Graphic Design IV (3). Advanced graphic design problems in magazines, books, film. Prerequisite: 323. May repeat to 15 hours maximum. f,w.

421 Graduate Spatial Design (3). Comprehensive study of three-dimensional design; emphasis on creative expression based on original theoretical research. Prerequisites: 322 and graduate standing. May repeat to 15 hours maximum. f,w.

422 Graphic Design V (3). Supervised creative research and practical application of individualized graphic design problems. Prerequisites: 324 and graduate standing. May repeat to 15 hours maximum. f,w.

Drawing & Painting

60 Beginning Drawing I (2). Basic practice in fundamentals of drawing. Various approaches to drawing problems in black and white. Studies from the human figure and still life. f,w.

160 Beginning Drawing II (3). Continuation of 60. Emphasizes drawing of the human figure in various graphic media. Prerequisites: 2, 60. f,w,s.

165 Anatomical Drawing (3). Anatomical structure of human figure as it relates to art. Drawing from live model; emphasis on gross anatomy as defined by skeletal and muscular structure. Prerequisites: sophomore standing, one semester of drawing. May repeat to six hours maximum. f,w.

175 Beginning Water Color (3). Theory, practice of painting in water color from still life, landscape, figure. Prerequisites: 2 and one semester of drawing. f,w.

177 Beginning Painting (3). Basic exploration of oil and acrylic painting techniques and methods. Still life, landscape and figure. Prerequisites: 2, 20 and one semester of drawing. f,w,s.

260 Intermediate Drawing (3). Continuation of 160. Prerequisite: 160. f,w,s.

270 Experimental Media I (3). Ordering and structuring materials into compositional forms, using various media, traditional as well as new. Subject matter will vary each semester. Prerequisite: 160 and 220 or instructor's consent. f,w.

275 Intermediate Water Color (3). Continuation of 175. Prerequisite: 175. f,w.

277 Intermediate Painting (3). Continuation of 177 with the addition of portrait painting. Prerequisite: 177. f,w,s.

360 Advanced Drawing (3). Continuation of 260 with increased emphasis on expressive drawing. Prerequisite: 260. May repeat to 15 hours maximum. f,w,s.

370 Experimental Media II (3). Continuation of 270. Prerequisite: 270. f,w.

371 Experimental Media III (3). Continuation of 370. Prerequisite: 370. May repeat to nine hours maximum. f,w.

375 Advanced Water Color (3). Advanced problems in water color. Prerequisite: 275. May repeat to 15 hours maximum. f,w.

377 Advanced Painting (3). Advanced problems in oil and acrylic painting. Prerequisite: 277. May be repeated to 15 hours maximum. f,w,s.

460 Graduate Drawing (3). Continuation of 360 with emphasis on individual creative expression. Prerequisites: 360 and graduate art major. May repeat to 15 hours maximum. f,w,s.

470 Experimental Media IV (3). Advanced study of compositional organization at the graduate level. Prerequisites: 371 and graduate standing. May repeat to nine hours maximum. f,w.

475 Graduate Water Color (3). Advanced study in water color. Emphasis on individual creative expression. Prerequisites: 375 and graduate standing. May repeat to 15 hours maximum. f,w.

477 Graduate Painting (3). Advanced study continued. Emphasis on individual creative expression. Prerequisites: 377 and graduate art major. May repeat to 15 hours maximum. f,w,s.

Printmaking

290 Relief Printmaking (3). Relief printing techniques in color and black and white; includes woodcut, mixed media. Prerequisites: 2, 21 and one semester of drawing. May be repeated to six hours maximum. f,w.

291 Intaglio Printmaking (3). Intaglio printing techniques, including etching, engraving and aquatint. Prerequisites: 2, 21 and two semesters of drawing. May repeat to six hours maximum. f,w.

292 Lithography (3). Lithographic printing techniques from stone and metal plates. Prerequisites: 2, 21 and two semesters of drawing. f,w.

296 Serigraphy I (3). Introduces methods, materials and techniques of printmaking with the silk screen. Prerequisite: 20 & one semester of drawing. f,w.

390 Advanced Printmaking (3). Advanced study in relief, intaglio and lithographic printmaking with emphasis on individual creative expression. Prerequisite: 290 or 291 or 292. May repeat to 15 hours maximum. f,w.

396 Serigraphy II (3). Advanced study of serigraphy; pictorial composition through stencil arrangements emphasized. Prerequisite: 296. May repeat to 15 hours maximum. f,w.

490 Graduate Printmaking (3). Graduate level study in relief, intaglio and lithographic printmaking with emphasis on individual creative expression. Prerequisites: 390 and graduate standing. May repeat to 15 hours maximum. f,w.

496 Graduate Serigraphy (3). Advanced problems in serigraphy; emphasis on creative expression through a combination of methods. Prerequisite: 396 & graduate art major. May repeat to 15 hours maximum. f,w.

Photography

225 Beginning Photography (3). Basic photography as an art form; camera and darkroom techniques; surveys photographic history and esthetics. Camera with adjustable aperture and shutter required. Prerequisite: eight hours studio art. f,w.

325 Intermediate Photography (3). Continuation of 225 with emphasis on advanced photo techniques and photographic image making. Prerequisite: 225. May repeat to 15 hours maximum. f,w.

425 Graduate Photography (3). Advanced technical study with emphasis on development of the individual student's creative ideas. Prerequisites: 325 and graduate standing. May repeat to 15 hours maximum. f,w.

Sculpture

285 Beginning Sculpture (3). Principles of sculptural organization, figure studies, modeling techniques, simple plaster casting. Prerequisite: 5, 20, 165 or 160. f,w.

385 Intermediate Sculpture (3). Continuation of 285. Introduction to carving techniques. f,w.

386 Wood and Stone Carving (3). Advanced carving technique. Prerequisite: 385. May repeat to 12 hours maximum. f,w.

387 Sculpture in Plastics (3). Explores polyester, epoxy and acrylic plastics as sculptural media. Prerequisite: 385. May repeat to six hours maximum. f,w.

388 Sculptural Welding and Metal Casting (3). Prerequisite: 385. May repeat to six hours maximum. f,w.

485 Advanced Sculptural Composition (3). Prerequisite: 386 or 387 or 388 and graduate standing. May repeat to 15 hours maximum. f,w.

Crafts

55 Artcraft Fundamentals (3). Practical work in handling various craft materials. Encourages creative expression in artcraft activities. f,w.

140 Beginning Fibers (3). Basic weaves, drafting, introduction to simple and four-harness loom weaving. Prerequisite: 2. f,w.

230 Beginning Ceramics (3). Artistic fabrication of clay through basic forming, ornamentation, glazing and firing; includes study of ceramic design, technology, history and contemporary movements. Prerequisites: 2, 20. f,w.

240 Intermediate Fibers (3). Patterns and pattern drafting for four-harness looms. Off-loom weaving. Prerequisite: 140. f,w.

250 Beginning Metals (3). Comprehensive introduction to basic techniques in jewelry and silversmithing with emphasis on design. Techniques include sawing, soldering, piercing, bezel setting, forging, reticulation and etching. Prerequisites: 20, 220. f,w.

330 Intermediate Ceramics (3). Continuation of 230 with emphasis on throwing and glaze formulation. Prerequisites: 230 and 220 or 285 or 250. f,w.

331 Advanced Ceramics (3). Continuation of 330. Includes advanced problems in firing, clay and glaze technology, forming and ornamentation. Prerequisites: 330 and (if repeated) Chemistry 1. May be repeated to 12 hours maximum. f,w.

332 Ceramic Sculpture (3). Sculptural forms constructed of slabs, coils and wheel-thrown elements. Prerequisite: 331. May be repeated to nine hours maximum. f,w.

340 Advanced Fibers (3). Projects in off-loom, four-harness and/or multi-harness weaving. Prerequisite: 240. May repeat to 15 hours maximum. f,w.

341 Weaving IV (3). Continuation of Weaving III. Advanced problems in textile designing, weaving. Prerequisite: 340. f,w.

350 Basic Casting (3). Lost wax method of centrifugal casting, including vacuum, steam and cuttlefish casting. Prerequisites: 250 and instructor's consent. f,w.

351 Enameling (3). Techniques of applying enamels to non-ferrous metals. Prerequisites: 250, 350 and instructor's consent. f.

352 Raising (3). Design and construction of hollow and flatware forms. Techniques include forming by planishing, sinking, upsetting and raising, and methods of finishing and ornamentation. Prerequisites: 350, 250 and instructor's consent. w.

353 Advanced Techniques in Metals (3). Emphasis on complex design problems in jewelry and silversmithing, including chasing and repousse, wood graining and advanced stone-setting. Prerequisites: 350, 351, 352 and instructor's consent. May repeat to nine hours maximum. f,w.

430 Graduate Ceramics (3). Advanced study of ceramic technology and design concepts with emphasis on directed development of individual work. Prerequisite: 331. May be repeated to 12 hours maximum. f,w.

431 Graduate Ceramic Sculpture (3). Directed development of individual work. Prerequisite: 331. May be repeated to 12 hours maximum. f,w.

440 Graduate Fibers (3). Individually assigned projects in off-loom, four-harness and/or multi-harness weaving. Prerequisites: 340 and graduate standing. May repeat to 15 hours maximum. f,w.

450 Graduate Seminar in Metals (3). Supervised research in individually directed projects in advanced jewelry design and construction; includes lapidary work. Prerequisites: 353, graduate art major and instructor's consent. May repeat to 15 hours maximum. f,w.

Problems

300 Problems in Art (1-3). Directed advanced study and practice of art in a combination of areas related to, but not included in, scheduled courses. Prerequisites: senior standing or adequate preparation in art and instructor's consent. f,w,s.

301 Topics (cr. arr.) Special studies in studio art; covers subjects not included in regularly offered courses. Prerequisites: junior standing & instructor's consent.

402 Graduate Collaboration (1-4). Collaborative projects involving two or more students in Department of Art. f,w.

403 Historic Research in Drawing, Painting and Design (1-4). Investigation of historic precedent in drawing, painting, design. f,w.

424 Problems in Design (1-12). f,w.

429 Problems in Photography (1-12). Supervised research in creative photography. Prerequisites: 425 and graduate standing. f,w.

434 Problems in Ceramics (1-12). f,w.

444 Problems in Weaving (1-12). f,w.

454 Problems in Metals (1-3). Prerequisites: 15 hours of 450 and instructor's consent. May be repeated to 12 hours maximum. f,w.

456 Historic Research in Artcrafts (1-4). f,w.

464 Problems in Drawing (1-12). f,w.

474 Problems in Experimental Media (3). Independent study at the graduate level. May be repeated to a maximum of 12 hours. Prerequisite: 470 & graduate standing. f,w.

479 Problems in Painting (1-12). f,w.

489 Problems in Sculpture (1-12). f,w.

494 Problems in Printmaking (1-12). f,w.

499 Problems in Serigraphy (1-12). Prerequisites: 496 and instructor's consent. f,w.

Art History & Archaeology

- 10 Introduction to Western Art (3).** Architecture, sculpture and painting of the ancient world, and of Europe from medieval to modern times. f, w.
- 45 Art History of the Cinema (3).** A brief survey of techniques, with main emphasis on style and iconography. Principal theme is art of the fantasy film.
- 130 Oriental Art and Civilization I (3).** Architecture, sculpture, painting of late ancient and Islamic Near East and India with particular emphasis on religious and cultural development. Prerequisite: Honors freshman, sophomore standing or instructor's consent. f.
- 131 Oriental Art and Civilization II (3).** Architecture, sculpture, painting of Buddhist India, Southeast Asia, China, Japan, Central Asia. Special emphasis on relationships with philosophy, religion, symbolism. Prerequisite: Honors freshman, sophomore standing, or instructor's consent. w.
- 141 American Art and Architecture (3).** Architecture, sculpture, painting of America from 17th century to present day. Prerequisite: Honors freshman, sophomore standing or instructor's consent. w.
- 180 Introduction to Art History/Archaeology (1).** Introduces methods and historiography of art history/archaeology; required of departmental majors in junior year. Graded S/U only. Prerequisite: candidacy for B.A. in Art History/Archaeology.
- 181 Senior Seminar in Art History and Archaeology (1).** Discusses research techniques. Majors in their senior year required to present papers. Graded S/U only. Prerequisite: candidacy for the B.A. in Art History/Archaeology.
- 190 Honors Proseminar I (3).** Introduction in research, individual reports, papers. Prerequisite: junior standing. Restricted to Honors candidates & 3-year M.A. program. f.
- 191 Honors Proseminar II (3).** Continuance of 190. w.
- 192 Honors Reading and Research I (3).** Individual research projects in preparation of senior thesis. Prerequisite: senior standing. Restricted to Honors candidates & 3-year M.A. program. f.
- 193 Honors Reading and Research II (3).** Prepares senior thesis. Prerequisite: 192. w.
- 218 The Art and Archaeology of Syria-Palestine (3).** Surveys material culture of Syria-Palestine from early Bronze Age to destruction of the temple in Jerusalem. Prerequisite: 10 or General Honors 101 or History 101 or instructor's consent.
- 219 Art and Archaeology of Ancient Egypt (3).** General survey of development of material culture in Egypt from predynastic period to the Roman conquest. Prerequisite: 10 or General Honors 101 or History 101 or instructor's consent.
- 220 Classical Art and Archaeology I: Greece (3).** General survey of development of material culture in Greece from earliest time to Hellenistic period. Prerequisite: 10 or General Honors 101 or History 101 or instructor's consent. f.
- 221 Classical Art and Archaeology II: Rome (3).** General survey of development of material culture in Roman world from earliest times through early Empire. Prerequisite: 10 or General Honors 101 or History 101 or instructor's consent. w.
- 240 Early Medieval Art (3).** Architecture, painting and sculpture of Europe from 4th century to beginnings of Romanesque period. Prerequisite: 10, General Honors 102, or instructor's consent. f.
- 241 Late Medieval Art (3).** Evolution of art and architecture in Europe from Charlemagne to 15th century as a result of the intellectual situation. Prerequisite: 10, General Honors 102, or instructor's consent. w.
- 250 Italian Renaissance Art (3).** Architecture, painting and sculpture of Italy from 14th through 16th century. Prerequisite: 10, General Honors 103 or instructor's consent.
- 251 Northern Renaissance Art (3).** Evolution of art and architecture in Northern Europe from about 1400 to end of 16th century as a result of intellectual and historical situation. Prerequisite: 10 or equivalent, General Honors 102 or instructor's consent.
- 260 Baroque Art (3).** European architecture, painting and sculpture of 17th century. Prerequisite: 10, General Honors 103 or instructor's consent.
- 261 Rococo Through Romanticism (3).** European architecture, painting and sculpture of 18th century. Prerequisite: 10, General Honors 103 or instructor's consent.
- 270 Modern Art and Architecture I (3).** Architecture, painting and sculpture of Europe from French Revolution to 1885, covers Neoclassicism, Romanticism, Realism, Impressionism. Prerequisite: 10, General Honors 104 or instructor's consent.
- 271 Modern Art and Architecture II (3).** International directions in painting, sculpture and architecture from Post-Impressionist movement to present; special emphasis on development of abstract art in relation to other culture factors. Prerequisite: 10, General Honors 104 or instructor's consent.
- 300 Problems (cr. arr.).** Special studies in Art History/Archaeology; covers subjects not included in regularly offered courses. Prerequisites: adequate preparation in either art history, archaeology, anthropology, classical languages or history; & instructor's consent.
- 301 Topics in Art History and Archaeology (cr. arr.)** Special studies in Art History/Archaeology; covers subjects not included in regularly offered courses. Prerequisites: adequate preparation in either art history, archaeology, anthropology, classical languages or history; & instructor's consent.
- 306 European Art and Archaeology I (3).** Art, culture of Europe from earliest period to Bronze Age. Prerequisite: 220 or equivalent.
- 307 European Art and Archaeology II (3).** Art, culture of Europe during Bronze Age and Iron Age. Prerequisite: 221 or equivalent.
- 308 Ancient Painting I: Greece (3).** Surveys art of painting in Aegean and Classical world, 2000 B.C. to Hellenistic period. Prerequisite: 220 or General Honors 101 or equivalent.
- 309 Ancient Painting II: Italy (3).** Surveys art of painting in Roman world. Prerequisite: 221 or General Honors 101 or equivalent.
- 310 Ancient Sculpture I: Greece (3).** Survey of sculptor's art in Aegean and Classical world from earliest times to Hellenistic period. Prerequisite: 220 or General Honors 101 or equivalent.
- 311 Ancient Sculpture II: Italy (3).** Surveys sculptor's art in Roman world. Prerequisite: 220 or General Honors 101 or equivalent.
- 312 Ancient Architecture I: Greece (3).** Surveys art of building in Aegean and Classical world from earliest times to Hellenistic period. Prerequisite: 220 or General Honors 101 or equivalent.
- 313 Ancient Architecture II: Italy (3).** Surveys art of building in Roman world. Prerequisite: 221 or General Honors 101 or equivalent.
- 314 Archaeological Methods (2-6).** Methods of excavating various types of sites; recording, preserving their materials. Prerequisites: adequate preparation in archaeology or anthropology & instructor's consent.

- 315 Near Eastern Art and Archaeology I: Before 3000 B.C. (3).** General survey of development of material culture in Near East from earliest times to beginning of Bronze Age. Prerequisite: 220, 221, General Honors 101 or equivalent.
- 316 Near Eastern Art and Archaeology II: 3000-500 B.C. (3).** Continuation of 315.
- 317 Aegean Archaeology (3).** Greek prehistoric civilizations from Palaeolithic Period to 1000 B.C. Prerequisite: 220, General Honors 101 or equivalent.
- 319 Greek Sanctuaries (3).** Great sanctuaries of Greece as epitome of Greek art and civilization. Prerequisite: 220, General Honors 101 or equivalent.
- 320 Monuments and Topography of Athens (3).** Descriptive and historical analysis of major monuments of the city of Athens in the ancient period. Prerequisite: 220 or equivalent.
- 321 Monuments and Topography of Rome (3).** Descriptive and historical analysis of major monuments of the city of Rome in ancient period. Prerequisite: 221 or equivalent.
- 323-324 Greek and Roman Numismatics I and II (3) (3)** (same as Classical Studies 323-324). Coinage of Greek city-states and/or Roman Republic and Empire. Prerequisite: Greek 103 or Latin 103.
- 325-326 Greek and Latin Epigraphy I and II (3) (3).** Inscriptions of ancient Greece and/or Rome. Prerequisite: Greek 103 or Latin 103.
- 330 Roman Provincial and Early Christian Art (3).** Analyzes development of art and architecture of provinces of Roman empire into Early Christian period of Europe and Near East. Prerequisite: 221, 240, General Honors 102 or instructor's consent.
- 336 Art of the Dark Ages (3).** Analyzes Barbaric, Merovingian, Carolingian and Viking art and archaeology. Prerequisite: 240 or equivalent.
- 341 Byzantine Art and Archaeology (3).** Byzantine, Slavic and Russian art and architecture. Prerequisite: 240 or equivalent.
- 342 Romanesque Art and Architecture (3).** Art and architecture of Europe in Romanesque period. Prerequisite: 240, 241 or equivalent.
- 343 Gothic Art and Architecture (3).** Art and architecture of Europe in Gothic period. Prerequisite: 241 or equivalent.
- 350 Renaissance Figural Arts I: Italy (3).** Painting and sculpture of Italy from 14th to 16th century. Prerequisite: 250 or equivalent.
- 351 Renaissance and Baroque Architecture (3).** Problems in European architectural history from 14th through 17th century. Prerequisite: 250, 260 or equivalent.
- 352 Renaissance Figural Arts II: Northern Europe (3).** Painting and sculpture of Europe outside Italy from 14th to 16th century. Prerequisite: 241, 251 or equivalent.
- 355 Sixteenth-Century Figural Arts (3).** European painting and sculpture in 16th century. Prerequisite: 260 or equivalent.
- 359 Baroque Figural Arts I: Italy (3).** Painting and sculpture of Italy in 17th century. Prerequisite: 260, 261 or equivalent.
- 360 Baroque Figural Arts II: Europe Outside Italy (3).** Painting and sculpture of Europe outside Italy in 17th and 18th centuries. Prerequisite: 260, 261 or equivalent.
- 361 Art of the Eighteenth Century (3).** European architecture, sculpture and painting in 18th century. Prerequisite: 261, 270 or equivalent.
- 362 Art of the Nineteenth Century (3).** Painting, sculpture and architecture of Europe in 19th century. Prerequisite: 270 or equivalent.
- 365 American Architecture (3).** Architecture from colonial period to present in relation to European architecture. Prerequisite: 141 or equivalent.
- 366 Modern American Painting (3).** Painting in United States during 19th and 20th centuries in relation to European painting. Prerequisite: 141, 270, 271 or equivalent.
- 370 Contemporary Art (3).** Painting and sculpture in 20th century. Prerequisite: 271 or equivalent.
- 371 Modern Architecture (3).** Problems in history of architecture from late 18th century to present. Prerequisite: 141, 270, 271 or equivalent.
- 380 Archaeological Ceramics (3).** Lecture and lab course in scientific analysis of archaeological ceramics. Prerequisites: adequate preparation in archaeology, anthropology, or geology, & instructor's consent.
- 401 Introduction to Graduate Study (3).** Methods of research, bibliography, use and criticism of source material. Required of graduate students in Art History & Archaeology who have not had 190. Prerequisite: graduate standing.
- 402 Historiography of Art and Archaeology (3).** Literature of art and archaeology in terms of works of leading European art historians, archaeologists. Required of graduate students in Art History & Archaeology. Prerequisite: graduate standing, w.
- 403 Theory and Practice of College Humanities Teaching (3-6).** Required for students in M.A. program for teaching humanities; others, instructor's consent. Theory, techniques and substantive concerns in interdisciplinary college teaching. Comparative analyses of literature, art, philosophy. Prerequisite: degree in humanities field.
- 410 Seminar in Greek Art and Archaeology (cr. arr.)** Special subjects of study assigned for individual research; discuss reports by seminar members. Prerequisite: 308, 310, 312 or equivalent.
- 411 Seminar in Roman Art and Archaeology (cr. arr.)** Special subjects of study assigned for individual research; discuss reports by seminar members. Prerequisite: 309, 311, 313 or equivalent.
- 420 Seminar in Medieval Art and Archaeology (cr. arr.)** Special subjects of study assigned for individual research; discuss reports by seminar members. Prerequisites: 336 & 341 or equivalent.
- 425 Seminar in Late Medieval Art (cr. arr.)** Special subjects of study assigned for individual research; discuss reports by seminar members. Prerequisite: 342, 343 or equivalent.
- 430 Seminar in Renaissance Art I: Italy (cr. arr.)** Special subjects of study assigned for individual research; discuss reports by seminar members. Prerequisite: 350 or equivalent.
- 431 Seminar in Renaissance Art II: Northern Europe (cr. arr.)** Special subjects of study assigned for individual research; discuss reports by seminar members. Prerequisite: 352 or equivalent.
- 432 Seminar in Renaissance Architecture (cr. arr.)** Special subjects of study assigned for individual research; discuss reports by seminar members. Prerequisite: 351 or equivalent.
- 440 Seminar in Baroque Art (cr. arr.)** Special subjects of study assigned for individual research; discuss reports by seminar members. Prerequisite: 359, 360 or equivalent.
- 442 Seminar in Baroque Architecture (cr. arr.)** Special subjects of study assigned for individual research; discuss reports by seminar members. Prerequisite: 351 or equivalent.
- 445 Studies in European Prints and Drawings (cr. arr.)** History and connoisseurship of prints and drawings, using collections of the Museum of Art and Archaeology. Prerequisite: 350, 352, 355, 359, 360, or equivalent.

451 Seminar in Modern Art (cr. arr.) Special subjects assigned for individual research; discuss reports by seminar members. Prerequisite: 370, 371 or equivalent.

452 Seminar in Modern Architecture (cr. arr.) Special subjects of study assigned for individual research; discuss reports by seminar members. Prerequisite: 371 or equivalent.

460 Seminar in American Art (cr. arr.) Special subjects of study assigned for individual research; discuss reports by seminar members. Prerequisite: 365 or equivalent.

465 Studies in American Decorative Arts (cr. arr.) The minor arts of the United States; furniture and silver of 18th century emphasized. Prerequisite: 141, 365 or equivalent.

470 Museum Training (1-6). Training in museum techniques, handling museum materials at Nelson Gallery of Art, Kansas City, Museum of Art and Archaeology, Columbia, or other approved museums. Prerequisite: one semester of graduate standing. f. or w.

471 Museum Training II (1-6) (credit for students in Museum Training curriculum only). Continuation of 470. f. or w.

480 Readings (cr. arr.) Reading, critical evaluation of literature of special fields of Art History and/or Archaeology. Prerequisite: 401 or equivalent.

490 Research and Thesis (cr. arr.) Individual research leading to preparation of thesis or dissertation. Prerequisite: 401 or equivalent.

Astronomy (See Physics)

Atmospheric Science

50 Introductory Meteorology (3) (same as Geography 50). Physical processes of atmosphere in relation to day-to-day changes in weather. f.

200 Independent Study in Atmospheric Science (1-3). Independent study of a topic dealing with meteorological theory or application of meteorological science to the solution of a relevant problem. Prerequisites: upperclass standing, 50 or equivalent work, & instructor's consent.

301 Topics in Atmospheric Science (cr. arr.) Development of theory and applications for selected topics in atmospheric science. Prerequisites: junior standing & instructor's consent.

302 Weather Briefing (1). Student participation in daily discussions of current weather patterns. Prognostic maps prepared from various atmospheric models. Prerequisite: 50 or graduate standing.

303 Meteorology of the Biosphere (3) (same as Geography 303). Energy balance of biological systems including plant canopies, forests and animals. Effects of weather events on plant and animal production discussed. Prerequisite: 50, graduate standing or instructor's consent. w.

304 Meteorological Analysis I (3). Basic techniques for surface and upper air analysis, using selected examples of weather patterns. Prerequisite: 50, 350, or instructor's consent. f. odd yrs.

305 Meteorological Analysis II (3). Graphical analysis and interpretation of physical, kinematic and dynamic properties of the atmosphere. Analysis techniques applicable to atmospheric research. Prerequisite: graduate standing. w. even yrs.

314 Cloud and Precipitation Physics (3). Physics of atmospheric nucleation-condensation, cloud droplet and ice crystal growth, precipitation processes, and associated electrical phenomena. Prerequisites: 1 year college physics & Math 175. alt. f. odd yrs.

316 Micrometeorology (3). Transport processes in surface boundary layer. Important applications in pollution discussed. Prerequisite: Math 304.

350 Fundamentals of Meteorology (3). Comprehensive review of fundamental concepts and major developments of modern meteorology; introduces basic physical and dynamic processes of the atmosphere. Prerequisites: Math 175 & Physics 123.

366 Climates of the World (3) (same as Geography 366). Climatic elements, climatic classifications, climatic regions of the world. Special attention to ecological, pedological aspects of climate. Prerequisite: 50 or equivalent. w.

377 Climate Dynamics (3). Physical and dynamic problems of climate and climatic variation, climatological phenomena and various time ranges of forecasting, variation and predictability of the climate. Prerequisite: 350 or 366.

392 Atmospheric Thermodynamics and Statics (5). Thermodynamics of dry and moist air, atmospheric hydrostatics, convection, and development of the fundamental equations of geophysical fluid dynamics. Prerequisite: 350 or instructor's consent. f. even yrs.

393 Atmospheric Kinematics and Dynamics (5). Dynamics and kinematics of atmospheric flow. Manipulation of fundamental equations; numerical modeling of atmosphere. Prerequisite: 392. w. odd yrs.

400 Problems (cr. arr.) Independent study by graduate students in Atmospheric Science. Prerequisites: graduate standing & instructor's consent.

401 Topics in Atmospheric Science (cr. arr.) Development of the theory with its application for selected topics in atmospheric science. Prerequisites: graduate standing & instructor's consent.

402 Radiation in the Atmosphere (3). Physics of solar and infrared radiative transfer in the atmosphere, including energy conversion effects, atmospheric optics and photochemical processes. Prerequisites: 1 year college physics & Math 175. alt. w. even yrs.

410 Seminar (cr. arr.) Prerequisite: graduate standing. f,w.

412 Advanced Dynamic Meteorology (3). Application of perturbation dynamics, advanced dynamics and numerical methods to study of atmospheric circulations. Prerequisite: 393. alt. f. odd yrs.

416 Atmospheric General Circulation (3). Comprehensive review of dynamical theories of general circulation with intensive discussion of current problems. Prerequisite: 393 or instructor's consent. alt. f. odd yrs.

420 Meteorological Statistics (3). Applies theory of probability and frequency distribution to meteorological variables. Prerequisite: 350 or Statistics 320 or instructor's consent. alt. f. odd yrs.

466 Advanced Dynamic Climatology (3). Global climate; application of large scale atmospheric dynamics; conservation of various forms of energy, climatic evaluation, large scale climatic modification. Prerequisite: 393 & 416, or 366 or instructor's consent. alt. w. even yrs.

490 Research (cr. arr.) Research for thesis preparation. f,w.

Bacteriology (See Biological Sciences: Dairy Husbandry; Food Science & Nutrition; Microbiology)

Biochemistry

10 Biochemistry, the Field and the Profession (1). Introductory seminar for students interested in brief exposure to field of biochemistry. Topics: nature of projects in department, literature sources, professional codes, organization of chemical community, biographies of famous biochemists. Graded S/U.

110 Introductory Biological Chemistry (3). Introduction to organic structures and functional groups as they relate to biologically important compounds. Structures and function of proteins, polysaccharides, lipids and enzymes. Prerequisite: 5 hours general chemistry. f,w.

193 General Biochemistry (3). Surveys biochemistry: static/dynamic aspects of carbohydrates, lipids, proteins, nucleic acids. Discusses metabolic pathways, energy production and metabolic regulatory mechanisms. Prerequisites: Chemistry 1; Biochemistry 110, Chemistry 210-211, or Chemistry 205; sophomore standing. f,w.

195 General Biochemistry Laboratory (2). To be taken concurrently with 193. Lab sessions (one 4-hour lab weekly); experiments on chemical/physical properties of biomolecules, enzyme assays and application of instrumentation applicable to biochemical studies. Prerequisite: same as 193. f,w.

203 Elementary Biochemistry (3). Surveys structures, chemical reactions and metabolism of carbohydrates, lipids, proteins, nucleic acids. Enzymes, coenzymes and hormone actions discussed. Prerequisite: 3 hours organic chemistry. w.

204 Elementary Biochemistry Laboratory (2). To be taken concurrently with 203. Classical experiments in biochemistry. Subjects covered in lecture are investigated in some detail to help learn methods, reactions and major concepts in biochemistry. Prerequisite: organic chemistry. w.

206 Medical Biochemistry (9). Lectures cover the broad field of biochemistry of man. Clinical correlative lectures. Research project labs. Prerequisites: 8 hours general chemistry, 5 hours organic chemistry. Some quantitative chemistry recommended. f.

270 Biochemistry (3). First semester of comprehensive biochemistry course: metabolic pathways, amino acids/proteins, carbohydrates, lipids, nucleic acids, kinetics, energy requirements, metabolic regulation in living cells. Prerequisites: one year inorganic chemistry, 5 credits organic chemistry with lab. Recommended: quantitative analysis. f.

272 Biochemistry (3). Second semester of a comprehensive biochemistry course: metabolism of carbohydrates, fatty acids, steroids, amino acid synthesis and metabolism, molecular genetics, hormones, photosynthesis and integrated metabolism. Prerequisite: 270. w.

274 Biochemistry Laboratory (3). Techniques course in biochemistry involving analytical experiments with carbohydrates, lipids, and proteins, the use of instrumentation in biochemistry and isolation, purification, kinetics of enzymes. Prerequisite: 270 & 272, or 272 concurrently. w.

299 Seminar (1). Discuss journal papers dealing with current topics of research, techniques, status of field, importance of results. Students report on completed undergraduate research projects. Prerequisites: senior standing, a minimum of 10 hours chemistry including a biochemistry course with lab.

300 Problems (1-3).

301 Biophysics (3). Presents mathematical and physical concepts useful to biologists, illustrated by biological numerical problems. Topics include: biomathematics, statistics, mechanics, fluids, bioelectricity, electromagnetic energy and ionizing radiations. Prerequisites: general chemistry & physics, calculus & a biological science course. f.

303 Techniques in Nutritional Biochemistry (3). Primarily a lab course providing training in use of biochemical tools utilized in nutrition research. Prerequisite: six hours biochemistry or concurrent with 272 or 322. w.

304 General Biochemistry Lectures (5). Principles of biochemistry; studies bioconstituents and enzymes, coenzymes, metabolism, hormones and nutrition. Prerequisites: organic chemistry & quantitative chemistry & biology. f.

305 Biochemistry Laboratory (3). Broad view of principles and methods of biochemistry via laboratory practice. Prerequisites: organic chemistry & quantitative chemistry. f.

310 Trace Analysis (3) (same as Chemistry 310). Methods of trace element analysis; emphasizes analysis of biological materials. Prerequisite: quantitative analysis. w.

311 Interpretation of Molecular Spectra (3). Basic theory and practical application of vibrational, electronic nuclear magnetic resonance and mass spectra; emphasis on structures of biochemical importance. Prerequisites: organic chemistry & instructor's consent. f.

312 Instrumental Methods of Analysis (4) (same as Chemistry 312).

320 Biochemistry (3). Biochemistry of proteins, nucleic acids, enzymes, coenzymes, bioenergetics, biological oxidation; emphasizes control processes and recent developments. Prerequisites: Chemistry 210-211-212, Chemistry 221, Chemistry 230 & 5 hours biology; concurrent registration on last two acceptable. f.

322 Biochemistry (3). Lectures cover carbohydrate and lipid chemistry, photosynthesis and metabolism; emphasis on control processes and recent developments in these areas. Prerequisite: 320. w.

350 Chromatography (3). Current theory and practice of chromatographic methods. Prerequisite: one semester physical chemistry or instructor's consent.

375 Topics in Biochemistry (cr. arr.) Experimental courses; highly specialized topics taught infrequently or courses taught by visiting professors. Prerequisite: general biochemistry; others as specified by instructor each semester course is offered.

400 Problems (1-6).

401 Plant Biochemistry (3). Emphasizes biochemistry unique to plants; biochemical events plants share with other organisms discussed, compared. Photosynthesis, metabolism, composition, compartmentation, regulation of biochemical events included. Prerequisite: 272 or 320-322 or 304 or instructor's consent. alt. f. odd yrs.

402 Advanced Physiological Chemistry of Domestic Animals (3). Designed for students fitting themselves for investigations in animal industry. Prerequisites: 272 & Chemistry 212 or equivalent. alt. w. even yrs.

403 Topics in Biochemistry (2-3). Experimental courses, highly specialized topics taught infrequently or courses taught by visiting professors. Prerequisite: general biochemistry, others as specified by instructor each semester course is offered.

404 Comparative Biochemistry (2). Lectures and assignments give a comparison of compounds and reactions occurring in different classes of living organisms and a broad view of biochemical evolution. Prerequisite: biochemistry. f.

406 Comparative Nutrition and Metabolism (2) (same as Nutrition 406). Broad view of metabolism and nutrition in living organisms representative of viruses, bacteria, yeasts, molds, plants, protozoa, invertebrates, reptiles, birds, mammals. Prerequisite: biochemistry. w.

410 Seminar (1). Reviews current literature; individual presentation of research or classical science topics. f,w.

412 Biochemistry of Hormones (3). Surveys current knowledge of hormones and their function, including: assay, isolation, chemistry, biosynthesis and mechanism of action. Prerequisite: 272 or instructor's consent. alt. w. even yrs.

413 Reproductive Biology Seminar (1) (same as Animal Husbandry 413). Presents and discusses selected topics from all phases of reproductive biology. Open to qualified students of graduate standing in field of reproductive biology. f,w.

420 Chemistry of Enzyme Cofactors (3). Chemistry of metalloenzymes and coenzymes and their functions as biocatalysts. Prerequisites: 8 hours organic chemistry; 8 hours biochemistry.

422 Analytical Biochemistry—Chromatography (2). Principles, experimental design, capabilities, limitations, and applications of the general field of chromatography of biologically important molecules. Eight (2-hour) lectures, eight (4-hour) labs. Four weeks. Prerequisite: graduate standing or instructor's consent. f.

423 Analytical Biochemistry—Multiple Automatic Microanalysis (1). Basic principles of autoanalysis with lab experiments on ion exchange, GLC, flame analysis, and spectrophotometry. Three (2-hour) lectures and five (4-hour) labs. Two weeks. Prerequisite: graduate standing or instructor's consent. f.

424 Analytical Biochemistry—Mass Spectrometry (2). Instrumentation, fragmentation mechanisms, interpretation of spectra, combined gas chromatography—mass spectrometry. Eight (2-hour) lectures, eight (4-hour) labs. Prerequisites: two courses in organic chemistry, one course in physics, & instructor's consent. w.

425 Biophysics Topics (2-4). Selected topics in biology which have a quantitative or theoretical basis in physics. Prerequisites: calculus & physics & physiology or equivalent. alt. w. odd yrs.

440 Hormones and Metabolism (2). Seminar course. Effects of hormones on intermediary metabolism considered. Prerequisite: 304 & instructor's consent. alt. w. odd yrs.

450 Research (2-8). Does not include preparation of dissertation.

461 Advanced Carbohydrate Metabolism and Biological Oxidations (2). Reviews current knowledge of intermediary metabolism of carbohydrates and the respiratory chain. Prerequisite: 304 or equivalent. alt. w. odd yrs.

462 Advanced Metabolism: Proteins and Nucleic Acids (2). Advanced course in fields of protein and nucleic acid metabolism. Prerequisite: 304 or equivalent. alt. f. odd yrs.

463 Advanced Lipid Metabolism (2). Advanced course in lipid metabolism; selected topics: digestion, absorption, blood lipids, tissue lipids, lipid oxidation, lipid biosynthesis, metabolic control of lipid metabolism. Prerequisite: 304 or equivalent. f.

464 Physical Biochemistry: Proteins, Enzymes, Nucleic Acids (2). Theoretical aspects of biokinetics, bioenergetics; principles of physical chemical techniques applicable to structural problems in proteins, nucleic acids. Prerequisites: 320 or equivalent & physical chemistry & differential integral calculus. w.

465 Advanced Metabolism: Amino Acids (2) (same as Nutrition 465). Advanced course in the metabolism of amino acids, nitrogen and sulfur compounds with related control mechanisms and nutritional aspects. Prerequisite: 304 or equivalent. alt. w. even yrs.

466 Regulation of Energy Metabolism (2). Integrated approach to the regulation of principal pathways involved in cellular fuel utilization. Prerequisite: 304 or 322 or equivalent. alt. w. odd yrs.

490 Research (cr. arr.) Research in biochemistry for qualified students, with counsel of faculty. Includes preparation of dissertation.

Biological Sciences

1 General Biology Lecture (3). General principles of biology. Designed for non-science majors. Biology from the cell through organisms, ecosystems and man. f,w.

2 General Biology Laboratory (2). Observes and discusses biological materials for the non-science major. Prerequisite: 1 or concurrent with 1.

6 Basic Environmental Studies (3) (same as Agriculture 6). Considers ecosystem, energy and biogeochemical cycles and population dynamics; relations of environment to agriculture and technology, pollution, power, food production; politico-economic considerations; moral and ethical issues. f,w.

11 Introductory Zoology (5). Introduces important principles and concepts of zoology. Emphasizes cell biology; evolution; genetics; ecology; structure, function, development of the organism. f,w.

12 General Botany (5). Introduces fundamental principles of biology illustrated by plants. f,w.

21 General Biology (5). Thorough presentation of major principles and details of biology dealing with form, function and behavior of organisms. First course of a sequence for natural sciences majors. f,w.

22 General Biology (5). Continuation of 21. Prerequisite: grade of C or better in 21. f,w.

50 Experimental Biology (3). Introduces experimental methods. Includes examples of classical experiments in different branches of biology. Prerequisite: 22 or equivalent.

101 Laboratory Instructional Skills in Biology (2). Philosophy/techniques of lab instruction, supervised participation; independent opportunity to develop or modify curricular materials for introductory biology courses. Prerequisites: at least 3.0 in 21, 22 & Chemistry 11 & instructor's consent. f,w.

105 Introductory Microbiology (3). Introductory lectures in microbiology describing unique activities of microorganisms which influence history, health, and technology; discusses role of microbes in the changing environment. Prerequisite: one year of biology or instructor's consent. f,w.

115 Plant Function and Structure (3). Basic principles of organismal physiology as illustrated by higher plants. Physiological mechanisms correlated with structure. Emphasizes environmental and internal control of plant growth. Prerequisites: general botany & 5 hours inorganic chemistry. f.

194 Readings in Biological Literature (2-3). Selected readings for Honors majors. Prerequisite: Biological Sciences Honors program majors.

195 Honors Research in Biology (2-3). Special field or laboratory problems of experimental nature for upper-level Honors students, in consultation with instructor. Prerequisites: overall GPA 3.3; either GH125, GH150 or 194; and instructor's consent.

196 Honors Research in Biology (2-3). Continuation of research; preparation of Honors report. Successful completion of report leads to degree with Honors in Biological Sciences. Prerequisites: 195, fourth-year Honors student.

197 Honors Colloquium in Biology (1). Open to Honors students. Treats selected subjects of common interest in biology. Lecture, group discussions. f.

198 Honors Colloquium in Biology (1). Open to Honors students. Lectures, group discussions. w.

199 Honors Proseminar in Biology (2-3). In consultation with instructor, student works on Honors thesis. Prerequisites: senior standing; overall GPA of 3.3; 194, 197, 198 or 3 hour course at 301 level or higher in life sciences; instructor's consent.

201 General Entomology (3) (same as Entomology 201).

202 General Genetics (3). Principles of inheritance in plants, animals; physical basis of heredity, segregation, linkage, gene interactions; genetics in practice. Prerequisite: one year of biology. (Open to graduate students outside Biological Sciences.) f.w.

203 Physiological Biology (3). Surveys physical and chemical factors affecting organismic functions; introduction to aspects of metabolism, especially as they relate to regulatory responses of organisms. Prerequisites: one year of biology & Chemistry 210-211, or equivalent. f.w.

205 Developmental Biology (3). Processes whereby new molecular complexes, organelles, cells, organs and organisms develop from simpler structures through directed- and self-assembly leading to higher levels of organization with new properties. Prerequisites: 202, 203 & Chemistry 210 or equivalent. f.w.

206 Developmental Biology Laboratory (2). Experimental studies illustrate basic concepts of animal and plant development. Includes opportunity to design experiments testing instructor-imposed hypotheses. Prerequisite: 205. w.

207 Plant Growth and Development (3). Introduction to growth and development of common cultivated plants. Emphasizes basic tenets of development which lead to better understanding of common cultivated plants. Prerequisite: 1 or 12 or Agronomy 30 & 5 hours inorganic chemistry. f.

210 Parasitology (3). Surveys animal parasites; emphasizes morphology, life history, host-parasite relationships. Prerequisite: 8 hours biology. w.

212 Basic Microbiology (4). Principles of microbiology. Prerequisites: general botany, general zoology or general biology; general inorganic chemistry & general organic chemistry. f.w.

213 Comparative Anatomy of Vertebrates (5). Comparative study of organ-systems of a series of vertebrates. Prerequisite: 22. f.w.

214 Plant Taxonomy (4) Principles of classification of plants; use of keys; identification of local flora. Prerequisite: one year of biology. f.w.

222 Vertebrate Embryology (5). Compares basic patterns of development in vertebrates. Prerequisite: 22 or equivalent. Recommended: 213. w.

225 Sociobiology (3). Introduces general biological principles that govern social behavior and social organization in all animals, blending theories of ecology, evolution, ethology and genetics. Prerequisites: 22 & 202. f.

230 Invertebrate Zoology (5). Structure, ecology and phylogeny of the invertebrate phyla. Prerequisite: 11 or 22. f.w.

238 Basic Genetics I (3) Mendel's law, chromosome structure; molecular mechanisms of DNA replication, mutation, recombination and gene expression; gene fine structure; bacterial and viral genetics. Prerequisites: 21, 22 or 11, 12 or equivalent; Chemistry 11, Chemistry 12 or equivalent. f.

Courses 238 and 239 are a two-semester sequence of integrated material for genetics-oriented majors which fulfills the genetics requirement as an alternative to 202.

239 Basic Genetics II (3). Segregation and linkage in eukaryotes; somatic cell genetics, extranuclear inheritance, gene interactions, immunogenetics, control of gene expression, population genetics. Prerequisite: grade of C or better in 208. w.

241 Genetics Laboratory (2). Experimental genetic studies of *Drosophila*, corn and microorganisms. Prerequisite: satisfactory grade in 202 or equivalent and/or instructor's consent. f.w.

250 Community Biology (3). Introduces general ecology to non-major. Integrated set of lectures on evolution/population genetics, population dynamics/social systems, ecosystem structure/process, biomass in worldwide context, man in the environment. Prerequisite: 1, 11 or 12 or equivalent. f.

260 Introductory Cellular and Molecular Biology (4). Introduces molecular biology of prokaryotes and eucaryotes; emphasizes molecular genetics. Prerequisites: 202 & 203 or a basic biochemistry course. f.

266 Human Genetics (3) (same as Child Health 266). General course in human genetic aspects of medical practice, family planning, public health, education, social welfare, and business. Designed for student from life sciences/medicine to sociology/psychology. Prerequisites: 202 & Chemistry 210 or equivalent. f.

270 Physiological Zoology (4). Topics of general mammalian, and comparative physiology and biochemistry. Prerequisite: 203 or equivalent. f.w.

275 Introduction to the Nervous System (3). Introduces neurophysiology of resting and action potentials, synaptic transmission, integration, structure/function of receptors/neurons. Surveys nervous system through animal kingdom. Prerequisite: 203. f.

300 Problems in Biological Sciences (cr. arr.) Individual supervised work to supplement regularly organized courses in biology; introduces research. Prerequisites: upperclass standing & instructor's consent. f,w,s.

301 Topics in Biological Sciences (cr. arr.) Selected topics not in regularly offered courses. Prerequisite: instructor's consent. f,w,s.

302 Evolution (3). Surveys various processes in organic evolution, underlying genetic mechanisms. Prerequisite: 12 hours biology or geology, or upper-class standing. w.

304 Systematic Entomology (3) (same as Entomology 304). f.

305 General Phycology (3). Introduces morphology and taxonomy of algae with emphasis on fresh water algae. Lecture, lab. Prerequisite: general botany, general zoology or general biology. f.

307 Mycology (4) (same as Plant Pathology 307). Introduces fungi, primarily from the morphological and systematic approach. Prerequisite: 202 or instructor's consent. f. even yrs.

308 Plant Anatomy (4). Comparative structure, growth of meristems; development, structure of important cell types, tissues, tissue systems; comparative anatomy of stem, root, leaf. Emphasizes anatomy of gymnosperms, angiosperms. Prerequisite: 12 or 22. w.

313 Plant Physiology (3-5). Physiology of common cultivated plants. Lectures, lab. Section 3 for Forestry students only; extra lecture, no lab (3 credit hours). Prerequisites: 12 or 22 & 5 hours chemistry. f.w.

314 Agrostology (3 or 5). Identification of native grass flora. Five hours credit includes lectures, special assignments. Prerequisite: 12 or 22 or equivalent. alt. f. odd yrs.

315 Paleobotany (3). General survey of plant fossils; their orientation in time and space. Lecture, discussion, lab. Prerequisite: 12 or 22 or Geology 1 or instructor's consent. w.

316 Principles of Insect Physiology (4) (same as Entomology 316).

317 Palynology (3). Introduces pollen types of modern plants, ontogeny, comparative morphology; airborne types, extent of distribution, applications to study of phylogeny. Prerequisites: upper-class standing & instructor's consent. Every 3rd f.

318 Micro-Paleobotany (3). Lecture/discussions include origin, evolution, morphology, stratigraphic significance of fossil spores. Laboratory on collection and preparation of samples. Prerequisites: 12 or 22 & instructor's consent. alt. w. odd yrs.

- 321 Marine Biology (3).** Marine organisms and their environment. Prerequisites: junior standing; 22 or 230, & 5 hours chemistry & 5 hours physics. w.
- 322 Protozoology (4).** Biology of protozoa; emphasizes morphology, physiology, systematics and development of free-living and parasitic forms. Collection, culture and classification of local forms. Prerequisite: 22. Recommended: 230 & a community biology course. f. alt. yrs.
- 323 Helminthology (4).** Morphology, physiology, development and systematics of parasitic worms. Some collection and classification expected. Prerequisite: 22 or equivalent. Recommended: 203, 210 or 230. f. '78 & every 3rd yr.
- 324 Analysis of Biological Macromolecules (3).** Theory/application of techniques used for characterization of proteins, nucleic acids; topics; sedimentation velocity, equilibrium; sucrose, density gradients; electrophoresis; spectrophotometry. Prerequisites: 203 or Biochemistry 270, Math 80 & one year physics. alt. w. even yrs.
- 325 Herpetology (4).** The biology, ecology, taxonomy and distribution of amphibians and reptiles. Some Saturday field trips. Prerequisite: 8 hours biology or equivalent training. f.
- 328 Introductory Radiation Biology (3)** (same as Nuclear Engineering 328, Radiology 328, Veterinary Medicine & Surgery 328).
- 330 Sensory Physiology (3).** Introduces neurophysiology of resting and action potentials, synaptic transmission and integration, structure/function of receptors/neurons. This information applied to specific sensory/motor systems including five basic senses. Prerequisite: 203 or equivalent or instructor's consent. f.
- 331 Comparative Animal Physiology (5).** Functional differentiation of animal groups; adaptive, evolutionary significance. Prerequisite: 270 or equivalent. alt. w. odd yrs.
- 332 Physiological Ecology (4).** Relationship of physiological responses of organisms to their ecology; emphasizes different manifestations of a living system's ability to modify its properties in accord with environmental changes. Prerequisite: 203 or equivalent; a course in physiology & in ecology. w.
- 333 Histology of Vertebrates (5).** Microscopic anatomy of vertebrate tissues and organs. Prerequisites: junior standing & 5 hours biology. w.
- 340 Mammalian Cell Genetics (3).** Recent advances in mammalian somatic and hybrid cell research; viral carcinogenesis. Prerequisite: introductory genetics. f.
- 341 Genetic Techniques (3).** Methods used in planning, conducting and evaluating genetic experiments. Prerequisites: 202 or equivalent & 3 hours statistics. alt. f. odd yrs.
- 342 Comparative Animal Ethology (4).** Comparative study of animal ethology. Principles of animal ethology illustrated in different animal phyla. Prerequisites: 22 & one additional upper-class course in biology or psychology. f.
- 343 Evolution of Genetic Concepts (2)** (same as Agronomy 343).
- 345 Animal Communication (3 or 5).** Physical properties of sensory stimuli, receptor mechanisms, functional significance of communication behavior, and multidisciplinary and experimental approaches to current research in animal communication. Prerequisites: 203 & Physics 12 or equivalent. alt. w. even yrs.
- 346 Genetics of Microorganisms (3 or 5).** Lectures, readings in formal genetics, sexuality and mating systems of fungi, algae, protozoa, bacteria, and viruses. First course in two-part series on genetics for microbiologists. Prerequisites: 202 or equivalent & 212 or equivalent. f.
- 354 Advanced Bacteriology (3 or 5).** Discusses modern microbiology. Solvable questions posed by instructor answered by student through independent experimentation. Techniques of molecular biology stressed. Prerequisites: 212 & instructor's consent. f.
- 360 Techniques in Cell Culture (4).** Cultivation *in vitro* of tissue and cells from mammalian and other sources. Prerequisites: 203 or Biochemistry 270 & instructor's consent. alt. w. even yrs.
- 362 General Ecology (5).** Principles of populations, coevolution, density factors, competition; physical environment; concept of community, trophic structure, biotic succession; characterization of biomes, man in ecosystem. Biology majors having completed 250: 2 hours credit. Prerequisite: 20 hours upper-class biology. f, w.
- 369 Genetics of Plant Disease Development (3)** (same as Plant Pathology 369). Gene-for-gene interactions between host and pathogen in plant disease. Prerequisites: 202 & Plant Pathology 301. w.
- 371 Cellular Physiology (3 or 5).** The cell as a functional unit. Prerequisites: 10 hours biology & 5 hours physics & 5 hours organic chemistry. Lectures only may be taken by graduate students or with instructor's consent. f.
- 374 Cell Biology I (3 or 5).** Survey of chromosome structure and production of RNA and protein gene products through critical review of research papers. Laboratory is optional. Prerequisites: 203; either 238 or 260; Math 80. f.
- 375 Cell Biology II (3).** Continuation of 374. Structure and function of membranes; cell ultrastructure; organelle function; cellular movement; microtubules; microfilaments; mitosis and meiosis. Prerequisite: 374 lecture. w.
- 380 Cytology (4).** Structure and function of the major organelles of a cell; mitosis and meiosis; chromosomal rearrangements; ploidy; sex-determination, Karyotype evolution. Prerequisite: 12 hours biology including 202 or equivalent. f.
- 384 Cytogenetics (3)** (same as Agronomy 384).
- 385 Cytogenetics Laboratory (1)** (same as Agronomy 385).
- 400 Problems in Biological Sciences (cr. arr.)** Research not expected to terminate in thesis or individual advanced study in special subjects. Prerequisites: graduate standing & instructor's consent. f, w, s.
- 401 Topics in Biological Sciences (cr. arr.)** Advanced topics not in regularly offered courses. Prerequisite: instructor's consent. f, w, s.
- 403 Physiological Responses to Environment (3)** (same as Forestry, Fisheries & Wildlife 403). Changes induced in plants by variations in water, light, temperature, etc. Prerequisite: 313 or equivalent. f.
- 404 Cell Metabolism (3).** Lectures on photosynthesis, respiration, amino acid metabolism, nucleic acid and protein synthesis. Prerequisites: 313 or equivalent & 6 hours organic chemistry & graduate standing or instructor's consent. alt. w. odd yrs.
- 406 Terrestrial Ecosystems (3).** Characteristics of organic production, consumption and nutrient patterns in various ecosystems; biotic and physical factors dealing with equilibrium processes; environmental disorganization on diversity and stability. Prerequisite: 362 or equivalent. alt. w. odd yrs.
- 407 Molecular Genetics Laboratory (4).** Emphasizes recently developed genetic and biochemical techniques; illustrates how they apply to contemporary problems in biological research. Prerequisites: 202, 203, 212, Biochemistry 270 & instructor's consent. alt. f. even yrs.
- 408 Developmental Genetics (3).** Discussion and analysis of selected regulatory mechanisms in development, with major emphasis on the regulation of gene transcription. Prerequisites: 202 & Biochemistry 270, Biochemistry 272, or equivalent. alt. f. even yrs.

409 Plant Morphogenesis (2). Reading, discussion, reports based on world's literature dealing with analysis of factors involved in development of plants from time of inception to adult form. Prerequisite: 308 or equivalent. alt. f. even yrs.

410 Seminar (1). Current topics in the biological sciences. Open to all graduate students. f,w.

411 Seminar in Area of Specialization (1). Offered each semester in one or more specialized sections designated 411A, 411B, etc., followed by the topic title of the seminar. f,w.

412 Seminar in Genetics (1). Discussion of current investigations in genetics. f,w.

414 Photosynthesis (4). Discussion of structure, organization, control, and biochemical and biophysical processes of photosynthesis with emphasis on "light reaction." Prerequisite: instructor's consent.

420 Endocrinology (3) (same as Dairy Husbandry 420). f.

421 Plant Geography (3). Species distribution over the earth; population centers, migrations, external factors in isolation, present-day dispersal. Prerequisite: 214. alt. w. even yrs.

423 Genetics of Populations (4) (same as Animal Husbandry 423, Poultry Husbandry 423).

424 Molecular Biology of Bacteriophage (3). Biophysical techniques of bacteriophage structure. Replication of phage and cellular protein, RNA, DNA. Molecular basis of control of RNA; protein synthesis in specific systems. Prerequisite: a course in biochemistry & genetics. alt. f. even yrs.

426 Neural Basis of Animal Behavior (3). Analysis of the cellular neurobiology of invertebrate and vertebrate behavior. Prerequisite: an upper-class neurobiology or ethology course or instructor's consent.

430 Speciation (2). Factors involved in process of speciation; breeding population structure and effects; effects of pollinating agents. Prerequisites: 202 & 214. f.

434 Advanced Plant Taxonomy (2). Phylogenetic relationships of monocotyledonous plant families. Critical evaluation of views of various workers. Prerequisite: 214. Every 3rd w.

435 Advanced Plant Taxonomy (3). Phylogenetic relationship of dicotyledonous plant families. Critical evaluation of views of various workers. Prerequisite: 214. Every 3rd f.

436 Comparative Endocrinology (3). Endocrine systems, their functions as they occur throughout the animal kingdom. Prerequisites: senior or graduate standing & 8 hours biology. f.

444 Comparative Vertebrate Reproduction (4). Comparative gross and microscopic anatomy of the reproductive tract, placentation. Reproductive cycles; influences of population density and environment. Prerequisites: 222 & 333 or instructor's consent.

445 Avian Physiology (4). Physiological mechanisms and specializations of birds. Emphasizes physiological relationships of avian anatomical and behavioral specializations. Prerequisite: 203 or equivalent.

446 Fundamentals and Advanced Aspects of Oncogenic Mechanisms (3). Basic and advanced knowledge in nature of cancer. Chemical radiation and viral oncogenesis. Prerequisites: 202, 212, & 260; Chemistry 212; Biochemistry 270, 272; or equivalent & instructor's consent. alt. w. odd yrs.

450 Research (cr. arr.) Research not leading to thesis or dissertation. Prerequisite: instructor's consent. f,w,s.

452 The Biology of Nucleic Acids (3). Evaluation of current literature in molecular biology of nucleic acids: chromosome replication/cell division in microorganisms, molecular basis of mutation, radiation biology. Prerequisites: 202 & Biochemistry 304 or equivalent; & instructor's consent. alt. w. even yrs.

462 Gene Structure and Function (3). Readings, discussion of systems of mutation and of the structure and function of the gene. Prerequisites: cytology & 8 hours genetics. alt. f. even yrs.

480 Ultrastructural Basis of Cell Function (3). Examines cell structure as it relates to function. Includes advanced treatment of cellular organelles, emphasizing the ultrastructural level. Prerequisites: biochemistry & cytology, or instructor's consent.

490 Research in Biological Sciences (cr. arr.) Research leading to thesis or dissertation. Prerequisites: graduate standing & instructor's consent. f,w,s.

Biology (See Biological Sciences)

Botany (See Biological Sciences)

Business Administration

Open only to MBA candidates and to other graduate students by consent of the Director, Graduate Studies in Business.

301 Organization Theory and Behavior (3). Organization theory; study of relationships among individuals, groups and units in organizations and the systems which facilitate organizational goal achievement.

320 Computer Applications for Planning and Decision Making (3). Introduction to computer programming for administrative uses, including management information systems for facilitating organizational operations.

324 Managerial Statistics (3). Statistics as an aid in decision making; emphasis on statistical inference, sampling techniques and nonparametric statistics as applied to problems of business and public administration.

326 Information Systems for Planning and Decision Making (3). Management information systems for facilitating organizational operations; information for planning and control; managing the information function. Prerequisites: 320; 324 or instructor's consent.

342 Production/Operations Management (3). Surveys problems common to operations within a complex organization. Emphasizes planning, control and decision making. Prerequisites: 320 & 324, or instructor's consent.

344 Managerial Finance (3). Analyzes financial information relative to acquisition, management of assets; costs of alternative financial contracts; effect of mix of outstanding securities on entity's cost of capital; interaction between funding/investment decisions. Prerequisites: Accountancy 310; 320 or instructor's consent.

346 Managerial Marketing (3). Analysis and control of an integrated marketing program with special emphasis on prices, products, promotion and channels of distribution.

420 Managerial Decision Science (3). Application of mathematical/statistical models to decision making. Includes, but not limited to, use of mathematical programming, stochastic processes, Bayesian analysis. Manager's, rather than technician's, point of view stressed. Prerequisites: 320, 324, & Math 205.

442 Business and Society (3). Interdependence of the business firm and its social, political and legal environment; interrelationships with governments, interest groups and the larger society; role of business in formulation of community, regional, national and foreign policy.

449 Business Environment and Policy (3). Investigates alternative goals of business enterprises relative to internal resources and external environment; development and implementation of policies and strategies to achieve objectives. Cases, computer simulations and/or field research may supplement published materials.

471 Behavioral Science in Business I (3). Intensive examination of behavioral sciences focusing on individual and small group behavior within the business organization. Selected topics: employee motivation, leadership, decision making, group dynamics. Prerequisite: Ph.D. status or instructor's consent.

472 Behavioral Science in Business II (3). Examination of behavioral sciences focusing on structure and processes of business organizations and environments. Selected topics: structure, environmental influences, organization change, conflict resolution, interorganizational relations. Prerequisite: Ph.D. status or instructor's consent.

481 Research Design and Methodology (3). Intensive study of fundamental issues, problems and procedures in the conduct of research in business organizations. Orientation includes philosophical, theoretical, empirical, operational considerations. Prerequisite: Ph.D. status or instructor's consent.

Business Management (See Finance; Management; Marketing)

Chemical Engineering

17 Experimental Course. For freshman-level students. Content and number of credit hours to be listed in *Schedule of Courses*.

117 Experimental Course. For sophomore-level students. Content and number of credit hours to be listed in *Schedule of Courses*.

170 Chemical Process Measurements (3). Lecture and lab instruction on physical and chemical measurements essential to chemical process industries. Prerequisites: Physics 123 & Chemistry 12.

199 Engineering Thermodynamics II (3) (same as Mechanical & Aerospace Engineering 199). Gas and vapor mixtures, cycles, availability, imperfect gases, thermodynamic relations, combustion, chemical equilibrium. Prerequisites: Engineering 99 & Math 201.

201 Topics in the Interrelation of Chemical Engineering and Society (3). Problems of contemporary interest involving chemical engineering and society. Prerequisite: instructor's consent.

204 Chemical Engineering Materials (3). Properties of engineering materials used in chemical plants and equipment. Prerequisite: Physics 124.

225 Chemical Process Calculations (3). Industrial stoichiometry, material and energy balances, thermodynamics, thermochemistry; related topics. Prerequisites: Physics 123 & Chemistry 12, or concurrently.

234 Principles of Chemical Engineering I (3). Fluid flow, heat transfer. Prerequisite: 225 or Engineering 99.

235 Principles of Chemical Engineering II (3). Mass transfer. Prerequisite: 234.

243 Chemical Engineering Laboratory I (2). Laboratory study of some principal unit operations of chemical engineering. Prerequisite: 235 or concurrently.

244 Chemical Engineering Laboratory II (2). Prerequisite: 243.

261 Chemical Engineering Thermodynamics I (3). Study of thermodynamics, with particular reference to chemical engineering applications. Prerequisite: 225 or Engineering 99.

262 Chemical Engineering Thermodynamics II (3). Prerequisite: 261.

300 Problems (2-4). Directed study of chemical engineering problems. Prerequisite: instructor's consent.

301 Topics in Chemical Engineering (3). Current and new technical developments in chemical engineering. Prerequisite: instructor's consent.

304 Digital Computer Applications in Engineering (3) (same as Electrical Engineering 304, Mechanical & Aerospace Engineering 304, Nuclear Engineering 304). Use of digital computer for solution of engineering problems involving roots of equations, simultaneous equations, curve fitting, integration, differentiation and differential equations. Prerequisite: Math 201.

306 Engineering Analysis (3) (same as Nuclear Engineering 306). Applies ordinary and partial differential equations to engineering problems; Fourier's series; determinants and matrices; Laplace transforms; analog computer techniques. Prerequisite: Math 304.

311 Chemical Engineering Basis for Pollution Control (3). Introduces chemical processes and technology used in control of environmental pollution. Emphasizes control of pollution from chemical process industries. Prerequisite: 234 or equivalent.

312 Air Pollution Control (3). Modeling of urban air pollution and control techniques. Topics: plume dispersion theories, photochemistry, methods of monitoring, methods of industrial abatement, legal aspects. Prerequisite: 311 or instructor's consent.

315 Introduction to Biochemical Engineering (3). General introduction to biochemical engineering follows fundamentals of microbiology and biochemistry. Topics: fermentation, microbial population kinetics, bio-product separation and purification, enzyme engineering techniques, biochemical reaction energetics. Prerequisite: Chemistry 212, Math 201 or instructor's consent.

335 Transport Phenomena (3). Integrated study of momentum, heat and mass transport. Prerequisites: 235, 261 & Math 304.

337 Chemical Reactor Systems Design (4). Applies chemical kinetics and process control theory to design of reactors. Prerequisites: 235, 262 & Math 304.

345 Special Reading (2-5). Individually supervised special reading leading to an engineering report. Prerequisite: senior standing in Chemical Engineering.

350 Research for Honor Students (3-6). Individual research for a senior thesis; research supervised by Chemical Engineering faculty. Thesis to be defended before Departmental Honors Committee. Prerequisite: senior standing in Chemical Engineering.

363 Chemical Reaction Engineering and Technology (3). Reactor design and optimization; rate equations; thermal effects in reactor. Prerequisite: 262 or instructor's consent.

370 Modern Methods of Chemical Process Control (3). Process description using state space theory; introduces digital control techniques; stability analysis. Prerequisite: 262.

385 Chemical Engineering Design I (3). Design and layout of chemical plants and equipment. Prerequisites: 235, 262 & Engineering 85.

386 Chemical Engineering Design II (3). Prerequisite: 385.

387 Process Analysis and Simulation (3). Mathematical analysis and modeling of chemical processes; optimization during process design and operation. Prerequisite: 304.

391 Radioisotope Techniques (3). Lectures on properties and safe handling of radioisotopes; lab experience in measurement, application. Prerequisite: senior standing or instructor's consent.

400 Problems (1-5). Supervised investigation in chemical engineering to be presented in the form of a report. Prerequisite: instructor's consent.

401 Advanced Topics in Chemical Engineering (3). Prerequisite: instructor's consent.

408 State Variable Methods in Automatic Control (3) (same as Mechanical & Aerospace Engineering 408, Electrical Engineering 408, Nuclear Engineering 408). State variables for continuous and discrete-time dynamic control systems; controllability and observability; optimal control of linear systems. Prerequisites: 370, Electrical Engineering 206, Mechanical & Aerospace Engineering 357 or instructor's consent.

410 Seminar (1). Reviews investigations and projects of importance in chemical engineering.

420 Advanced Heat and Momentum Transfer (3). Advanced study of these transport phenomena. Prerequisite: 235.

422 Analysis of Equilibrium Stage Processes (3). Advanced study of stage processes. Prerequisites: 262 & 304.

423 Advanced Mass Transfer (3). Advanced study of mass transfer. Prerequisite: 235.

430 Mechanics of Viscoelastic Fluids (3). Rheological behavior of viscoelastic materials described in terms of invariant equation of state, stressing characteristic features of fluids. Prerequisite: Math 302 or equivalent, a course in Newtonian fluid mechanics or instructor's consent.

451 Advanced Chemical Engineering Thermodynamics I (3). Advanced thermodynamics; particular reference to its application to chemical engineering. Prerequisite: 262.

452 Advanced Chemical Engineering Thermodynamics II (3). Prerequisite: 451.

455 Irreversible Thermodynamics (3). Simultaneous fluxes of thermal and other energy, mass or work across continuous and discontinuous thermodynamic system boundaries lead to transport coefficients in the phenomenological relationships between fluxes and conjugate forces. Prerequisite: 451 or instructor's consent.

461 Process Development and Plant Design (3). Advanced study of chemical engineering design and manufacturing processes. Prerequisite: 386.

463 Chemical Reaction Engineering Science (3). Phenomenological behavior of catalysts. Theoretical interpretations for heterogeneous and homogeneous catalysts. Prerequisite: 363.

470 Mathematical Studies of Chemical Engineering Operation (3). Analytical methods applied to solution of chemical engineering problems. Prerequisite: Math 304.

471 Process Optimization Methods in Chemical Engineering (3). Steady-state and unsteady-state optimization techniques applied to chemical processes. Prerequisite: 304.

490 Research (cr. arr.) Independent investigation in chemical engineering to be presented a thesis.

Chemistry

1 Introductory Chemistry (5). Important basic concepts of chemistry. For the general student. A terminal course which does not serve as a prerequisite for any other Chemistry Dept. course. f,w.

3 Physical Science (5) (same as Physics 3).

5 Chemistry for Engineers (5). For students in College of Engineering in fields other than Chemical Engineering. Presents chemical principles in areas of greatest importance to engineers. Prerequisite: prior or concurrent enrollment in Math 76 or Math 80. f,w.

10 Preparation for General Chemistry (2). For students lacking adequate preparation for general chemistry. Emphasizes basic chemical calculations.

Not open to students with credit in any other college chemistry course. No advance standing permitted in lieu of this course. Chemistry 1 may be taken after Chemistry 10 only with reduced credit (3 hours). Does not fulfill General Education Requirements in physical sciences in Arts & Science.

11 General Chemistry (5). Thorough treatment of major principles of chemistry. First course of a sequence. Prerequisites: either 1½ units algebra, 1 unit geometry, & a Q score of 50; or completion of college algebra. f,w,s.

Students may take only one course from 1, 5 or 11 for full credit; however, if a C or better is obtained in 1, 11 may be taken for reduced credit (2 hrs.). With instructor's permission, 12 may be taken if a student obtains a B in 5 or an A in 1.

12 General Chemistry (5). Continuation of 11. Prerequisite: grade of C or better in 11. f,w,s.

50 General Honors (3).

90 Orientation in Chemistry (0). w.

150 Undergraduate Research (1-3). May be repeated. Cannot be substituted for other chemistry courses required for B.S. or A.B. degree. Prerequisite: 2.75 GPA and/or instructor's consent. Only 3 hours credit for students of special summer institutes.

198 Senior Honors Research (3). Prerequisites: 3.33 GPA in chemistry courses & instructor's consent. f.

199 Senior Honors Research (3). Prerequisites: 3.33 average in chemistry courses & instructor's consent. w.

205 Organic Chemistry (5). Surveys field of organic chemistry, including natural products. Prerequisite: 8-10 hours chemistry or instructor's written consent.

For students needing only 5 hours of organic chemistry. Does not meet requirements for 212. Only 1 hour credit if student has completed Biochemistry 110 or equivalent.

210 Organic Chemistry (3). First course of a sequence. Concentrates on fundamentals and applies them to a few functional groups. Only 1 hour credit if student has completed 205 or equivalent. Prerequisite: 11 & 12 or equivalent. f,w,s.

211 Organic Chemistry Laboratory (2). Must accompany, cannot precede 210. f,w,s.

212 Organic Chemistry (3). Continuation of 210. Covers carbonyl-containing compounds, amines, heterocycles, natural products (fats, carbohydrates, amino acids, proteins, nucleic acids) and others. Prerequisite: 210 or special permission. f,w,s.

213 Organic Chemistry Laboratory (2). Must accompany, cannot precede 212. f,w.

221 Quantitative Instrumental Analysis (4). Introductory course for non-majors. Stresses chemical analysis, including the basic principles of modern instrumental methods. Prerequisite: 12.

223 Quantitative Chemical Analysis (4). Extensive treatment of principles and practice of quantitative analysis and separations. For chemistry and other science majors. Prerequisite: 12. f.

230 Physical Chemistry (3). Satisfies Physical Chemistry prerequisite for Biochemistry 320-322. Prerequisites: Math 175, a course in quantitative analysis, a course in organic chemistry; Physics 11 & Physics 12 or Physics 123, & Physics 124 or Physics 124 concurrently.

231 Physical Chemistry (3). Lecture only. Topics include the kinetic theory of gases, thermodynamics and chemical equilibrium. Prerequisites: 1 semester organic chemistry & 1 year college physics & Math 201, or Math 201 concurrently. f,w.

233 Physical Chemistry (3). Continuation of 231. Lecture only. Covers reaction kinetics, wave mechanics, bonding and molecular spectroscopy. f,w.

234 Physical Chemistry Laboratory (3). Normally concurrent with 233. w.

250 Senior Research (3). May take for credit three times. Prerequisite: 2.75 grade point average, 33 hours chemistry or senior standing & approval of department chairman. f,w,s.

310 Trace Analysis (3) (same as Biochemistry 310).

312 Instrumental Methods of Analysis (4) (same as Biochemistry 312). Chemical instrumentation methods including electrochemistry, spectroscopy and advanced separation techniques. Prerequisites: 223 & 231 concurrently. f.

314 Advanced Organic Synthesis (2-3). Prerequisites: 212 & 213.

315 Intermediate Organic Chemistry (3). Stresses physical-organic chemistry. Prerequisite: one year organic chemistry. f.

316 Intermediate Organic Chemistry (3). Stresses synthetic-organic chemistry. Prerequisite: at least one year organic chemistry. w.

318 Chemical Literature and Patents (1). f.

321 Intermediate Analytical Chemistry (3). Advanced treatment of subject matter of undergraduate quantitative and qualitative analysis. Prerequisites: two courses in analytical chemistry, each including lab & physical chemistry. f.

325 Qualitative Organic Analysis (3). Methods of separation, purification and characterization of organic compounds by modern research techniques; identifies individual compounds and the components of mixtures by chemical procedures and spectroscopic methods. Prerequisite: 10 hours organic chemistry. w.

329 Environmental Chemistry (3). Surveys the chemistry of air and water environments; discusses the chemistry of waste treatment. Prerequisite: 18 hours chemistry, including organic and analytical.

331 Physico-Chemical Calculations (2-5). Prerequisite: 233. f.

332 Chemical Thermodynamics (3). Prerequisite: 233. f.

333 Introductory Quantum Chemistry (3). Introduces quantum concepts, Schrodinger equations of simple systems and their solutions, many electron systems, approximate methods, and applications to molecular orbital. Prerequisite: 233 or equivalent. w.

335 Nuclear Chemistry (3). Studies nuclear reactions and properties of products of those reactions. Prerequisite: 233.

341 Inorganic Chemistry (3). Atomic and molecular structure, bonding, kinetics and mechanism, ligand field theory, coordination compounds, acids and bases. Prerequisite: one semester physical chemistry, 2nd semester co-requisite. w.

342 Inorganic Preparations (3). Vacuum techniques, magnetic susceptibility, rate studies, prepares and determines formation constants of coordination complexes, geometrical and optical isomerism, redox potentials. Prerequisite: concurrent with 341.

351 Topics in Environmental-Toxicological Chemistry (3). In-depth study of the chemical aspects of current issues dealing with environmental pollutants and toxic chemical substances. Prerequisite: 329 or equivalent. w.

361 Introduction to Radiochemistry (3). Introduces application of radioactive-tracer techniques to chemical research. Prerequisite: course in quantitative analysis or instructor's consent. w.

401 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to

semester. Repeatable upon consent of department. Prerequisite: instructor's consent.

409 Chemistry of Natural Products (3). Studies shikimates, acetogenins, terpenoids, steroids, alkaloids, drugs. Emphasis on biogenesis and relevant chemistry.

410 Seminar (1). f,w.

411 Advanced Organic Chemistry (3). Condensation reactions, organometallic compounds.

412 Physical Organic Chemistry I (3). Bond theory, physical methods, absorption spectroscopy, conformational analysis, mechanism of reactions.

413 Chemistry of High Polymers (3). Surveys field of natural, synthetic organic high polymers.

417 Applications of the Reactions of Organic Chemistry (3). Prerequisite: one year graduate organic chemistry.

418 Advanced Inorganic Chemistry (3). Selected topics dealing with fundamental reactions of inorganic systems with emphasis on application of thermodynamics, oxidation-reduction potentials, types of bonding and acid-base theory. Prerequisite: course in physical chemistry.

419 Physical Organic Chemistry II (3).

421 Electroanalytical Chemistry (3). Polarography, amperometry, potentiometry and other selected electroanalytical techniques.

423 Separations and Chromatography (3). Classical and electrochemical methods of separation: gas, paper, thin film and column chromatography; ion exchange.

425 Advanced Analytical Chemistry I (3). Selected topics dealing with recent advances in analytical chemistry.

427 Advanced Analytical Chemistry II (3). Continuation of 425.

430 Advanced Physical Chemistry (3).

432 Chemical Kinetics (3). Factors affecting rates, orders and mechanisms of chemical reaction, with emphasis on current theories and experimental techniques.

433 Atomic and Molecular Structures (3). Introduces molecular symmetry and eigen-value problems; quantum mechanical treatment of topics selected from molecular vibration and notation, electronic structure and spectra, crystal field theory, magnetic resonance, theory of solids. Prerequisite: 333 or equivalent. f.

436 Photochemistry and Molecular Excitation (3). Introduces experimental studies of interaction of light and ionizing radiations with matter. Emphasizes mechanism and rates of reaction of molecular fragments and electronically excited species and experimental methods for studying these reactions.

438 Kinetic Theory and Absorption (3).

440 Inorganic Mechanisms (3). Experimental stoichiometry and rate law determination. Isotopic applications. Methods and results of fast reaction studies. Basic known inorganic mechanisms. Experimental methods of establishing mechanisms of reaction.

442 Inorganic Thermodynamics (3). Heats of hydration, ligand field theory, stabilization of oxidation stages by complexation, evaluation of stability constants, solution calorimetry. Prerequisite: 332.

444 Inorganic Structural Methods (3). Chemical bonding, application of group theory, spectroscopy; diffraction as applied to structure determination; structural implications of dipole moment and magnetic susceptibility measurements.

450 Research (cr. arr.) Does not lead to dissertation. f,w,s.

461 Advanced Radiochemistry (3). Reviews current advances in radiochemistry, hot atom chemistry, radiation chemistry, nuclear spectrometry. Prerequisite: 361 or equivalent. alt. f. even yrs.

490 Research (cr. arr.) Research leading to thesis.

Child & Family Development (See Home Economics)

Child Health

266 Human Genetics (3) (same as Biological Sciences 266).

Pediatrics, Third Year (10). During the clinical years, an 8-week full-time clerkship is required. Students are assigned patients on the ward and newborn nursery and in the diagnostic outpatient clinics for independent history-taking, examination and clinical and laboratory evaluation, followed by discussion with a member of the staff. In addition to general pediatric clinics, subspecialty clinics are held in the fields of prematurity, diabetes, endocrinology, nutrition, gastroenterology, hematology, allergy, cardiology, neurology and rheumatology. Clinical experience is supplemented by participation in daily conferences, lectures and seminars.

Pediatrics, Elective (10). All fourth-year students are encouraged to spend elective time in pediatrics. During this period there will be extensive exposure to everyday pediatric problems in the outpatient clinics, and a shorter period of intensive inpatient training, with increasing responsibility in both areas. Preceptorship with a practicing pediatrician, laboratory and clinical research, or a combination of these may also be arranged. These programs should not be confused with research fellowships which are available during the student's clinical years. Arrangements for such fellowships may be made through the department chairman.

Postgraduate Instruction. Advanced postgraduate instruction in pediatrics (both short-term and long-term programs, up to 4 years in duration) and residencies are available to qualified physicians by arrangement.

Civil Engineering

17 Experimental Course. For freshman-level students. Content and number of credit hours to be listed in *Schedule of Courses*.

20 Surveying (2). Primarily for Forestry students. Uses surveying equipment; boundary and traverse surveying; coordinate and topographic surveying; elementary route surveys. Prerequisites: Math 9 & Math 10 or equivalent.

113 Engineering Measurements (3). Introduces methods of engineering surveys. Theory of errors. U.S. Public Land Surveys. Surveys computations by conventional and computer computations. Prerequisites: Math 80 & Engineering 30.

117 Experimental Course. For sophomore-level students. Content and number of credit hours to be listed in *Schedule of Courses*.

121 Introduction to Structures (4). Architectural and historical development of structural forms; behavior of structural forms; analysis of statically determinate beams, frames and trusses. Elementary design of timber, steel and reinforced concrete members. Prerequisites: Engineering 85 & Engineering 195 or concurrently.

185 Introduction to Dynamics (3) (same as Mechanical & Aerospace Engineering 185).

212 Transportation Systems Engineering (3). Studies engineering characteristics of various modes of transportation of passengers and goods. Prerequisite: 113.

224 Structural Design I (4). Basic principles of structural design in steel and concrete. Design of structural elements: beams, columns, connections. Prerequisite: 121.

225 Structural Analysis I (3). Classical methods of analysis for indeterminate beams, frames and trusses. Prerequisite: 121.

232 Civil Engineering Materials (3). Introduces composition, structure, properties, behavior and selection of civil engineering materials. Prerequisite: Engineering 195 or instructor's consent.

241 Fluid Mechanics Laboratory (1). Applications and demonstration of basic principles of fluid mechanics by experiment. Prerequisite: 251.

251 Fluid Mechanics (3) (same as Mechanical & Aerospace Engineering 251). Concepts of statics and dynamics of fluids; emphasis on principles of continuity, momentum, energy. Includes brief introductions to compressible and potential flow and viscous effects. Prerequisites: 185 & Engineering 99 concurrently.

276 Aerospace Structures I (3) (same as Mechanical & Aerospace Engineering 276). Analysis and design of aerospace structural components and structures. Prerequisites: Engineering 195 & Math 304.

291 The Technology Environment Interface (3). Evaluates interactions inherent in technology application to the natural world.

300 Problems (2-4). Directed investigation of civil engineering. Prerequisite: instructor's consent.

301 Topics in Civil Engineering (3).

304 Digital Computer Applications in Engineering (3). Use of digital computer for solution of engineering problems involving roots of equations, simultaneous equations, curve fitting, integration, differentiation and differential equations. Prerequisite: Math 201.

313 Advanced Surveying (3). Celestial observations for determining position; state coordinate systems, precise surveys, introduces geodetic surveys, principles of photogrammetry. Theory of optical surveying instruments. Prerequisites: 113 & Math 80.

323 Structural Design II (3). Design of building structures and bridges in steel and reinforced concrete, using case studies. Prerequisites: 224 & 225.

324 Structural Design and Analysis (3). Design and analysis of building frames and bridges in steel and concrete using case studies. Economic selection of structural type and material. Basic methods of analysis for statically indeterminate structures. Prerequisite: 224.

325 Engineering Kinetics (3) (same as Mechanical & Aerospace Engineering 325). Introduces mathematical treatment of complex forces and motion. Ballistics, vibrations, balancing. Prerequisite: 185.

326 Structural System Design (3). Design of structures using prefabricated elements. Economic considerations for system selection. Design and analysis of connection details. Case studies of modular structural systems. Prerequisite: 224.

331 Prestressed Concrete (3). Theory and practice of prestressed concrete design: pretensioning, posttensioning, anchorage of steel, materials, design specifications.

333 Plain Concrete (3). Theory of concrete mix design; concrete placing and curing practices; specifications, inspection, testing. Lab included. Prerequisite: 232.

340 Applied Fluid Mechanics (2). Steady and unsteady flow in closed conduits, flow in multiple pipe systems, compound reservoir problems, gravity dam design, gradually varied flow. Prerequisite: 251.

341 Hydrology (2). Fundamental concepts of hydrology in engineering; quantitative estimation of stream-flow magnitude and frequency. Prerequisite: Math 201.

342 Hydraulics of Open Channels (3). Gradually varied flow and theory of the hydraulic jump. Slowly varied flow involving storage; rating curves. Prerequisite: 251.

343 Analytical Hydrology (3). Modern methods of hydrologic analysis and synthesis of hydrologic records. Prerequisite 341 or instructor's consent.

- 344 Analysis of Water-Resource Systems (3).** Applies hydrology, hydraulic and sanitary engineering, and economics to water-resource design problems considering man and his environment. Utilizes methods of systems analysis. Prerequisite: 340, 341 or instructor's consent.
- 346 Intermediate Fluid Mechanics (3).** Basic theory of fluid mechanics; theoretical analysis of potential and viscous flows. Prerequisite: 251 or equivalent, Math 302 or equivalent.
- 348 Environmental Sanitation (3)** (not for credit for engineering). Principles of environmental sanitation as applied to community and rural problems of water supply, sewerage, housing, waste disposal, food sanitation, etc. Prerequisite: junior standing.
- 349 Environmental Sanitation Practice (3).** Companion course to 348, including group evaluation of environmental controls, lab instruction and field practice. Prerequisite: concurrent enrollment in 348.
- 352 Advanced Mechanics of Materials (3)** (same as Mechanical & Aerospace Engineering 352). Analysis of more complicated problems in stresses, strains. Prerequisite: Engineering 195.
- 353 Experimental Stress Analysis (3)** (same as Mechanical & Aerospace Engineering 353). Photoelastic, electric strain gage, brittle lacquer methods of experimental stress analysis for static loads. Strain gage work includes strain rosettes. Prerequisite: Engineering 195.
- 355 Soil Mechanics (3).** Detailed study of physical and mechanical properties of soil governing its behavior as an engineering material. Prerequisite: Engineering 195.
- 363 Urban Development and Planning (3).** Introduction to planning processes; procedures and forces that shape urbanization. Prerequisite: senior standing.
- 365 Engineering Administration (3).** Cash flow analysis, financial analysis, managerial accounting and cost control, budgeting, organizational structure and behavior. Prerequisite: junior standing.
- 367 Construction Contracts and Specifications (3).** Structure of the construction industry; varieties of construction contracts; principles of contract law; preparation and administration of construction contracts; construction plans and specifications; estimating procedures. Prerequisite: junior standing.
- 368 Construction Planning and Scheduling (3).** Planning and scheduling of construction operations by the critical path method. Network diagramming, scheduling computations and time-cost trade-offs. Manpower and equipment leveling. Computer and non-computer techniques. Prerequisite: senior standing.
- 369 Construction Methods and Equipment (3).** Selection and use of construction equipment; planning construction operations. Equipment economics. Prerequisite: senior standing.
- 370 Analysis of Civil Engineering Decisions (3).** Formulates and analyzes probabilistic models of civil engineering systems and their environment. Elementary theory of decision making under uncertainty. Application to selected civil engineering problems. Prerequisite: senior standing.
- 372 Foundation Engineering (3).** Design of basic foundation structures, footings, retaining walls, pile foundations, dams. Prerequisite: 355.
- 373 Optimization of Civil Engineering Systems (3).** Automated design techniques such as linear, nonlinear and dynamic programming; gradient and random searching. Civil engineering applications emphasized throughout. Prerequisite: senior standing.
- 374 Civil Engineering Systems Design (3).** Design of civil engineering systems. Prerequisite: senior standing.
- 375 Statically Indeterminate Structures (3).** Introduces classical and modern methods for elastic analysis of statically indeterminate frames, trusses.
- 381 Traffic Engineering (3).** Characteristics and studies associated with highway traffic. Analysis of signalized intersections. Prerequisite: 212 or instructor's consent.
- 384 Pavement Materials and Design (3).** Properties of materials used in roads, airports, and other pavement construction. Design methods for rigid and flexible pavements. Prerequisite: 212 or 212 concurrently.
- 385 Vibration Analysis (3)** (same as Mechanical & Aerospace Engineering 385). Vibration theory with application to mechanical systems. Prerequisites: 185 & Math 304.
- 391 Environmental Engineering—Water (3).** Principles and practices of water treatment and distribution, and wastewater collection, treatment and disposal. Prerequisite: junior standing.
- 392 Water and Wastewater Treatment Processes (3).** Planning, layout and design of municipal and industrial water and wastewater treatment systems. Prerequisite: 391.
- 393 Sanitary Engineering Microbiology (3).** Theory and application of fundamental principles of microbiology, ecology and aquatic biology of the microorganisms of importance to sanitary engineers. Prerequisite: senior standing or instructor's consent.
- 394 Sanitary Engineering Chemistry (3).** Applications of chemical theory and concepts of operations commonly employed in water and wastewater treatment to pollution from persistent chemicals and to specific control parameters. Prerequisite: senior standing or instructor's consent.
- 395 Water Quality Analysis (3).** Chemical, physical and biological methods for analysis of streams, lakes, wastewaters and water supplies and their use in water quality management. Prerequisite: 391 or instructor's consent.
- 396 Planning and Geometric Design of Highways (3).** Techniques of highway planning in rural and urban areas. Design of the visible elements of highways. Prerequisite: 212.
- 400 Problems (1-6).** Supervised investigation in civil engineering to be presented in the form of a report.
- 401 Advanced Topics in Civil Engineering I (1-3).** New and current technical developments in civil engineering. Prerequisite: 304 or equivalent.
- 407 Numerical Methods in Engineering (3).** Classification and numerical solution of engineering problems—ordinary and partial differential equations, algebraic equations. Includes initial, boundary, eigen- and characteristic-value problems. Prerequisite: Math 304.
- 410 Seminar (1).** Review of research in progress. Research techniques.
- 411 Continuum Mechanics (3)** (same as Mechanical & Aerospace Engineering 411). Introductory course in the mechanics of continuous media. Basic concepts of stress, strain, constitutive relationships; conservation laws are treated using Cartesian tensor notation. Examples from both solid and fluid mechanics investigated. Prerequisites: 251, Math 304, Engineering 195.
- 412 Theory of Elasticity (3)** (same as Mechanical & Aerospace Engineering 412). Stress and strain at a point. General equations of elasticity. Plane stress, plain strain problems; torsion of prismatic bars. Energy methods.
- 413 Theory of Plates and Shells (3)** (same as Mechanical & Aerospace Engineering 413). Bending of plates with various loading and boundary conditions. Deformations, stresses in thin shells.
- 414 Theory of Elastic Stability (3)** (same as Mechanical & Aerospace Engineering 414). Buckling of columns, beams, rings, curved bars, thin plates, shells.
- 416 Theory of Plasticity (3)** (same as Mechanical & Aerospace Engineering 416). Plastic yield conditions and stress-strain relations. Behavior of elastic-perfectly plastic members. Plain strain in plastic members. Prerequisite: 412 or instructor's consent.

- 418 Advanced Dynamics (3)** (same as Mechanical & Aerospace Engineering 418). Fundamental principles of advanced rigid body dynamics with applications. Special mathematical techniques including Lagrangian and Hamiltonian methods. Prerequisites: 185 & Math 304.
- 419 Nonlinear Mechanical Analysis (3)** (same as Mechanical & Aerospace Engineering 419). Analysis of behavior of nonlinear mechanical systems. Nonlinear phenomena of importance in mechanical design. Prerequisites: Mechanical and Aerospace Engineering 285 or equivalent & Math 304.
- 421 Matrix Analysis of Structures (3)**. Force and displacement methods of analysis using matrices and the computer; applications to continuous beams, plane frame and trusses, grids and space frames and trusses.
- 422 Advanced Structural Analysis (3)**. Current trends in structural analysis. Elastic analysis of curved beams, arches and suspensions. Finite element and nonlinear methods of analysis.
- 423 Structural Analysis (3)**. Classical and modern methods for elastic analysis. Influence line, Miller-Breslau principle. Introduces force and displacement methods using matrix analysis. Application to continuous beams, grids, plane and space frames and trusses.
- 424 Design of Special Structures Systems (3)**. Reviews current trends in design of structural systems and components. Critical evaluation of recent code modifications. Application to design of light gauge metal structures, lateral bracing systems, curved beams, panel systems. Prerequisite: 324 or 326.
- 426 Space Mechanics (3)** (same as Mechanical & Aerospace Engineering 426). Rigid body dynamics analysis of satellites, space vehicles. Trajectories, time flight optimization. Prerequisites: Mechanical & Aerospace Engineering 285 or equivalent & Math 304.
- 428 Vibrations of Distributed Parameter Systems (3)** (same as Mechanical & Aerospace Engineering 428). Vibration analysis of strings, cables, bars, rods, shafts, beams, membranes, plates, circular rings, frames; free and forced oscillation; miscellaneous loading; various boundary conditions; effect of damping; energy methods; method of difference equations. Prerequisite: 385.
- 430 Reinforced Concrete Theory and Design (3)**. Advanced design of reinforced concrete structures; review of standard codes and specifications and their influence. Prerequisite: 375 or equivalent.
- 432 Concrete Shell Design and Construction (3)**. Membrane theory: application to shells of revolution, barrel shells, hyper shells. Simplified solutions for perturbation stresses. Practical design criteria and shell layout principles. Construction methods. Applications of prestressing and precasting. Prerequisite: 324 or 326.
- 436 Advanced Soil Mechanics (3)**. Theoretical soil mechanics as applied to solution of specific engineering problems. Prerequisite: 355 or equivalent.
- 437 Design of Earth and Earth-Rock Dams (3)**. Seepage analysis. Design considerations. Stability analysis. Failures in dams. Foundation explorations. Special design problems and details. Prerequisite: 355 or equivalent.
- 438 Highway Transportation (3)**. Economics of transportation on highways. Comparison of vehicle operation costs. Project studies of highway problems in general. Prerequisite: 396 or equivalent.
- 441 Advanced Hydraulic Engineering (3)**. Rapidly varied flow and design of transition structures. Hydraulic design of spillways, reservoirs and related structures. Prerequisite: 340.
- 445 Biological Aspects of Water Quality (3)**. Systematic study of microbiological and ecological relationships in wastewater treatment facilities and polluted water. Prerequisites: 393 & 394 or instructor's consent.
- 450 Construction Engineering (3)**. Selection and layout of construction plant. Design and construction of formwork, falsework, cofferdams, conveyors and other temporary structures used by contractors. Prerequisite: 369 or equivalent.
- 452 Construction Project Management (3)**. Cost analysis, estimating techniques. Time, cost and quality control of construction projects. Recording/analyzing construction effort. Applications of crew balance, process charts, time-lapse motion pictures, operations research and pre-planning techniques to construction operations. Construction safety.
- 453 Construction Administration (3)**. Organization, management, engineering, business and legal problems in the construction industry. Purchasing, bonding, insurance, financing, labor relations and contract administration. Prerequisite: 367 or concurrently.
- 457 Land Use Planning (3)**. Case study of site planning using systems analysis; feasibility for development or redevelopment; restraints imposed by political, social and economic conditions on land use activity as related to urban and regional relationships. Prerequisite: 363.
- 458 Dynamical Theory (3)** (same as Mechanical & Aerospace Engineering 458). Engineering principles and application in mathematical expression of energy, force, inertia system. Prerequisite: Mechanical & Aerospace Engineering 285 or equivalent & Math 304.
- 459 Dynamics of Structures (3)** (same as Mechanical & Aerospace Engineering 459). Studies the dynamic behavior of structures. Analyzes equivalent lumped parameter systems for the design of structures in a dynamic environment. Prerequisite: 421 or equivalent, proficiency in digital computer programming, or instructor's consent.
- 460 Fundamentals of Fluid Mechanics (3)**. Fundamentals of fluid motion, lecture and lab. Instrumentation, technique and analysis for experimental studies in fluid mechanics. Prerequisite: 251 or equivalent.
- 461 Potential-Flow Theory (3)**. Dimensional considerations, fundamental relationships of fluid mechanics, potential theory and conformal mapping for incompressible fluid flow. Prerequisites: Math 302 & Math 305 or equivalent.
- 462 Viscous-Flow Theory (3)**. Theory of laminar and turbulent flow, boundary layers, free-turbulence flow. Prerequisite: 461 or equivalent.
- 464 Hydrodynamics (3)**. Special topics in potential theory and conformal mapping. Prerequisite: 461.
- 472 Behavior of Reinforced Concrete Members (3)**. Experimental and analytical investigations of the behavior and strength of reinforced concrete members. Literature survey of current research.
- 475 Random Vibration (3)** (same as Mechanical & Aerospace Engineering 475). Analysis of random vibrations including topics in stationary, ergodic and nonstationary random processes, with application to single-degree of freedom, discrete and continuous mechanical systems. Prerequisite: 385.
- 483 Transportation Planning and Models (3)**. Regional and metropolitan transportation studies; land use, traffic generation, distribution and assignment models. Prerequisite: 370 or 373.
- 484 Theory of Traffic Flow (3)**. Scientific approach to study of traffic phenomena with emphasis on applications. Deterministic and stochastic models of traffic flow; optimization of intersection controls; computer simulation of traffic problems. Prerequisite: 370 or instructor's consent.
- 485 Traffic Control Engineering (3)**. Information retrieval and analysis of human and vehicular characteristics; roadway element; system control and optimization of highways, intersections; planning and design of new traffic facilities including ways, terminals. Prerequisite: 212 or equivalent.

490 Research (cr. arr.) Independent investigation in the field of civil engineering to be presented in the form of a thesis.

491 Unit Process Laboratory (3). Studies chemical and physical relationships as applied to unit processes of water and wastewater. Prerequisites: 393 & 394.

492 Sanitary Engineering Operations (3). Applies physical and chemical fundamentals to problems of water and wastewater treatment. Prerequisite: 391.

493 Sanitary Engineering Processes (3). Applies biological and chemical fundamentals to problems of water and wastewater treatment. Prerequisite: 391.

496 Design of Water and Wastewater Treatment Facilities (3). Development of design criteria and their application to the design of water and wastewater treatment facilities. Prerequisite: 391.

498 Engineering Aspects of Water Quality (3). Theoretical aspects of biological, chemical, physical processes; applications in water, wastewater, industrial-waste treatment processes, natural water systems; chemical equilibria, flow models; reaction kinetics on process design, pollutants. Prerequisite: 391 or instructor's consent.

Classical Studies

300 Problems (cr. arr.) (Greek and Latin). Independent study and reports on selected topics. Prerequisite: instructor's consent.

350 Special Readings (1-3). Readings in authors and texts not covered in other courses. Prerequisite: Classics/Classical Civilization—departmental consent; Greek—2 years Classical Greek or equivalent; Latin—2 years Classical Latin or equivalent.

480 Seminar in Special Fields (3) (Greek and Latin).

Classics

Courses Requiring Knowledge of Greek and/or Latin

193 Honors Proseminar (3-6). Limited to Honors undergraduates. To be taken in senior year. Integrated exploration of classical civilization. May repeat to 6 hours maximum.

311 History of the Greek and Latin Languages (3) (same as Linguistics 313). Evolution of classical languages and their relationship to each other.

323-324 Greek and Roman Numismatics I and II (3) (3) (same as Art History & Archaeology 323-324).

330 Introduction to Text Criticism and Palaeography (3). Latin and/or Greek textual criticism and palaeography, using manuscript facsimiles at the University library. Prerequisite: two years of classical languages or equivalent.

380 Advanced Study in the Teaching of the Classics (3). Prerequisite: classroom teaching experience or with chairman's consent.

409 Introduction to Graduate Study in Classics (1). Required of all first-year graduate students.

415 Seminar in Classical Mythology (3). Intensive study of classical mythology in origin, development, meaning and influence. Prerequisite: instructor's consent.

425 Seminar in the Hellenistic Age (3-6).

435 Seminar in Ancient Rhetoric and Oratory (3).

437 Seminar in Ancient Literary Criticism (3). Principles and theories of ancient Greek and Latin literary criticism, as developed in significant works on the subject.

445 Seminar in the Ancient Novel (3).

455 Seminar in Greco-Roman Religion (3).

465 Seminar in Greco-Roman Satire and Social Criticism (3).

475 Seminar in the Age of the Antonines (3-6).

485 Seminar in the Culture of the Later Roman Empire (3-6).

490 Research and Thesis (1-8). Individual research in preparation for writing thesis and/or dissertation.

Greek

Courses in Greek Language

1 Elementary Ancient Greek I (5). Study of forms, grammar, syntax. Early attention to reading in simple Attic prose.

2 Elementary Ancient Greek II (5). Continuation of Greek 1. Readings in Attic prose. Prerequisite: Greek 1 or equivalent.

103 Greek Reading (3). Selected works of Greek literature. Prerequisite: Greek 2 or equivalent.

203 Intermediate Readings (3). Selected advanced readings in prose and poetry. Introduction to Homer. Prerequisite: Greek 103 or equivalent.

207 Intensive Beginning Greek I (3). Intensive study of forms, grammar, syntax; early attention to readings in simple prose. Course meets five hours weekly for 3 hours credit. Prerequisite: graduate standing.

208 Intensive Beginning Greek II (3). Continuation of 207. Attention to ability to read rapidly and accurately. Course meets five hours weekly for three hours credit. Prerequisite: graduate standing.

303 Greek Stylistics (1-3). Study and practice of general Greek prose tendencies, with special consideration to basic problems: abstract expression, word order, sentence structure and use of common rhetorical devices.

304 Greek Tragedy (3). Selected works of Aeschylus, Sophocles, Euripides; special attention to language, style, ideas and dramatic techniques. Prerequisite: two years Classical Greek or equivalent.

305 Greek Comedy (3). Selected plays of Aristophanes and Menander, with special attention to cultural contexts. Prerequisite: two years Classical Greek or equivalent.

306 Greek Lyric Poetry (3). Selected readings from lyric poets, with attention to verse, forms and dialects. Prerequisite: two years Classical Greek or equivalent.

307 Greek Oratory (3). Selections from Greek orators; emphasis on Lysias and Demosthenes. Prerequisite: two years Classical Greek or equivalent.

308 Greek Philosophers (3) (same as Philosophy 308). Emphasis on readings and analysis of selected texts of major Greek philosophers. Prerequisite: two years Classical Greek or equivalent.

310 Greek Historians (3). Reading and analysis of selected texts of major Greek historians. Prerequisite: two years Classical Greek or equivalent.

315 Homer (3). Reading, discussion and literary analysis of *Iliad* and *Odyssey*. Prerequisite: two years Classical Greek or equivalent.

325 Greek Epigraphy (3). Introduction to study of Greek inscriptions and their contribution to the understanding of other aspects of ancient culture. Prerequisite: Greek 103.

327 Papyrology (3). Introduction to study of Greek papyri and their contribution to the understanding of other aspects of ancient culture. Prerequisite: two years Classical Greek or equivalent.

375 Greek Literature of the Roman Period (3-6). Critical readings in, and integrated analyses of, the culture of the Greek-speaking part of the Roman Empire. Prerequisite: two years Classical Greek or equivalent.

399 Survey of Greek Literature (3). Greek literature from origins to end of Roman period; emphasis on authors not covered in other courses, to provide general view of styles on genres. Prerequisite: two years Classical Greek or equivalent.

- 425 Seminar in Greek Drama (3).**
440 Seminar in Greek Lyric Poetry (cr. arr.)
450 Seminar in the Greek Philosophers (3).
460 Seminar in the Greek Historians (3).
470 Seminar in Greek Epic Poetry (3).
475 Seminar on the Age of Pericles (3-6). Study of Greek culture of mid-fifth century B.C. law, religion, art, philosophy, science and other aspects of the culture to give students an integrated view of life of the period.

Latin

Courses in the Latin Language

- 1 Elementary Latin I (5).** Forms, grammar, syntax.
2 Elementary Latin II (5). Continuation of 1. Readings in Latin prose. Prerequisite: a grade of C or higher in Latin 1.
103 Latin Reading (3). Readings in Latin prose and poetry. Prerequisite: Latin 2 or equivalent.
203 Latin Poetry (3). Readings in Latin poetry, with concentration on Vergil's *Aeneid*, Books VII-XII. Prerequisite: Latin 103 or equivalent.
207 Intensive Beginning Latin I (3). Intensive study of morphology, grammar, syntax; early attention to readings in simple prose. Course meets five hours weekly for 3 hours credit. Prerequisite: graduate standing.
208 Intensive Beginning Latin II (3). Continuation of 201. Readings in Latin prose. Prerequisite: graduate standing.
303 Latin Stylistics (1-3). Study and writing of connected prose compositions.
305 Age of the Scipios (3-6). Critical readings in and integrated analyses of the culture of the second century B.C. Prerequisite: two years Classical Latin or equivalent.
310 Age of Cicero (3-6). Critical readings in and integrated analyses of the culture of the last decades of the Roman Republic. Prerequisite: two years Classical Latin or equivalent.
320 Augustan Literature (3-6). Critical readings in and integrated analyses of the culture of Augustan Rome. Prerequisite: two years Classical Latin or equivalent.
325 Latin Epigraphy (3). Introduction to the study of Latin inscriptions and their contributions to ancient culture. Prerequisite: Latin 103.
335 Neronian Literature (3-6). Critical readings in and integrated analyses of the culture of the age of Nero. Prerequisite: two years Classical Latin or equivalent.
340 Age of Pliny and Tacitus (3-6). Critical readings in and integrated analyses of the ages of Comitian and Trajan. Prerequisite: two years Classical Latin or equivalent.
375 Literature of the Late Empire (3-6). Critical readings in and integrated analyses of the culture of the late Roman Empire. Prerequisite: two years Classical Latin or equivalent.
376 Medieval Latin (3). Selected texts of Middle Ages and Renaissance. For students with primary interest in history, literature, philosophy, religion, Romance Philology, or the Classical Tradition, experience with Latin sources in their field. Prerequisite: instructor's consent.
399 Survey of Latin Literature (3). Latin literature from origins to end of Roman Empire; emphasis on authors not covered in other courses, to provide general view of styles and genres. Prerequisite: two years Classical Latin or equivalent.
410 Seminar in Roman Comedy (3).
420 Seminar in Latin Lyric and Elegiac Poetry (3).
430 Seminar in Neronian Literature (3).
450 Seminar in Roman Historians (3).
470 Seminar in Latin Epic Poetry (cr. arr.)

475 Seminar in the Augustan Age (3-6). Integrated studies in the culture of the Age of Augustus—its literature, art and architecture, religion, political and social institutions.

Sanskrit

- 211 Elementary Sanskrit I (5)** (same as South Asia Studies 211).
212 Elementary Sanskrit II (5) (same as South Asia Studies 212).

Classical Civilization & Literature in Translation

Courses Requiring No Knowledge of Latin or Greek

- 10 The Greek and Roman Achievement (3).** General introduction to Greco-Roman culture. Primarily intended for students planning to take only one course in classical civilization. Credit will be reduced for students who elect to take 100-level courses in classical civilization.
50 Greek and Latin in English Usage (3). Influence of Latin and Greek on English vocabulary.
60 Classical Mythology (3). Myths of Greece and Rome as an aid in interpretation of literature and art. cor.
115 Greek Culture (3). Survey of Greek life and thought. Principal developments in literature, the arts, politics, religion and philosophy, and their influence on western civilization.
116 Roman Culture (3). Survey of Roman life and thought. Principal developments in literature, the arts, politics, religion, philosophy and private life and their influence on western civilization.
201 Topics in Classical Studies (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable with departmental consent.
210 Theory and Art of Literary Translation (3) (same as Comparative Literature 210).
224 Roman Classics in Translation (3). Reading in translation and critical study of the most important literary works of the ancient Roman world. Prerequisite: sophomore standing.
225 Greek Classics in Translation (3). Reading in translation and critical study of the most important literary works of the ancient Greek world. Prerequisite: sophomore standing.
226 Greek Drama (3). Reading and interpretation of Greek tragedies and comedies in translation. Prerequisite: sophomore standing.
227 Advanced Mythology (3). Interpretation of selected classical myths and their influences on later literature and art. Prerequisite: C or above in previous Classical Civilization course.
260 Greek and Roman Religion (3). Surveys religious development among the Greeks and Romans.
271 Approaches to Comparative Literature (3) (same as Comparative Literature 271, English 271, Germanic & Slavic Studies 271).
301 Topics in Classical Studies (cr. arr.) Subjects and earnable credit may vary from semester to semester. May be repeated with departmental consent. Prerequisites: junior standing & instructor's consent.
352 The Classical Tradition (3). Selected studies in continuity and influence of Greek and Roman culture on Middle Ages, Renaissance and modern times.

Clothing & Textiles (See Home Economics)

Community Development (See Regional & Community Affairs)

Community Health & Medical Practice (See Family & Community Medicine)

Comparative Literature

102 Introduction to Comparative Literature (3). Study of selected works acquaints student with international and interdisciplinary aspects of literature. May be used as partial fulfillment of general education requirement in humanistic studies in Arts and Science. Prerequisite: English 3 or instructor's consent.

201 Topics (cr. arr.) Subjects and earnable credit may vary from semester to semester. May be repeated with committee's consent.

210 Theory and Art of Literary Translation (3) (same as Classical Studies 210, German 210, Russian 210, Romance Languages 210). Study of nature and problems of translation; critical standards; varieties of translation; practice in literary translation. Prerequisite: 200-level course in a foreign language.

271 Approaches to Comparative Literature (3) (same as Germanic & Slavic Studies 271, Classical Studies 271, English 271). Critical approaches to comparative literature through genre, period, theme, translation, influence, mythology and recurrent imagery.

301 Topics (cr. arr.) Subjects and earnable credit may vary from semester to semester. May be repeated with consent of committee. Prerequisites: junior standing & instructor's consent.

379 Colloquium on Comparative Literature (3). Application of the techniques of comparative literature. Content varies according to instructor and to student needs. Prerequisite: 271.

Computer Science

75 Introduction to Computer Science (3). Survey of computer science emphasizing basic concepts and techniques. Algorithms, flowcharts, representation of information, data structures, computer organization, programming languages, software systems, social issues. Students write programs in several languages.

104 Computers and Programming I (3). Introduces computer programming in FORTRAN, key punching, flowcharting, use of CALCOMP plotter. Prerequisite: Math 10 or equivalent.

201 Programming as a Research Tool I (3). Intensive study of programming techniques and applications for graduate students and superior seniors with no previous programming experience. Prerequisite: Statistics 207 or Statistics 234 or equivalent. Credit not given for both 104 and 201.

202 Programming as a Research Tool II (3). Advanced practical programming, with emphasis on use of job control language, auxiliary storage media, access methods and system utilities. Prerequisite: 201 or 203.

203 Computers and Programming II (3). Thorough treatment of computer programming language PL/I and its application to both numerical and non-numerical problems. Prerequisite: 104.

207 Survey of Programming Languages (3). Study of four important programming languages that illustrate a variety of language features and introduce various programming applications: list processing, string manipulation, array processing and record handling. Prerequisite: 104 or 201, concurrent registration in 203.

301 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon consent of department. Prerequisites: junior standing & instructor's consent.

303 Programming Languages and Their Compilers I (3). Language concepts: information binding, data structures, control structures, input/output, execution environment. Language specification: BNF, static and dynamic semantics. Language processors: lexical and syntactic analysis, storage organization, semantic routines. Prerequisites: 203; 207 concurrently.

304 Minicomputers: Programming and Applications (3). Structure, operation and programming of the PDP 11/20 studied in detail. Characteristics and applications of minicomputers discussed. Using assembly language, student writes and executes numerous programs by actually operating the PDP 11/20. Prerequisite: 104 or 201.

305 Assembly Language Programming (3). Assembly language programming for IBM 360/370 series computers. Prerequisite: 104 or 201.

320 Data Structures (3). Studies certain important programming techniques/fundamental algorithms for representing and manipulating data. Linked list structures, arrays, stacks, queues, deques; trees, tree traversal; analysis of sorting/searching algorithms; miscellaneous combinatorial algorithms. Prerequisite: 104 or 201, Math 80.

323 Numerical Analysis (3) (same as Mathematics 323).

324 Numerical Linear Algebra (3) (same as Mathematics 324).

330 Computer Organization I: Design Fundamentals (3) (same as Information Science 330). Boolean algebra, combinational logic, digital circuits, representation and transfer of data, digital arithmetic, storage and accessing, control functions, input/output facilities, system organization. Prerequisite: 104.

337 Applied Modern Algebra (3) (same as Mathematics 337).

341 Automata Theory I: Sequential Machines (3) (same as Electrical Engineering 341). Introduces formal languages and abstract machines with applications to parsing and compiling. Prerequisite: Math 201 or Electrical Engineering 205.

350 Special Readings (1-3).

351 Systems Programming I (3). Analysis and design of computer systems including assemblers, input/output; executive, multiprogramming and multiprocessing systems with a close examination of at least one major system. Prerequisite: 305.

400 Problems (1-3).

401 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon consent of department. Prerequisite: instructor's consent.

403 Programming Languages and Their Compilers II (3). Advanced language concepts and processing techniques. Language concepts: exception handling, protection, abstract data types, modularity, extensibility. Language specification: Vienna Definition Language, axiomatization, two-level specification. Language processors: code generation, optimization. Prerequisites: 303, 305.

425 Heuristic Programming (3). Concepts and theories underlying intelligent machines. Programming techniques used in artificial intelligence for game playing, automatic theorem proving, natural language "understanding," pattern recognition, deductive and inductive inference. Prerequisites: 203, 320.

430 Computer Organization II: Architecture (3). Comparative study of computers; emphasizes alternative designs and trade-offs. Introduces computer description languages. Prerequisite: 330 or Electrical Engineering 226.

440 Computability and Recursive Functions (3). Rigorous analysis of the concept of an algorithm given in terms of recursive functions. Turing machines and Post systems. The halting problem and Post correspondence problem are shown to be undecidable.

441 Automata Theory II: Formal Languages (3) (same as Electrical Engineering 441). Further study of languages and machines. Unsolvable problems about languages; other machine models such as cellular and probabilistic automata. Prerequisite: 341.

450 Research (cr. arr.) Investigation and research into a topic, not leading to a thesis. Prerequisite: department chairperson's consent.

451 Systems Programming II (3). Concepts and problems associated with design of large scale systems such as assemblers, compilers, loaders, interpretive systems, real-time, monitor, executive multiprogramming, multiprocessing, multiaccess systems; scheduling algorithms for jobs and input/output. Prerequisite: 351.

460 Data Storage and Retrieval (3). Theory and techniques for organization, storage and retrieval of data. Covers automatic indexing, text processing techniques and file organization techniques. Comparisons of typical commercial and special purpose systems. Prerequisites: 203 & 305.

465 Data Base Management Systems (3). Introduces computer data base systems: functions, uses, requirements, security, storage structures, sub-languages, actual systems. Details of three major approaches: relational, hierarchical, network. Emphasizes design techniques for constructing systems meeting their specifications. Prerequisite: 203.

490 Research (cr. arr.) Graduate thesis research.

Consumer Economics (See Family Economics & Management)

Correspondence Courses (See Independent Study)

Counseling & Personnel Services

G60 Introduction to Counseling and Personnel Services (1). Overview and orientation to various specialties comprising the field of counseling and personnel services. Required of those planning to obtain endorsement in guidance services (elementary or secondary) and rehabilitation services.

G151 Problems in Counseling and Personnel Services (1-3). Independent problems.

G152 Seminar in Counseling and Personnel Services (1-3). Special seminars in selected topics.

G160 Field Experience in Counseling and Personnel Services (3). Guidance services (elementary/secondary) or rehabilitation services, related clinical/administrative and monitorial duties in schools and approved agencies during semesters and summer. Work 30 hours for each credit hour. Professor-supervised.

G199 Internship in Counseling and Personnel Services (3). Supervised experience in guidance services (elementary/secondary) or rehabilitation services in approved internship station. For students enrolled in guidance services or rehabilitation services. Satisfies three hours student teaching requirement. D199 or E199 concurrently.

G320 Planning and Implementing Guidance Programs (3). Provides knowledge and skill in guidance program development and management techniques, including program planning, structuring, implementing and evaluation.

G325 Individual Vocational Assessment (3). Information about individual vocational assessment theory, process, technology. Practical application emphasized through developing occupational sample for a community agency, using the Dictionary of Occupational Titles, giving vocational tests, conducting a job analysis. Prerequisite: R370.

G330 Parent Counseling and Consultation (3). For educational personnel, mental health consultants, child development specialists who work with parents in professional setting. Examines current family needs and child rearing practices. Basic skills in diagnosis, counseling, consultation, parent education developed.

G335 Vocational Placement Methods (2). Review and application of several techniques involved in vocational placement, i.e., diagnostic interviewing and placing, job seeking skills training, job development, placement and follow-up. Lab. Prerequisite: G325.

G352 Psychological Aspects of Disability (3). Introduces rehabilitation counselors and service workers to unique psychological problems and adjustments associated with a wide range of physical and mental disabilities. Emphasizes desirable service delivery intervention strategies to facilitate vocational, social and personal adjustment.

G360 Topics (cr. arr.)

G395 Principles and Procedures of Student Personnel Work (2½-3). Student personnel work in educational institutions—objectives of student personnel work, certain pertinent techniques.

G396 Group Procedures in Counseling I (3). Group theory and related research, observation and analysis of group dynamics with emphasis on counseling group member skills and behaviors. Prerequisite: junior standing.

G397 Occupational and Educational Information (2½-3). Nature, use of occupational and educational information. Characteristics, requirements of occupations and training opportunities. Process of vocational choice. Prerequisite: G395 or Practical Arts & Vocational-Technical Education F321.

G400 Problems (cr. arr.)

G404 Individual Inventory (2½-3). Interprets educational, psychological test data and data in personnel records; emphasizes use of data in counseling. Prerequisites: G395 or Practical Arts & Vocational-Technical Education F321; Education R370.

G406 Mental Hygiene (2½-3). Psychology of mental health. Emphasizes normal personality, improved self-management. Prerequisite: Educational Psychology A405 or equivalent.

G407 Counseling Methods (2½-3). Counseling as a professional field; process of counseling; counseling re educational, occupational, social, personal adjustment. Prerequisites: G395 or Practical Arts & Vocational-Technical Education F321; Educational Psychology A405 or equivalent.

G408 Student Personnel Administration (2-3). Organization and administration of student personnel services in elementary, secondary, higher educational institutions. Prerequisites: G395 or Practical Arts & Vocational-Technical Education F321; Educational Psychology A405 or equivalent.

G409 Group Procedures in Counseling II (3). Continuation of G396. Emphasis on analysis of individual behavior in a counseling group. Prerequisites: G396 & instructor's consent.

G410 Seminar (½-3).

G411 Vocational Rehabilitation I (2). Vocational handicaps, methods of rehabilitating vocationally handicapped. State, national provisions for vocational rehabilitation services.

G412 Vocational Rehabilitation II (2). Continuation of G411.

G415 Supervised Practice in Counseling and Personnel Services I (6). Supervised practice of counseling in an approved counseling agency. Prerequisites: minimum grade of B in G397; G404; G406; G407 or equivalent; instructor's consent.

G416 Supervised Practice in Counseling II (2½-3). Advanced supervised practice in counseling in an approved counseling agency. Prerequisites: G415 & G422 (concurrent registration in G422 acceptable).

G417 Supervised Practice in Personnel Services II (3). Advanced supervised practice in student personnel services in an approved agency. Prerequisites: G415 & G408 (or G408 concurrently).

G419 Studies in Supervision of Counseling and Personnel Services (3). Instruction and practice in the supervision of counseling and personnel services conducted in appropriate lab and agencies. Prerequisite: G416 or G417 or G418.

G422 Advanced Counseling Theories (2-3). Historical, contemporary theories of counseling. Advanced study of techniques, research findings. Prerequisite: G415 or equivalent.

G447 Family Counseling (3). Appropriate for master's and doctoral students who will work with families in a professional setting. Examines family systems theories and major theories in terms of family needs. Basic skill development in family counseling processes. Prerequisite: G407 or instructor's consent.

G448 Marriage Counseling (3). Marriage counseling as a professional goal, process of marriage counseling, premarital and divorce counseling, sexual adjustment in marriage, marital enrichment, research in marriage counseling. Prerequisite: G407 or instructor's consent.

G460 Topics (cr. arr.)

G470 In-Service Course in Counseling (cr. arr.)

G473 Supervised Practice, Method and Theory in Group Procedures I (3). Supervised practice of group facilitation in an approved counseling setting. A study of the contemporary theories and advanced technique are integrated with the practice of group facilitation. Prerequisites: G409, G415 and instructor's consent.

G474 Supervised Practice, Method and Theory in Group Procedures II (3). A continuation of G473. Prerequisites: G473 & instructor's consent.

G475 Internship in Counseling and Personnel Services (3-6). Supervised experience in research, instruction, counseling or student personnel work on half- or full-time basis in approved internship station. May repeat to 12 hours credit. Prerequisites: Master's in C&PS; department chairperson's consent.

G490 Research (cr. arr.) Independent research leading to thesis.

Curriculum & Instruction

Secondary Education

D110 Teaching Skills (2). Series of weekly experiences—demonstrations, observations, microteaching, small group discussions—to develop concepts of and skill in a variety of basic teaching tasks. Prerequisite: Educational Psychology A102.

D111 Teaching of English (2). Teaching of language, composition and literature. Prerequisite: Educational Psychology A102.

D113 Teaching of Speech (2). Aims, standards, problems, methods in conduct of high school courses in speech improvement, oral interpretation, dramatics, public speaking, debating. Prerequisite: Educational Psychology A102.

D115 Teaching Art in Secondary Schools (2). Philosophy of art education. Considers classroom techniques employed in teaching secondary school art. Prerequisite: Educational Psychology A102. cor.

D116 Teaching of French (2). Objectives, methods and instructional materials related to teaching of French at the secondary level. Prerequisites: Educational Psychology A102 & 18 hours or the equivalent in French.

D117 Teaching of Spanish (2). Objectives, methods and instructional materials related to the teaching of Spanish at the secondary level. Prerequisites: Educational Psychology A102 & 18 hours or the equivalent in Spanish.

D119 Art Experiences in the Secondary School Program (3). Considers the meaning of art and creative experiences in development of youth. Studio activities related to media included in the secondary curriculum.

D121 Teaching of Social Studies in the Secondary School (2). Required of social studies majors, elective for minors. Fundamental problems of teaching social studies on high school level. Prerequisite: Educational Psychology A102.

D124 The Teaching of Science in the Secondary School (2). Prerequisite: Educational Psychology A102.

D128 Teaching of Mathematics in the Secondary School (2). Prerequisite: Educational Psychology A102.

D135 Teaching Practicum for Allied Health Sciences (3) (same as Medical Technology 135, Occupational Therapy 135, Physical Therapy 135, Radiologic Technology 135, Respiratory Therapy 135). Designed to strengthen teaching competence. Projects, exercises, teaching experiences supervised by program directors in cooperation with College of Education. Prerequisites: Educational Psychology A102 & program director's consent.

D150 Special Readings (1-3). Directed study of literature and research reports in secondary education. cor.

D160 Early Classroom Experiences as Instructional Aides (1-4). Instructional related clinical/administrative and monitorial duties in the secondary classroom during semesters and summer. Student works 30 hours for each credit, with professor supervising. cor.

D190 Experimental Education in the Secondary Schools (1-5). Participation in experimental programs or projects approved by the College of Education. Prerequisite: junior standing or approval by project or program director.

D199 Student Teaching in the Secondary School (cr. arr.) Hours, credit must be arranged with Director of Student Teaching. Must apply during February for following year. Prerequisite: D110 & special methods course(s) in the area of specialization.

D312 English Language Study in the Schools (1-3). Problems in teaching of standard English usage and in the use of current linguistic materials in the schools.

D313 Teaching of Literature in Secondary Schools (1-3). Selection and organization of materials for teaching literature to adolescents.

D314 Teaching of Composition in Secondary Schools (1-3). Current approaches to teaching composition in junior and senior high schools.

D315 Teaching of Physics in the Secondary School (4). Basic course to prepare future high school teachers of physics and to increase professional competency for practicing high school teachers. Prerequisite: Educational Psychology A102 & one year college general physics.

D351 Teaching Legal Rights and Responsibilities of Citizenship (2). An introductory course for teachers and undergraduate students dealing with the teaching of the basic legal concepts which underlie effective citizenship.

D360 Topics in Secondary Education (cr. arr.)

D365 Teaching Reading in the Secondary School (3). For secondary school teachers. Specific ways teachers can help students improve reading skills in content areas and ways reading can be taught in reading classes. Prerequisite: Educational Psychology A102 & a methods course.

D369 Analysis and Correction of Reading Disabilities (3) (same as E369).

D370 Diagnostic and Corrective Reading in the Classroom (3) (same as E370).

D380 Studies in the Techniques of Teaching German (3) (same as Germanic & Slavic Studies 380).

D400 Problems (cr. arr.)

D403 The Supervision of Student Teaching (3). Introduces theory, knowledge and practices involved in supervision of student teaching and other professional lab experiences. Offers assistance to all major aspects of supervision of student teaching.

D405 Tests and Measurements for Elementary and Secondary Schools (3) (same as E405).

D409 Literature for Children and Youth (3). Systematic study of selected areas of particular importance to students of literature, teachers, librarians, supervisors, and school administrators. Prerequisite: E196 or instructor's consent.

D410 Seminar in Secondary Education (1-3).

D411 Studies in English Education (3) (same as English 411).

D412 Advanced Teaching of Science (2). For teachers and supervisors of science. Problems of organization, content, teaching. Includes summary of investigations on teaching of science.

D414 Production and Examination of Instructional Materials (3) (same as E414).

D415 Practicum in Child Study I (3-5) (same as E415).

D416 Practicum in Child Study II (3-5) (same as E416).

D417 Practicum in Child Study Supervision (3-5) (same as E417).

D420 Patterns for Instruction in Secondary Social Studies (3). Examines and evaluates alternative instructional patterns or strategies for secondary school social studies.

D421 The Social Studies Curriculum (3). Examines current theory, trends and practices in secondary social studies curriculum with a practicum in curriculum development.

D428 Curriculum Development and Teaching Techniques in Secondary School Mathematics (3). Discussion and application of theories of learning, strategies of instruction, curriculum development, evaluation techniques and research to secondary mathematics programs. Prerequisite: mathematics secondary school teaching experience or equivalent.

D430 Survey of Art Education (3) (same as E430).

D431 Curricula in Art Education (3) (same as E431).

D432 Review of Research in Art Education (3) (same as E432).

D445 The Secondary School Curriculum (3). For secondary school principals, teachers, superintendents. Present trends in curricular change, methods of curricular investigation. cor.

D446 Curriculum Construction for Secondary Schools (3). Designed for those engaged in curriculum revision work and construction of new secondary school courses. Prerequisite: D445 or instructor's consent.

D447 Improvement of Secondary School Teaching (3). For secondary school teachers, principals, superintendents with considerable training in education and teaching experience. Recent developments in secondary school teaching.

D448 Analysis of Instructional Behavior (3) (same as E448, Educational Psychology A448).

D451 Teaching Contemporary Legal Issues of Citizenship (3). An advanced course in citizenship education dealing with the complexities of contemporary moral, social and legal issues. Introduces specific strategies for helping children and youth deal with social and moral dilemmas. Recommended: D351 or E351.

D460 Topics in Secondary Education (cr. arr.)

D470 In-Service Course in Secondary Education (cr. arr.)

D480 Internship in Secondary Education (cr. arr.) Provides internship experience under supervision in advanced levels of curriculum and instruction. Prerequisite: department chairperson's consent.

D490 Research in Secondary Education (cr. arr.)

Elementary Education

E118 Art Activities in the Elementary School (2). Considers the vital role of art activities and creative experiences in the growth and development of children. Prerequisite: junior standing. cor.

E122 Child Study (3). Presents physical, mental, social, emotional growth of child from prenatal period to sixth year. Prerequisite: Educational Psychology A102.

E123 Kindergarten Methods and Management (3). Development, theory and practice in the kindergarten. Prerequisite: junior standing.

E124 Learning Experiences for the Young Child (3). Includes lectures; at least six visits to nursery schools, kindergartens; readings; classroom investigations providing knowledge of developments in methods, materials, activities used in working with young children. Prerequisites: E122 & E123 or equivalents.

E150 Special Readings (1-3). Directed study of literature and research reports in elementary education. cor.

E160 Early Classroom Experiences as Instructional Aides (1-4). Instructional related clinical/administrative and monitorial duties in the elementary classroom during semesters and summer. Student works 30 hours for each hour of credit, with professor supervision. cor.

- E167 Mathematics in the Elementary School (2).** Materials and techniques used in the elementary school to develop mathematical concepts and skills. Prerequisites: Math 7 & Math 8 or equivalent; junior standing. cor.
- E190 Experimental Education in the Elementary School (1-5).** Participates in experimental programs or projects approved by the College of Education. Prerequisites: junior standing & project or program director's consent.
- E196 Literature in the Elementary School (3).** Surveys the field of literature for children and adolescents, with emphasis on selected readings of various types of literature. Prerequisite: junior standing or instructor's consent.
- E198 Science in the Elementary School (2).** Concepts, materials, methods in elementary school science program. Prerequisite: junior standing.
- E199 Student Teaching in the Elementary School (cr. arr.)** Hours, credit must be arranged with Director of Student Teaching. Must apply during February for following year. Prerequisites: E167, E325 & one additional elementary methods course.
- E312 English Language Study in the Schools (1-3).** Problems in teaching of standard English usage and in the use of current linguistic materials in the schools.
- E325 Teaching Reading in the Elementary School (3).** Materials, methods used in teaching reading in elementary grades. Prerequisite: Educational Psychology A102. cor.
- E340 Organization of Public School Art (2).** Purposes, practices of art experiences in elementary, secondary schools. Designed for teachers, supervisors, administrators.
- E351 Teaching Legal Rights and Responsibilities of Citizenship (2).** An introductory course for teachers and undergraduate students dealing with the teaching of the basic legal concepts which underlie effective citizenship.
- E360 Topics in Elementary Education (cr. arr.)**
- E365 Advanced Teaching of Elementary Science (3).** For experienced teachers. Studies science program in elementary school from viewpoint of objectives, content, techniques, evaluation, developing trends. Prerequisite: instructor's consent.
- E366 Teaching the Language Arts in the Elementary School (2).** Procedures used in teaching integrated language arts in elementary grades. Prerequisite: Educational Psychology A102.
- E367 Curriculum Development and Teaching Techniques in Elementary School Mathematics (3).** The mathematics program in the elementary school from viewpoint of goals, content, techniques and evaluation.
- E368 Social Studies in the Elementary School (3).** Problems in preparation, teaching of units with suitable materials, techniques. Prerequisite: Educational Psychology A102.
- E369 Analysis and Correction of Reading Disabilities (3)** (same as D369). Causes of reading disabilities; procedures that may be used to diagnose, correct. Prerequisite: E325, D365 or equivalent.
- E370 Diagnostic and Corrective Reading in the Classroom (3)** (same as D370). Procedures for diagnosing and correcting reading problems within the classroom. Prerequisite: E325 or equivalent.
- E400 Problems (cr. arr.)** Selected problems to meet needs of individual students.
- E403 The Supervision of Student Teaching (3).** Theory, knowledge and practices involved in supervision of student teaching and other professional lab experiences. Offers assistance in all major aspects of supervision of student teaching.
- E404 Psychology of Affective Growth (3).** Systematic review of research on selected affective (non-cognitive) variables; emphasizes potential applicability of research findings to school settings.
- E405 Tests and Measurements for Elementary and Secondary Schools (3)** (same as D405). Educational tests, measurements from points of view of teachers, supervisors, administrators.
- E406 The Elementary School Curriculum (3).** Studies elementary curriculum with regard to selection of objectives and content, and to provisions for curricular change.
- E409 Literature for Children and Youth (3).** Systematic study of selective areas of particular importance to students of literature, teachers, librarians, supervisors and school administrators. Prerequisite: E196 or instructor's consent.
- E410 Seminar in Elementary Education (1-3).**
- E411 Seminar in Reading and Language Arts (1-2).** Critical consideration of selected research and investigations in reading and language arts. Prerequisite: E325 or D365.
- E413 Seminar in Elementary School Curriculum (1-2).** Comparative study of selected areas of the elementary school curriculum with special emphasis on research and promising innovative and experimental projects. Prerequisite: E406.
- E414 Production and Examination of Instructional Materials (3)** (same as D414). Studies and investigations of types of instructional materials for developmental, corrective and remedial reading.
- E415 Practicum in Child Study I (3-5)** (same as D415). Practicum experiences in diagnosing educational problems of school children. Prerequisite: E325 or D365, E369, Educational Psychology A303.
- E416 Practicum in Child Study II (3-5)** (same as D416). Practicum experiences in applying remedial procedures to children with educational problems. Prerequisite: E415.
- E417 Practicum in Child Study Supervision (3-5)** (same as D417). Practicum experience in supervising and directing a clinic involved with educational evaluation. Prerequisites: E415 & E416.
- E420 Issues and Trends in Reading Instruction (3).** Provides intensive study of significant issues and current trends in reading on all instructional levels. Prerequisite: E325, D365 or equivalents or instructor's consent. cor.
- E430 Survey of Art Education (3)** (same as D430). Provides survey of the development of art education and problems in the field by means of a critical inquiry. Prerequisite: graduate standing.
- E431 Curricula in Art Education (3)** (same as D431). Advanced study of art education curricula, with option for elementary or secondary emphasis. Study of exemplary art programs, standards of quality, curriculum models, curriculum design and construction, concomitant instructional methods and evaluation. Prerequisite: graduate standing.
- E432 Review of Research in Art Education (3)** (same as D432). Studies appropriate research methodologies and reviews research and selected readings in art education. Prerequisite: graduate standing.
- E448 Analysis of Instructional Behavior (3)** (same as D448, Educational Psychology A448). Teaching models and a systematic review of literature on instructional behavior and student achievement. Methodological strategies for conducting naturalistic classroom research stressed. For advanced master's and doctoral students. Prerequisite: graduate standing.
- E451 Teaching Contemporary Legal Issues of Citizenship (3).** Advanced course in citizenship education dealing with the complexities of contemporary moral, social and legal issues. Introduces specific strategies for helping children and youth deal with social and moral dilemmas. Recommended: D351 or E351.
- E460 Topics in Elementary Education (cr. arr.)**

E465 Diagnosis and Remediation of Learning Difficulties in Mathematics (3). Formal and informal diagnostic techniques and instruments for assessing pupil difficulties in the area of mathematics. Multiple methods of remediating learning problems associated with specific mathematical topics.

E467 Development and Use of Manipulative Materials in Teaching Mathematics (3). Mathematics laboratory is developed and integrated with experiences in setting. Emphasis on materials for primary and intermediate grades.

E470 In-Service Course in Elementary Education (cr. arr.)

E480 Internship in Elementary Education (cr. arr.) Provides internship experience under supervision in advanced levels of curriculum and instruction. Prerequisite: department chairperson's consent.

E490 Research in Elementary Education (cr. arr.)

Music Education

J127 Music Literature for Children (2). Study and use of music literature and materials recommended for use in elementary schools. Prerequisite: J129 or J131 or equivalent.

J129 Elementary School Music (2). Pragmatic approach to music instruction within the elementary school curriculum. Prerequisites: Music 1, Music 10, or adequate music background; junior standing.

J130 Teaching of Secondary School Music (3). Studies the comprehensive secondary school music program.

J131 Teaching Music in the Elementary School (3). For students majoring in music education. A study of the comprehensive elementary school music program.

J132 Teaching of Instrumental Music (2). For all majors in instrumental music education. Studies the comprehensive instrumental school music program.

J301 Topics in Music Education (cr. arr.) Organized study of selected topics in music education. Subjects and credit variable. May be repeated with departmental consent. Prerequisite: junior standing or instructor's consent.

J380 Administering Music in the Public Schools (2). Analysis of administrative procedures in guiding and developing complete music curricula. Prerequisite: instructor's consent.

J381 Advanced Techniques in School Music Teaching (2-5). Analysis and evaluation of teaching-learning strategies for school music today. Prerequisite: instructor's consent.

J400 Problems (2-5). The development of paper based on inquiry and research in music, adapted to the needs of the student. Prerequisite: instructor's consent.

J401 Advanced Topics in Music Education (cr. arr.) Organized study of selected topics in music education. Subjects and credit variable. May be repeated with departmental consent. Prerequisite: instructor's consent.

J403 Foundations of Music Education (3). A study of the history, philosophy and rationale of music education. Prerequisite: instructor's consent.

J410 Seminar in Music Education (1-3). A review of research, selected readings and contemporary trends in music education. Prerequisite: instructor's consent.

J417 Curriculum Materials in Music Education (2-5). A development of critical abilities in evaluation and selection of music education materials. Section 1: Elementary; Section 2: Secondary Vocal; Section 3: Instrumental. Prerequisite: instructor's consent.

J418 Techniques in Instrumental Music Teaching (3). A practical study of the organization and instruction of class-teaching, with demonstrations by instructor and class. Prerequisite: instructor's consent.

J419 Teaching Secondary School Vocal Music (3). Advanced studies in fundamental voice development, materials and techniques of problem solving in school ensembles. Prerequisite: instructor's consent.

J470 In-Service Course in Music Education (cr. arr.) Course work adapted to current vocational needs. Prerequisite: instructor's consent.

Media Education

M342 School Learning Resource Centers (3) (same as Library Science 342).

M360 Topics in Media (cr. arr.)

M371 Production of Instructional Media Materials (3). For classroom teachers. Evaluation of visual education procedures and classroom instruction, including preparation of visual education materials. Prerequisites: Educational Psychology A102; an elementary or secondary education methods course.

M372 Selection, Utilization and Evaluation of Media Resources (3). Lectures, discussions and independent investigations directed to development of criteria sets for selection and evaluation of instructional media and materials. Includes familiarization with current utilization practices.

M375 Programmed Instruction (3). Historical, psychological and research foundations of self-instructional materials from linear booklets to computer-assisted programs. Lab exercises: production, selection, utilization, evaluation. Prerequisite: teaching experience or instructor's consent.

M376 Instructional Television (3). Prerequisite: D110.

M377 Production of Educational Motion Pictures (3). Provides practical transferable skills in the production of teacher- and student-made Super 8mm sound and silent motion pictures. Experiences in selecting and operating equipment, planning, shooting, editing, revising film.

M400 Problems (cr. arr.)

M401 Instructional Systems Design and Mediation (3). Considers principles and components of a systems approach for integrating educational resources into an instruction situation. Emphasizes management role of the media specialist for organizing a program of instructional development.

M403 Review of Research and Theory in Media (3). Surveys educational media research, including programmed and computer-mediated instruction, television and film, media utilization and evaluation, and management of media resource centers. Prerequisite: M371 or M372 & instructor's consent.

M410 Seminar in Media (cr. arr.)

M460 Topics in Media (cr. arr.)

M480 Internship in Media (cr. arr.) Provides internship experience under the supervision in advanced levels of media. Prerequisite: consent of department chairperson.

Dairy Husbandry

1 Dairy Husbandry (3). Fundamentals of dairy industry. Includes production, manufacturing, technology, public health, economic aspects. Prerequisite to all other courses in dairy husbandry. f,w.

12 Animal Science (5) (same as Poultry Husbandry 12, Animal Husbandry 12, Agriculture 12).

110 Dairy Cattle Judging (2). Dairy breeds, comparative judging, selections. f.

150 Physiology of Domestic Animals (3-5) (lecture 3 hrs; lecture and lab 5 hrs). Basic concepts of physiology and anatomy as related to domestic animals; optional lab; enrollment limited. Prerequisite: 12 or Biological Sciences 1 & Chemistry 1 or 11. w.

200 Problems (cr. arr.) Studies in some phase of dairy science. f,w.

210 Advanced Dairy Cattle Judging (2). Continuation of 110. Includes field trips. w.

300 Problems (cr. arr.) Advanced problems in a selected field to understand scientific problems, research methods.

310 Dairy Production (3). Applied dairy science; emphasis on nutrition and management, herd health, labor-saving equipment, buildings, quality products, organization of dairy enterprise, business and economic aspects. Prerequisites: 1 & Animal Husbandry 192 or equivalent. f.

335 Neurobiology and Animal Behavior (3). Analyzes neural and neuroendocrine control systems and their role in organismic integration, environmental adaptation and behavior. Prerequisites: 5 hours animal physiology & 5 hours biochemistry, or instructor's consent.

350 Special Readings (cr. arr.) Scientific publications in chosen field studies to acquaint student with technical literature, research methods.

380 Dairy Cattle Breeding (3). Genetic principles, breeding systems, practices for improving dairy cattle. w.

385 Artificial Breeding (3). Reproductive processes; collection, evaluation, storage of semen; insemination techniques; artificial breeding organizations. f.

390 Field Training in Dairy Husbandry (cr. arr.) Sub-field of study to be indicated. Combination of study, employment in selected fields. Planned study program, reports, final examination. Prerequisite: one or more of the following: 310, 380, 385 & instructor's consent.

391 Field Instruction in Animal Science (1-3) (same as Animal Husbandry 391, Poultry Husbandry 391).

400 Problems (cr. arr.) Individual studies include a minor research problem.

408 Dairy Chemistry (3). w.

410 Seminar (1). Reviews literature and current research in milk production, farm and milking management, nutrition, breeding, endocrinology, milk secretion and environmental physiology. May be divided into two or more sections to fit needs of students. f,w.

420 Endocrinology (3) (same as Biological Sciences 420). Hormones of pituitary and endocrine glands; special reference to influence on growth, reproduction, milk secretion. f.

425 Anatomy of the Mammary Gland (2). Comparative anatomy of mammary gland with special reference to dairy cow. f.

427 Recent Advances in Environmental and Endocrine Physiology (1) (Seminar). Presentation, discussion and critical evaluation of current status of selected topics in environmental and endocrine physiology. f,w.

430 Physiology of Milk Secretion (3). Physiology, biochemistry of milk secretion. w.

435 Physiology of Cell Preservation (3). Comparative physiological and biophysical changes occurring in cells, especially spermatozoa, ova and bacteria, which are exposed to various storage environments including cryogenic temperatures and dehydration. w.

437 Environmental Physiology (3). Principles of environmental physiology and animal adaptation; emphasizes mechanisms of temperature regulation and related nutritional and metabolic-hormonal functions. f.

440 Bioenergetics (3) (same as Nutrition 440). Energetic interactions of animals and their physical and nutrient environments. alt. w. odd yrs.

445 Advanced Dairy Production (2). Advanced dairy science; emphasizes management, organization of dairy enterprise, business and economics, production problems, market problems, producer organizations. Prerequisite: 310 or equivalent. w.

450 Research (cr. arr.) Original investigations, usually in connection with one of the research projects of Agricultural Experiment Station.

490 Research (cr. arr.) Continuation of 450. Leads to Graduate School dissertation.

Dramatic Art (See Speech & Dramatic Art)

Economics

1 Fundamentals of Economics I (3). Survey of economic principles and their application to contemporary economic issues. Not open to students who have completed 41 or 51. cor.

2 Fundamentals of Economics II (3). Elementary economic analysis of income, output, employment determination; price system; allocation of economic resources. Not open to students who have completed 41 or 51. Prerequisite: 1. cor.

41 Principles of Economics (3). Introduces study of economics. Prerequisite: Math 80 or instructor's consent required.

51 General Economics (5). Introduces economics; emphasizes certain fundamental principles, their application to questions of policy. Prerequisite: 15 credit hours.

141 Evolution of Industrial Society (2). Development, meaning and functioning of those socioeconomic institutions which characterize the American economy.

198 Honors Proseminar (2 or 3). Readings in selected topics in economics. Open only to economics majors eligible for Honors courses. May be repeated twice.

199 Honors Proseminar (2 or 3). Research for graduation with Honors in Economics. Prerequisite: 198.

201 Topics in Economics (1-5). Economic principles applied to the analysis of specific areas of interest or directed toward a specific group of students. May repeat to a maximum of 5 hours credit. Prerequisite: instructor's consent.

210 Labor Economics (3). Surveys economic activity of population, trade unionism, wage and employment determination, employment and income insecurity, underutilization of human resources from standpoint of public policy. Prerequisite: 41 or 51.

215 Economics of Public Policy: Government Finance (3). Analyzes policy issues in the public sector. Topics: governmental structure, cost-benefit analysis, public debt, urban problems and other issues. No credit for A.B. majors in economics. Prerequisite: 41 or 51.

229 Money and Banking (3). American monetary and banking systems; their influence upon economic activities. Prerequisite: 41 or 51. cor.

251 Theory of the Firm (3). Introduces price theory and economics of the firm. Prerequisite: 41 or 51.

253 Macroeconomic Policy (3). Analyzes economies as aggregate systems. Functions and operations of the economy interpreted in terms of decision framework and policy objectives. Prerequisite: 41 or 51.

256 Economics of Public Policy: Antitrust Economics (3). Competition and monopoly and their roles in the American economy. Prerequisite: 41 or 51.

260 Economic Development (3) (same as Peace Studies 260). Process of economic development examined. Structural transformation of the economy analyzed; problems of backward economies highlighted. Prerequisite: 41 or 51.

261 Introduction to the Soviet Economy (3). Analyzes resource allocation and income distribution in the Soviet-type economy. Emphasizes Soviet objectives, the role of central controls, and decentralization measures. Prerequisite: 41 or 51.

- 262 Latin American Economic Problems (3).** Economic structure of Latin American countries and policies for increasing the rate of economic growth: economic integration, tax and land reform, commodity stabilization schemes. Prerequisite: 260.
- 263 Economics of the Black Experience (3).** Economic institutions as they affect lives of black people. Precise identification of objectives undertaken; problems of discrimination, location, productivity, distribution examined; significance of capitalist, socialist systems explored. Prerequisite: 41 or 51.
- 265 The Economics of Location (3).** Influence of space on market structure, location of industry, land use, internal community structure, central place theory and general law of market areas considered. Prerequisites: 12 hours social science & 2, 41 or 51.
- 300 Problems (cr. arr.)**
- 301 Topics in Economics (1-5).** Study in applied or theoretical economics. May be repeated for credit to a maximum of 5 hours. Prerequisite: instructor's consent.
- 302 Introduction to the Economics of Planning (3).** Examines characteristics of planning problems. Identifies principal decision variables, constraints. Comparative studies of alternative optimization and evaluation techniques implied by economic theory. Prerequisite: 251 or 351 & Statistics 234 or equivalent.
- 308 Development of the American Labor Movement (3).** Origin/development of labor movement/unions—colonial era to present. Exposition of major social, economic, political factors influencing structure, philosophy, character of trade unions of past/present. Prerequisite: 51 or 1 & 2.
- 311 Labor Market, Employment and Wages (3).** Surveys theoretical explanations of wage and employment determination in contemporary labor markets. Prerequisites: 210 & 251.
- 312 Introduction to the Economics of Human Resources (3).** Labor force concepts and trends, underutilization of human resources in the United States and the nation's employment and training policies. Prerequisite: 210.
- 313 Labor Market Information (3).** Information requirements and sources for planning and delivery of human resources services. Economic implications of alternative human resource services; their impact on employment, training, education, welfare institutions. Prerequisites: 311 & 312 or instructor's consent.
- 315 Public Finance (3).** Analyzes economic effects of government expenditures, taxes, debt. Expenditure and taxation principles, tax reform, cost-benefit analysis, fiscal policy. Prerequisite: 229.
- 316 State and Local Finance (3).** State and local tax and expenditure programs, intergovernmental fiscal relations, problems of metropolitan areas. Prerequisite: 315 or instructor's consent.
- 317 Economic Security (3).** Economic problems arising from disability, unemployment, aging. Special problems of low-income and minority groups. Future of the American systems of social insurance and public assistance. Prerequisites: junior standing & 51.
- 318 Labor Law and Legislation (3).** Laws governing labor-management relations and regulating trade union activity: Taft-Hartley, Landrum-Griffin, EEOC, Walsh-Healy, Davis-Bacon, etc. Impact of NLRB/court decisions on labor union activities. Follow-up course to 309. Prerequisite: 309.
- 319 Public Sector Labor Relations (3).** Federal, state, local collective bargaining laws, regulations, practices examined; special emphasis on Presidential Executive Order #11491, postal employee negotiations and state legislation related to education, public safety and service employees. Prerequisite: 318.
- 320 Introduction to Economic Doctrines (3).** Origins of modern economic thought in the context of social and intellectual environment of the time in which they originated; their contribution to their period and to modern thought. Prerequisite: 251, 351, or instructor's consent.
- 325 International Economics (3).** Surveys theory of foreign trade, foreign exchange; export and import practices. Prerequisite: 229.
- 329 The Banking System and the Money Market (3).** Organization of the money market; credit control procedures and aims; effect of bank expansion and contraction on money market and national income. Prerequisite: 229.
- 332 Economics for Managers (3).** Macro- and micro-economic concepts, theory and methods as tools of analysis for management.
- 335 Economics for Decision Making (3).** Process of economic reasoning and application of economic concepts, theory and methods to a wide range of management problems at both private firm and public agency levels. Prerequisites: 229 & 251.
- 348 Economic Foundations of the Community (3).** Economic forces which account for organization and development of communities. Internal functioning of the local economy and patterns of external trade. Prerequisites: 12 hours social science, 51 & instructor's consent.
- 351 Intermediate Price Theory (3).** Analyzes influences underlying economic value. Pricing process under various market conditions considered; functioning of enterprise system evaluated.
- 353 Intermediate Income Analysis (3).** National income concepts; national income accounting; theory of income determination. Prerequisite: 229.
- 355 The Structure of Industry (3).** Analyzes the structure of industry; its impact upon operations of the firm; significance for public policy. Prerequisite: 251 or 351.
- 358 Regional Economic Analysis (3).** Functioning of regional economics considered. Alternative techniques for regional economic analysis introduced and evaluated. Prerequisites: 353 & 251 or 351.
- 361 Comparative Economic Systems (3).** Study of capitalism, market socialism and central planning. Prerequisite: 251 or 351.
- 362 Welfare Economics (3).** Role of value judgments; meaning and measurement of economic welfare; interpersonal comparisons; cardinal and ordinal utility; Pareto optimality, conflicts of interest and distribution of income; individual values and social choice. Prerequisite: 351.
- 365 Urban Economics (3).** General economic character of cities, interaction among various segments explored. Special attention paid to urban housing market, slums, the impact of new life styles and problems of urban finance. Prerequisites: 265, 353, & 351 or 251.
- 368 Business Fluctuations (3).** Defines and analyzes trends in economic activity; business cycle theory; introduces forecasting; policy for control; emphasizes work of the National Bureau of Economic Research. Prerequisite: 229.
- 370 Introduction to Quantitative Economics (3).** Development of mathematical methods used in economics, with applications. Prerequisite: Math 60 or Math 205 or instructor's consent.
- 371 Applied Econometrics (3).** Studies methods for quantitative analysis of economic data. Estimating techniques, tests of significance, prediction/forecasting reviewed with respect to problems presented by economic data and information demands of economic decision models. Prerequisite: Statistics 234 or equivalent.
- 372 Mathematical Economics (3).** Application of mathematical methods to selected topics in economic analysis. Prerequisite: 370 or Math 201 or instructor's consent.

384 Economic and Demographic Change (3). Economic theory of demographic change is developed and related to industrial development, based upon both demand shifts and supply shifts; European development examined. Prerequisite: 41 or 51.

388 Comparative Labor Movements (3). Introduces the study of unionism on a world basis; emphasizes similarities and differences between American and foreign labor movements; major problems confronting labor unions in selected European, Asian and African nations. Prerequisite: 319.

389 Theory of the Labor Movement (3). Concepts of labor movement theory; historical perspective. Views of the Webbs, and Commons, Pulman, Marx, DeLeon, Debs, etc., examined. Role of the theorist and his impact and trade union activity considered. Prerequisite: 319.

399 Independent Study (cr. arr.) Individual work, with conferences adjusted to needs of student. Prerequisite: instructor's consent.

400 Problems (cr. arr.) Graduate students may select topics for study and investigation from fields suggested by undergraduate courses listed above.

401 Topics in Economics (3). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon consent of department.

402 Problems in Economics Education (3). Seminar devoted to increased effectiveness of the classroom teacher in economics. Course required for graduate students in the first year of teaching.

411 Topics in Wage and Employment Theory (3). Analysis of the determination of wages and employment and the relation of trade unionism to the economy. May repeat for credit. Prerequisite: instructor's consent.

412 Topics in Human Resources Economics (3). Analysis of labor market information and of the development and utilization of human resources, with emphasis on the changing conceptual framework. May repeat for credit. Prerequisite: instructor's consent.

413 Current Economic Problems (3). Intensive study of selected current controversial issues in economic theory and policy. Prerequisite: 12 hours economics.

415 Advanced Public Finance I (3). Fiscal policy, alternative budgetary policies, burden of the debt, debt management, coordination with monetary authorities and governmental programs for price stability and economic growth. Prerequisites: 351 & 353.

416 Advanced Public Finance II (3). Expenditure theories, budgeting process, cost-benefit analysis, tax incidence, welfare economics of public finance and technical problems of income, sales, profits and property taxes. Prerequisite: 415.

420 History of Economic Thought (3). Analysis of development of economic theory; emphasis on evaluation of classical doctrine. Prerequisites: 351 & 353 or instructor's consent.

424 Public Health and Medical Care Economics (3) (same as Health Services Management 424). Demand and supply dynamics in public health and medical care. Prerequisite: 201 or 351 or instructor's consent. w.

425 International Finance (3). Balance of international payments, international lending; problem of international monetary equilibrium. Prerequisites: 229 & 325.

426 International Trade (3). Pure theory of international trade and commercial policy. Prerequisite: 351.

430 Advanced Money and Banking (3). Theories of determination of quantity of money and influence of money and near-money on income and prices. Theories explaining level and structure of interest rates. Prerequisite: 353 or instructor's consent.

431 Central Banking Policies (3). Examines central banking procedures, policies and the part they may play in maintaining economic stability. Special attention to connection of Federal Reserve System with money, capital markets. Prerequisite: 329 or 430 or instructor's consent.

451 Advanced Price Theory (3). Surveys major issues and writing in consumption, production, exchange and distribution theory, including a development of historical and current controversies. Prerequisite: 351.

452 Seminar in Microeconomics (3). Analysis of topics in price theory. May be repeated for credit. Prerequisite: instructor's consent.

453 Advanced Income Analysis (3). Surveys major issues and writings on the Classical, Keynesian and post-Keynesian income and employment theory with application to public policy. Prerequisite: 353.

454 Seminar in Macroeconomics (3). Analyzes topics in income analysis, including capital theory and economic dynamics. May be repeated for credit. Prerequisite: instructor's consent.

455 Monopoly and Competition (3). Antitrust policy and its impact on structure and performance of industrial enterprise. Prerequisite: 355.

456 Seminar in Public Utility Regulation (3). Pricing and investment in public utility industries.

460 Theory of Economic Development (3). Theories of economic development critically examined. Sources and consequences of growth processes analyzed in context of economic theory and historical occurrence.

461 Advanced Analysis of Economic Systems (3). Advanced study of income distribution and resource allocation in alternative economic systems; output decisions, role of price, problems of consistency and efficiency, success indicators, incentives. Prerequisite: 361 or instructor's consent.

468 Analysis of Economic Trends (3). Analysis of current business situations and outlook through examination and appraisal of economic indicators, governmental policies, and consideration of basic economic, political and social trends.

469 Public Policy and Private Enterprise (3). Examines impact of government economic policies upon private enterprise sector. Special emphasis on use of public controls to maintain economic stability and growth in an expanding economy.

470 Mathematical Economics I (3). Application of mathematical tools to advanced economic analysis. Prerequisite: 370.

471 Mathematical Economics II (3). Continuation of 470.

472 Introduction to Econometrics (3). Examines fundamentals of constructing economic models and econometric techniques used in estimating associated behavioral relationships. Prerequisite: Statistics 385 or instructor's consent.

473 Extremal Methods and Economic Analysis (3). Surveys recent advances in mathematical programming and its application to economic analysis. Prerequisites: 451, 471, Math 310 & Math 341 or Math 331; or instructor's consent.

474 Advanced Mathematical Economics (3). General equilibrium models—the existence, efficiency and stability of competitive equilibrium. Prerequisites: 451, 471, 473 & Math 311.

475 Econometrics I (3) (same as Agricultural Economics 475). Study of a single equation method for estimating parameters of economic models. Emphasis given to special estimation problems which occur in integrating the theory with various types of economic data.

476 Econometrics II (3) (same as Agricultural Economics 476). Models for simultaneous relationships, problems of identification, methods of estimation, tests of significance and prediction, errors in the variables, serial correlation and problems of aggregation. Prerequisite: 475.

478 Input-Output Analysis (3). Rationale of intersectoral analysis explored; theoretical and practical problems of construction discussed; applications of input-output demonstrated. Prerequisite: 370 or instructor's consent.

479 Advanced Seminar in Quantitative Economics (3). Current topics in quantitative economics. May repeat for credit. Prerequisite: instructor's consent.

480 Independent Readings for Ph.D. Comprehensive Examinations (1-6).

484 Economics of Technological Change (3). Explores American technological development from earliest colonial beginnings.

485 Industrial Relations (3). Interpretations of trade unionism and industrial relations. Controversies concerning economic effects of collective bargaining. Prerequisite: 351 or Management 311.

490 Research (cr. arr.) Thesis research for M.A. or Ph.D. degree.

Education

Social & Philosophical Foundations

B161 Observation of English Schools (3-5). Visits to English schools of many types; infant, junior, grammar, modern, technical, and comprehensive schools, colleges of education, and universities. Assigned readings and preparation of papers on English schools, and tutorial sessions.

B162 Observation of European Schools (2-4). Visits to French (or Belgian) schools of many types. Visits planned with cooperation of the respective ministries of education and supplemented by lectures and readings.

B163 Semester Abroad Seminar (2-4). Lectures in an academic subject (usually a branch of English literature or a social science), supplemented by papers and discussions in tutorial groups. Prerequisites: junior standing, approval of a faculty committee & B352.

B350 Historical Foundations of Modern Education (2-3). Educational practices and theory from ancient times to present.

B351 Historical Foundations of American Education (2½-3). Development of American educational institutions and ideas, and of social forces which have influenced them. Prerequisite: course in American history.

B352 Comparative Foundations of Education (2½-3). Educational institutions and ideas of major nations of Western Europe.

B353 Intellectual Foundations of Education (2½-3). Analyzes, interprets and evaluates fundamental concepts and controversial issues in contemporary education, with attention to ideological and social contexts of each.

B360 Topics in Educational Studies (cr. arr.) Group and/or independent study of selected topics in the social and philosophic foundations of education. Prerequisite: instructor's consent.

B400 Problems (cr. arr.) Prerequisite: instructor's consent.

B410 Seminar in the History and Philosophy of Education (1-3).

B471 Philosophic Theory in Education (3). Examines major ideological movements in modern education; their social antecedents and philosophic underpinnings.

B472 Readings in History of Education (3). Readings in selected topics in American educational history.

B473 The Development of Higher Education in the United States (3). Historical approach to main issues confronting higher education in United States.

B481 Classic and Contemporary Educational Thought (3). Study of selected major theorists in education, past and present, whose views are of basic significance to the analysis of educational theory and practice.

B490 Research in the History and Philosophy of Education (cr. arr.)

Education Honors

151EH Special Readings (1-4). Directed study of literature and research reports in education. Prerequisites: consent of instructor & Director of Honors Program.

152EH Honors Seminar (1-2). Prerequisites: consent of instructor & Director of Honors Program.

153EH Special Practicum (1-4). Directed practicum experience with students in educational settings. Prerequisites: consent of instructor & Director of Honors Program.

154EH Honors Research (1-4). Joint research in education with a member of the Education faculty. Prerequisites: consent of instructor & Director of Honors Program.

Educational Research & Statistics

R360 Topics in Educational Research and Statistics (1-3).

R370 Educational Statistics I (3). Introduces statistical techniques employed in education: descriptive statistics, correlation, simple regression, hypothesis testing, cor.

R400 Problems in Educational Research and Statistics (cr. arr.)

R409 Overview of Educational Research (2). Design and interpretation of educational research: methods of gathering and evaluating data. For master's and specialist's candidates. Doctoral students should take R441 instead of R409. Prerequisite: R370 or equivalent.

R410 Seminar in Educational Research and Statistics (1-3).

R435 Educational Statistics II (3). Analysis of variance and design of experiments for educational research. Prerequisite: a grade of B or higher in R370 or its equivalent.

R438 Computer Applications in Educational Research (3). Principles and techniques of utilization of computing as a tool in educational research. Prerequisites: R370 & R435 or R435 concurrently.

R441 Foundations of Educational Research (3). Principles and techniques of research problems, formulation of hypotheses and selection of appropriate design, instrumentation and analyses. For doctoral students. Prerequisites: R370 & R435.

Admission Seminar

S60 The Health-Related Professions (1). Acquaints students with information about individual interests, abilities and aptitudes and requirements of various health careers; assists student with career planning and selection of preparation program.

S75 Perspectives in Education (1-2). Two-hour credit required of freshmen; one hour for all others. Orientation to UMC campus; analysis of self related to career opportunities. Program planning leading to a baccalaureate degree through College of Education. Graded S/U.

Educational Administration

C140 School Organization and Administration for Secondary Teachers (2). Required for Certificated Secondary School Teachers. Problems of effective methods of school management from standpoint of teachers in secondary schools. Prerequisite: Educational Psychology A102.

C141 School Organization and Administration for Elementary Teachers (2). Required for Certificated Elementary School Teachers. Major problems of school organization, administration and management from the viewpoint of the elementary school teacher. Prerequisite: Educational Psychology A102.

C360 Topics in Educational Administration I (cr. arr.) Group experiences in educational administration for undergraduate and master's students.

C390 Foundations of Educational Administration (2-3). Surveys field of educational administration designed to serve as a foundation for more specialized courses. Emphasizes history and development of administrative theory.

C400 Problems (cr. arr.)

C402 Extracurricular Activities (2-3). Study of co-curricular activities in schools. For sponsors and administrators.

C404 Elementary School Supervision (3). Organized to study such problems in field of supervision as will meet needs of superintendents, principals, special supervisors.

C406 Secondary School Administration (2-3). Functions and principles of educational administration applicable to the leadership tasks of department chairpersons, secondary school administrators and school superintendents. Prerequisite: C140 or equivalent.

C408 Elementary School Administration (3). Specialized course in elementary school administration for administrators, supervisors and teachers. Prerequisite: C141 or equivalent.

C410 Seminar in Educational Administration (1-3).

C411 Politics of American Education (3). Organization and control of American education at national, state and local levels studied from the perspective of social and economic conditions, and political processes related to decision making.

C412 City School Administration (2-3). Principles and problems growing out of relationships between the local board of education, employed personnel and community.

C413 Administration of Student Personnel Services (3). Organization and administration of school programs supporting student needs and education: student activities, food service, transportation, learning media, special education, guidance, health service, housing, records, conduct/discipline, advisement, admission, enrollment, promotion.

C414 Development of School Facilities (3). The responsibility of school personnel for the planning, operation and maintenance of school facilities.

C415 Secondary School Supervision (2-3). Methods of improving teaching in secondary schools.

C416 Seminar in Elementary School Administration and Organization (1-2). Studies and investigates selected topics in elementary school administration and organization. Prerequisite: C408 or equivalent.

C430 The Junior High and Middle Schools (3). Organization and development of educational programs and practices for junior high schools and middle schools to meet requirements and serve the unique characteristics of late pre-adolescent and early adolescent age groups.

C440 Issues in School Finance (2-3). Fundamental principles and techniques of public school finance for teachers, counselors, principals and superintendents.

C441 Advanced School Finance (3). Advanced problems in theory and practice of financing education. Prerequisite: C440 or instructor's consent.

C442 Educational Systems—Design and Analysis (3). Design and analysis of educational systems utilizing systems models as they apply to planning, organization, administration, operation and evaluation of educational programs and institutions. Prerequisite: C440 or instructor's consent.

C444 Current Issues in School Administration (2). In-depth study of current issues and individual cases encountered by administrators in all levels of schools. Prerequisite: C406 or equivalent.

C446 School Surveys (2-3). Techniques of the survey movement. The survey as an administrative instrument for improvement of education programs. Prerequisite: C411, C412, C414, or instructor's consent.

C451 School Staff Personnel Administration (2-3). Principles and practices of modern school staff personnel administration as applied to human relations in educational institutions and programs, including higher education.

C452 School-Community Relations (3). Principles of good school public relations, unique public functions of various school and community groups. Technique for conducting school public relations. Prerequisite: C412 or instructor's consent.

C453 Advanced School Facilities Planning Practices (3). Problems in the principles and practices of school plant planning, development and operation in various types of educational institutions and programs. Prerequisite: C412 or instructor's consent.

C454 Legal Aspects of Education (3). The law pertaining to education as it applies to educational institutions and personnel in the United States: theory, organization, sources, processes, effects.

C460 Topics in Educational Administration II (cr. arr.) Group experiences in educational administration.

C470 In-Service Course in Educational Administration (cr. arr.)

C490 Research in Educational Administration (cr. arr.)

Educational Psychology

A102 Educational Psychology (2). General elementary course to acquaint students with scientific psychological principles underlying education. Prerequisites: General Psychology & sophomore standing, cor.

A140 Introduction to Educational Measurement and Evaluation (2). Use of educational and mental tests in improvement of instruction at elementary and secondary school levels. Prerequisite: A102, cor.

A207 The Psychological and Educational Development of the Child (3). Provides basic knowledge for identifying, explaining, predicting and controlling child behavior by presenting a theoretical and empirical orientation on psychological and educational stages of development. Prerequisite: A102, cor.

A302 Group Intelligence Testing (3). Principles of psychometrics and a critical examination of various group tests of ability. Prerequisites: A102 & Education R370 or equivalent training.

A360 Topics (cr. arr.)

A400 Problems (cr. arr.)

A403 Individual Intelligence Testing (3). Study of Stanford-Binet Scale and other individual tests of intelligence. Practice in administering and interpreting the tests. Prerequisite: A302 or equivalent training.

A404 Psychology of Affective Growth (3). Systematic review of research on selected affective (non-cognitive) variables, with emphasis on the potential applicability of research findings to school settings.

A405 The Psychology of Education (3). Advanced course covering entire field of educational psychology.

A407 Psychology of the Elementary School Child (3). Applies educational psychology to problems of teaching in elementary school. Prerequisite: A405. cor.

A408 The Psychology of Adolescence (3). Critical psychological analysis of studies and investigations of various aspects of adolescence.

A410 Seminar in Educational Psychology (1-3).

A411 Evaluation of Educational Programs and Products (3). Examines possible roles of evaluators, models used for evaluation and methods available for analysis of results. Competencies in planning, analyzing and administering program evaluations are developed. Existing evaluation reports are reviewed. Prerequisite: R370 or equivalent.

A415 School Psychology Practicum (6). Supervised practice of procedures of a school psychologist including evaluation and in-service training. Prerequisite: departmental consent.

A448 Analysis of Instructional Behavior (3) (same as Curriculum & Instruction D448, E448).

A460 Topics (cr. arr.)

A475 Internship (cr. arr.) Supervised experience in an institutional or applied setting. Prerequisite: department chairperson's consent.

A490 Research in Educational Psychology (cr. arr.)

Electrical Engineering

17 Experimental Course. For freshman-level students. Content and number of credit hours to be listed in *Schedule of Courses*.

101 Computer Basics and Applications (3). Not for engineering students; open to freshmen. What computers are, how they work and are used. History, scope of applications, low-level/high-level programming, computer arithmetic and equipment; uses University computers. Supplementary guest lectures.

110 Software Engineering (3). Examines techniques in software engineering: top down design, levels of abstraction, control structures, data structures, speed and storage optimization. Prerequisite: Engineering 5 or Computer Science 104.

117 Experimental Course. For sophomore-level students. Content and number of credit hours to be listed in *Schedule of Courses*.

205 Circuit Theory (3). Fundamental general circuit theory, simple transients, complete solutions for sinusoidally driven circuits, matrix methods of network analysis. Prerequisite: Engineering 124.

206 Feedback Theory (3). Feedback techniques, with applications to electronic circuits and control systems: modeling methods, Bode plots, Nyquist diagrams. Experimental homework using the servotainers of the control laboratory. Prerequisite: 216 or equivalent background in Laplace transforms.

216 Linear Systems and Circuits (3). Fourier series, Laplace transforms and operational methods applied to linear systems; analogous electrical and non-electrical systems; polyphase circuits; signal flow graphs. Prerequisite: 205.

220 Instrumentation for Life Scientists (4) (not for engineering students). Properties of signals and their modification by transduction, transmission, recording. Basic instrumentation schemes serve as examples, with heavy emphasis on electronic circuits and their operation.

225 Electromagnetic Fields (3). Elements of vector analysis, electrostatic, magnetostatic, and time-varying fields, plane waves. Prerequisites: Physics 123 & Math 304 concurrently.

226 Logic Design (3). Intermediate course in digital design logic structures covering integrated circuits. Introduces characteristics of digital logic, propagation delay, voltage, currents, timing diagrams. Major emphasis on design techniques for combinatorial and sequential design. Prerequisite: Engineering 126.

227 Assembly Language Programming (3). Techniques of programming in assembly language, starting from basic fundamentals, different classes of instruction types in date manipulation and logical flow control, introduction to input/output instructions and channel programming. Prerequisite: Engineering 126.

235 Physical Electronics (3). Junction theory, semiconductor diodes and models, bipolar transistors and models, field-effect transistors and models, selected electron devices and models. Prerequisite: Math 304 concurrently.

255 Experimental Electrical Engineering I (3). Application of standard electronic test equipment to basic experimental tasks of measurement and characterization of electronic phenomena and devices. Prerequisite: 205 or concurrently.

256 Experimental Electrical Engineering II (3). Continuation of 255, emphasizing experimental techniques in analysis, design, and practical optimization. Topics selected from circuits, electromagnetics, electromechanical systems and electronics. Prerequisite: 255.

266 Power Engineering I (3). Magnetic circuitry in general and in machinery; DC machine theory, operation, applications; transformer circuits, synchronous machine theory, applications; basic principles of energy conversion; use of matrices; basic principles of power transmission and control. Prerequisite: 205.

286 Electronic Circuits and Signals I (3). Electron devices, modeling and applications to basic electronic circuits, including RC amplifiers and power supplies. Prerequisite: 235.

300 Problems (2-4). Analytical or experimental problems pertaining to electric circuits, machines, fields or electronics. Prerequisite: instructor's consent.

301 Topics in Electrical Engineering (3). Current and new technical developments in electrical engineering. Prerequisite: senior standing or equivalent.

304 Digital Computer Applications in Engineering (3) (same as Chemical Engineering 304, Mechanical & Aerospace Engineering 304, Nuclear Engineering 304).

305 Basic Analog Computer Applications in Engineering (3). Analog computer techniques used in obtaining solutions of differential equations of diverse physical systems. Lab and project work assigned. Prerequisite: Math 304 or equivalent.

306 Introduction to Minicomputers (4). Fundamentals of small computers: architecture, software, peripherals, channels, addressing modes, system parameters. Use in lab and communication environments. Lecture and lab. Prerequisite: 227.

307 Introduction to Digital Signal Processing (3). Concepts, analytical tools, design techniques used in computer processing of signals: signal representation, sampling, discrete-time systems analysis, recursive/non-recursive filters, design/implementation, discrete Fourier transform/two-dimensional filtering. Prerequisites: 216, Engineering 126.

310 Introduction to Bioengineering (3) (same as Mechanical & Aerospace Engineering 310). Surveys selected biological systems and problems; emphasizes engineering aspects such as measurement, analysis, synthesis of devices and modeling. Prerequisite: Math 201.

315 Engineering Evaluation of Energy Systems and Resources (3) (same as Mechanical & Aerospace Engineering 315, Nuclear Engineering 315). Evaluation of energy resources, their potential utilization; economic, environmental, political, technical factors governing alternatives and their selection; time changes in energy needs, technology. Prerequisites: Engineering 99 & junior standing in engineering.

317 Network Analysis (3). Fundamentals, including matrix algebra, linear graph theory, topological formulas, state variable equations with an introduction to sparse matrix methods. Prerequisite: 216.

318 Network Synthesis and Filter Design (4). Fundamentals with emphasis on design of filters; positive real functions, physical realizability conditions, the approximation problem, RLC and RC passive filters and RC active filters. Lecture and laboratory. Prerequisites: 216 & 256.

327 Computer Architecture (3). Covers rationale behind the logical structure of digital systems: concepts of stored-program computers, program control, addressing of memory, fixed-point arithmetic operations, floating-point arithmetic operations. Prerequisites: 226, 227.

328 Design of Digital Subsystems (3). Covers methodology and techniques of logical design of structures discussed in 327. Companion course to 327. Prerequisites: 226, 286.

330 Electronic Circuits and Signals II (4). Study of operating point stability, feedback amplifiers, oscillators, modulation and detection, typical IC circuits for both digital and analog signals, and power supplies. Prerequisites: 256, 286.

333 Semiconductor Device Theory (3). Semiconductor devices and their terminal characteristics. Theories of P-N junctions, junction transistors and field effect transistors. Surveys modern semiconductor devices. Prerequisite: 235.

334 Design and Analysis of Integrated Circuits (3). Principles and technology of monolithic integrated circuits. Design, layout and implementation of digital and linear circuits. Surveys current circuits and their application. Prerequisites: 235, 286.

336 Solid State Power Circuits (4). Circuits employing solid state power devices: transistor and thyristor power amplifiers, regulated power supplies, static switching techniques, and thyristor phase control. Includes lab projects. Prerequisites: 256, 286.

338 Amplifier Analysis and Design (3). Design of electronic networks with application to instrumentation, control and communication systems. Practical specifications and problems in design. Lectures and projects. Prerequisite: 330.

341 Automata Theory I: Sequential Machines (3) (same as Computer Science 341).

345 Electromechanical Conversion I (4). Theory and practice of electrical machinery. Lecture and lab. Prerequisites: 256, 266.

347 Electric Transportation and Industrial Drives (4). Electric vehicle propulsion and industrial drives: review of d-c and a-c machine principles, traction motor requirements and performance, d-c and a-c industrial drives, heating effects. Lecture and lab. Prerequisites: 256, 266.

354 Microprogramming (3). Reviews classical computer architecture and control units. Modern microprogram controlled computer architecture, advantages/disadvantages, architectural implications of writable control stores. Microprogramming examples (IBM 360, Interdata 70 and 85, National IMP-16). Emulation, microdiagnostics. Prerequisites: 226 & 227.

357 Experimental Electrical Engineering III (3). Realistic engineering task assignments of four-week or longer duration requiring experimentation in their solutions. Written and oral communication of plans, progress and results. Prerequisite: 256.

358 Automatic Control System Design (4). Techniques for feedback system design and analysis: computational aids, compensator design and examples, state variable methods, non-linear systems, and sampled-data control systems. Lecture and lab. Prerequisites: 206, 256.

359 Computer Process Control (3). Introduces process control; role of analog and digital computers in the control of automatic processing systems; digital control systems analysis and design algorithms; process control applications. Prerequisites: 206 & Engineering 126.

361 Introduction to Power Systems (3). Introduces concepts of equipment, regulation, trade terms and engineering economics applications to power systems. Prerequisites: 266 & Economics 41 or equivalent.

362 Power Systems Analysis (3). Transmission line equations including resistance, inductance and capacitance. Introduces per unit system and voltage regulation. Prerequisite: 266.

363 Symmetrical Components Analysis of Power Systems (3). Short circuit analysis using symmetrical components. Simultaneous faults and open conductors. Prerequisite: 266.

364 Computer Applications to Power Systems (3). Load flow, fault, network reduction and transient stability studies on digital and analog computers. Non-engineering applications. Prerequisite: 361 or 362.

366 Introduction to Pattern Recognition (3). Aspects of pattern recognition theory; computer application to design and training of pattern recognizers using examples from speech recognition, visual inspection, clinical medicine, automatic photographic recognition and advanced automation. Prerequisite: Statistics 320 or equivalent.

372 Modulation and Transmission of Signals (3). Review of Fourier analysis of signals, study of signal transmission. Analog modulation and demodulation, use of nonlinear devices in modulation systems, sampling and pulse modulation. Prerequisite: 330 or instructor's consent.

375 Introduction to Plasmas (3) (same as Mechanical & Aerospace Engineering 375, Nuclear Engineering 375). Equations of plasma physics, interaction of waves and plasmas; plasma sheaths and oscillations; measurements and applications. Prerequisite: 376 or instructor's consent.

376 Distributed Transmission Systems (4). Theory and application of distributed parameter systems, with emphasis on transmission lines for low and high frequencies. Lecture and lab. Prerequisites: 206, 256.

378 Microwave Principles (4). Plane and spherical waves, wave guides, resonators, antennas, high frequency generators, radio wave propagation. Lecture and lab. Prerequisites: 225, 235, 256.

388 Logic and Wave-Shaping Circuits (3). Analysis and design of electronic logic circuits with applications to analog and digital computers and instrumentation. Prerequisite: 286.

400 Problems (2-5). Supervised investigation in electrical engineering to be presented in form of a report.

401 Advanced Topics in Electrical Engineering (3).

402 Thyristor Power Control and Conversion (3). Advanced study of thyristor phase controlled rectifiers, inverters, cycloconverters, and d-c to d-c converters. Prerequisite: 336.

- 405 Advanced Analog, Iterative and Hybrid Computer Techniques (3).** Analog computer generation of odd periodic wave shapes, mode cycling, analog memories, iterative operation and hybrid computation techniques. Prerequisite: 305 or instructor's consent.
- 408 State Variable Methods in Automatic Control (3)** (same as Chemical Engineering 408, Mechanical & Aerospace Engineering 408, Nuclear Engineering 408).
- 410 Seminar (1).** Reviews of recent investigations, projects of major importance. Prerequisite: graduate standing.
- 411 Advanced Electrical Machinery Theory (3).** Electrical machinery fundamentals necessary for understanding advanced literature. Applications of symmetrical components to machinery analysis. Prerequisite: 347 or equivalent.
- 413 Introduction to Fourier Optics (3).** Diffraction, lenses and coherence treated in terms of systems and transform concepts with applications; two- and three-dimensional signals, Fourier and Hankel transforms, random signals, diffraction and holography. Prerequisite: 372 or instructor's consent.
- 420 Analysis of Biological Control Systems (3).** Analysis and formulation of mathematical models for selected biological control systems. Models studied with emphasis on digital and analog computer simulation.
- 424 Digital Electronics (3).** Electronic hardware aspects of digital systems. Includes state-of-the-art information on integrated-circuit logic devices and their applications. Prerequisite: 388 or instructor's consent.
- 427 Digital Software Systems Design (3).** Characteristics and parameters of various software subsystems including: assemblers, compilers, utility programs, special programming packages, interpreters and operating systems; principles of organization into efficient systems. Prerequisite: 327.
- 428 Digital Hardware Systems Design (3).** Characteristics and parameters of various hardware subsystems including main memory, auxiliary memory, arithmetic units, card equipment, etc., and principles of organization into efficient system. Prerequisite: 328.
- 430 Power Systems Stability (3).** Performance of synchronous machines under transient conditions; power systems stability; system fault computations using symmetrical components.
- 431 Economics of Power Systems (3).** Transmission loss formula coefficients, incremental costs and losses, economic scheduling of generation, and applications. Prerequisite: 364.
- 433 Extra High Voltage Power Systems (3).** Design and performance criteria for extra high voltage including insulation, apparatus, line and related system equipment. Prerequisite: 362 or equivalent.
- 434 Direct Current Power Systems (3).** Characteristic and performance analysis of d-c transmission lines and associated conversion systems. Prerequisites: 362 or equivalent & graduate standing.
- 435 Power System Relaying (3).** Theory of relaying systems for power system protection, improvement of power system stability. Relay coordination; performance of relays during transient swings and out-of-step conditions. Prerequisite: 361 or equivalent.
- 436 Lightning and Switching Surges in Power Systems (3).** Overvoltage, switching surge and lightning effects on a power system. Use of grounding and lightning arresters. Effects of surges of and on machines. Prerequisite: 362.
- 437 Solid State Energy Conversion (3).** Solid state direct energy conversion; design of thermoelectric generators and heat pumps. Prerequisites: graduate standing & instructor's consent.
- 438 Computer Simulation (3).** Investigates various methods for solving differential equations toward the goal of using these methods to carry out dynamical simulations of physical systems. Both analog and digital computers utilized.
- 441 Automata Theory II: Formal Languages (3)** (same as Computer Science 441).
- 442 Advanced Integrated Circuits (3).** Fundamentals of advanced integrated circuit design; diffusion, ion implantation and epitaxy; MOS and bipolar techniques; survey of current LSI design, fabrication and testing.
- 443 Solid State Theory I (3).** Principles of quantum and wave mechanics as applied to solid state; Boltzman and Fermi statistics; energy band theory of crystals; electrons, holes in semiconductors. Current flow in P-N junctions, semiconductor devices. Prerequisite: graduate standing.
- 444 Solid State Theory II (3).** Fundamentals of crystallography; application of X-ray analysis to the study of crystallinity. Quantum mechanical solution for the wave function of an electron in a solid; concepts of reciprocal space. Prerequisite: 443 or Physics 415.
- 446 Semiconductor Device Theory (3).** Energy band structure of semiconductors; influence of an electric and magnetic field on holes and electrons in a solid; conductivity of solids; non-equilibrium carrier densities; transport of excess carrier densities; interface studies. Prerequisite: 444.
- 447 Magnetogasdynamics (3)** (same as Mechanical & Aerospace Engineering 447). Flow of electrically conducting fluids in the presence of applied electromagnetic field. Prerequisite: 375 or instructor's consent.
- 448 Quantum Electronics (3).** Optical pumping of metastable quantum states, magnetic state inversion. Semiconductor junction electron injection. Optical cavities, induced emission and optical regeneration. Parametric amplification. Prerequisite: Physics 215 or equivalent.
- 455 Biomedical Instrumentation (3).** Biomedical objectives, physical and engineering principles; optimal equipment design and actual performance of biomedical instrumentation; considers practical instrumentation problem solutions and unsolved problems. Prerequisites: 286 or Physics 305 or equivalent & instructor's consent.
- 456 Interactive Computer Graphics (3).** Survey of interactive graphics techniques and methodologies. Emphasizes computer graphics software. Topics include instruction sets for current display processors and mathematical techniques (e.g., clipping, windowing, shading, perspective transformation). Prerequisite: 227, Math 331 or instructor's consent.
- 457 Machine Intelligence (3).** Formal languages in relation to natural language processing; formal languages, graphs, and image processing; formal logic and automated theorem proving; natural language processing; aspects of problem solving and heuristic programming. Prerequisite: 341.
- 460 Advanced Electric Circuit Analysis (3).** Specialized study of mathematical analysis as applied to solution of circuit networks with fixed and variable parameters.
- 461 Network Synthesis (3).** Surveys linear active and non-reciprocal circuit elements, realizability conditions, methods for synthesizing active networks, and practical applications. Prerequisite: 460.
- 462 Linear Graphs and Electrical Networks (3).** Specialized study of linear graph theory as applied to electrical networks. Prerequisite: 460 or equivalent.
- 463 N-Port Networks Synthesis (3).** Synthesis of N-port networks including realizability conditions and synthesis conditions. Prerequisite: 461 or equivalent.

466 Liapunov and Related Nonlinear Methods in Automatic Control (3). Nonlinear methods in automatic control including phase plane analysis, describing function techniques, generation and application of Liapunov's method. Prerequisites: 408 & Math 331 or instructor's consent.

467 Optimal Control Theory (3). Analysis and design of dynamic systems using optimal control theory: parameter optimization, dynamic optimization, computational methods, differential games. Prerequisite: 408.

468 Stochastic Optimal Estimation and Control (3). Surveys random process theory; stochastic control and optimization; estimation and filtering based on Kalman-Bucy techniques; stochastic stability; adaptive and learning control systems. Prerequisites: 408 & Statistics 325.

469 Digital and Sample-Data Systems (3). Introduces sampling and quantization, design of digital and sample-data systems, digital filters, adaptive sampling and quantization. Prerequisite: 307, Math 310 or instructor's consent.

470 Applications of Transforms (3). Application of the Laplace, other transform methods of solution of circuit and field problems.

472 Communication Theory I (3). Generalized communication systems, signal processing, signals as random processes, optimum receivers. Prerequisite: Statistics 325 or equivalent.

473 Communication Theory II (3). Encoding methods, probability of error, detection schemes; decision methods for communication systems. Prerequisite: 472.

474 Artificial Intelligence (3). Concepts, theories, and models pertaining to neural nets, pattern recognition, learning systems, and programmed problem solving. Prerequisite: graduate standing & instructor's consent.

475 Information Theory (3). Shannon-McMillan Theorem, its generalizations and coding-decoding methods proposed to satisfy this theorem. Prerequisite: instructor's consent.

476 Theory of Automata (3). Sequential machines: Turing machines; deterministic and stochastic automata; applications of automata. Prerequisite: instructor's consent.

477 Coding Theory I (3). Coding and error-correcting codes; group codes, linear codes, decoding methods and probability of error. Prerequisites: 472 & Math 340 or equivalent.

478 Coding Theory II (3). Further study of error-correcting codes; ring and cyclic codes, linear switching circuits, burst error codes, codes for arithmetic units, etc. Prerequisite: 477.

479 Digital Image Processing (3). Modern techniques in computer processing of pictorial information; techniques of image digitization, contrast enhancement, spatial filtering, evaluation of quality, feature extraction, image recognition, description and applications. Prerequisite: 327 or instructor's consent.

480 High Frequency Transmission and Radiation (3). Skin effect; theory of transmission lines, wave guides, resonators.

481 Antennas (3). Point and aperture sources; simple antennas; antenna array; slot, horn, lens antennas.

490 Research (cr. arr) Independent investigation in field of electrical engineering, to be presented as thesis or dissertation.

Engineering

Lower Division

5 Digital Computer Computation (2). Primarily for freshman engineering students. Analysis and synthesis of digital computer programs for solving problems.

17 Experimental Course. For freshman-level students. Content and number of credit hours to be listed in *Schedule of Courses*.

30 Engineering Graphics (3). Lettering, drafting equipment, technique and standards. Engineering measurements, charts and graphs. Multiview and pictorial drawing, sketching and interpretation. Three-dimensional space analysis of lines, planes and solids. Dimensioning, sectioning, shop drawings, organization charts and flow diagrams.

85 Statics and Elementary Strength of Materials (3). Fundamentals of statics; static equilibrium and introduction to elements of mechanics of elastic materials. Prerequisites: Math 80 or Math 175, Physics 123 or Physics 123 concurrently.

99 Engineering Thermodynamics I (3). Fluid properties, work and heat, first law, second law, entropy, applications to vapor and ideal gas processes. Prerequisites: Physics 123 & Math 175.

117 Experimental Course. For sophomore-level students. Content and number of credit hours to be listed in *Schedule of Courses*.

124 Circuits, Devices and Systems (3). Introduces circuit analysis; terminal characterization of electronic devices; amplifier models; electro-magnetic/electromechanical device characteristics; integration of models and analytic concepts in functional studies of electronic measuring instruments and electrical systems. Prerequisite: Physics 124 concurrently.

126 Computers and Information Systems (3). Introduces organization, operation and interfacing of digital computers as applied to instrumentation, data management and problem solving. Prerequisite: 5.

132 Probabilistic Models (3). Introduction to logical and probabilistic description of constant-time and variable-time engineering systems. Prerequisite: Math 175 concurrently.

195 Intermediate Strength of Materials (3). Elements of mechanics of elastic materials. Prerequisite: 85.

English

Composition

1 Composition (3). Required. Theory and practice of composition. cor.

International students should consult the Department of English for information about special sections of English 1 and 60.

60 Exposition (3). Required. Theory and practice of expository writing. Prerequisites: 1 or placement test exemption, & sophomore standing or above. cor.

65H Honors Exposition (3). Theory and practice of exposition for freshmen qualifying for Honors on placement tests. Students completing this course may not take English 60.

99 Composition for Foreign Students (0). For students referred by the Coordinator of Foreign Student Program.

161 Technical Writing (3). Advanced composition for pre-medical students, science majors in Arts & Science, and students in Agriculture, Engineering, Forestry, Fisheries & Wildlife, & Veterinary Medicine. Prerequisite: junior standing. cor.

210 Advanced Rhetoric (3). Open to English majors in Arts & Science and Education only.

Creative Writing

50 Creative Writing: Short Story (3). Introduces basic material techniques including writing original stories. Prerequisites: 6 hours composition or equivalent & one semester any literature course. cor.

70 Creative Writing: Poetry (3). Introduces basic poetic techniques, including writing original poems. Prerequisites: 6 hours composition or equivalent & one semester any literature course. cor.

302-303 The Writing of Fiction (3 hrs. each). Advanced fiction writing with group discussion, individual conference.

313-314 The Writing of Poetry (3 hrs. each). Poetry regarded as a mode of understanding. Poetic values related to other values. Practical consideration of verse techniques. Prerequisite: instructor's consent.

315 Beginning Playwriting (3) (same as Speech & Dramatic Art 315). Study and practice of playwriting fundamentals; emphasizes the one-act play.

402-403 Advanced Writing of Fiction (3 hrs. each). Advanced fiction writing designed primarily for graduate students, with the intention of producing work of professional quality. Prerequisites: instructor's consent & 302-303, except by special consent.

413-414 Advanced Writing of Poetry (3 hrs. each). Advanced poetry writing designed for graduate students, with the intention of producing work of professional quality. Prerequisites: instructor's consent & 313-314, except by special consent.

Literature & Language

Unless otherwise specified in the individual course descriptions, all 300-level courses carry the prerequisite of two courses in English or American literature numbered below 300.

2 Introduction to Poetry (3). Open to underclassmen. Designed to acquaint beginning students with necessary critical tools for understanding and analyzing poetry. This course and either 3 or 4 prerequisite for English majors. Prerequisite: 1 or placement test exemption.

3 Introduction to Fiction (3). Open to underclassmen. Designed to acquaint beginning students with necessary critical tools for understanding and analyzing fiction. This course or 4, and 2 prerequisite for English majors. Prerequisite: 1 or placement test exemption.

4 Introduction to Drama (3). Open to underclassmen. Designed to acquaint beginning students with necessary critical tools for understanding and analyzing drama. This course or 3, and 2 prerequisite for English majors. Prerequisite: 1 or placement test exemption.

5-6 Masterpieces (2 hrs. each). Open to underclassmen; intended primarily for students not intending to major in language or literature. Appreciation of great writings of American, English and Continental literature.

90 Introduction to Film (3). Introduces the history, techniques and artistry of film through study, discussion and viewing some dozen film masterpieces.

101 Topics (3). Underclass topics. Subjects may vary from semester to semester. May be repeated to six hours maximum.

102-103 General Literature (2 hrs. each). Primarily for upperclassmen not specializing in literature. Reading in American and European literature.

104 Afro-American Literature (3). Surveys representative fiction, poetry and essays written by American Black authors from Emancipation to the Harlem Renaissance. Open to undergraduates; no prerequisites. cor.

135 Introduction to Shakespeare (3). Shakespeare's life and background of his age; a reading of 12 to 14 of his major plays, histories, comedies and tragedies representing all phases of his development, and including *Hamlet*, *Othello*, *King Lear*, and *Macbeth*. cor.

175 American Literature (3). Not open to freshmen. General survey of American literature; emphasizes major figures. cor.

177 The American Novel (3). Representative American novels of the 19th and 20th centuries.

179 Epic America: The Twilight of the Sioux (2). Epic period of American life beginning in 1882, ending in 1890. Based on Neihardt's *A Cycle of the West*.

190 Honors Senior Essay (3). Independent project for completion of Honors work in English.

196 Honor Seminar: Critical Approaches to Literature (3). Open to departmental Honors candidates only. Studies major critics from Aristotle to present; emphasis on the application of criticism to the study of literature. f.w.

197 Honors Seminar: Historical Approach to Literature (3). Introduces historical approach to the study of literature and the development of major traditions of English literature; readings selected from several periods. f.

201 The Tradition of English Literature: Beginnings to 1784 (3). Historical survey from beginnings of English literature through the age of Dr. Johnson; readings representing significant writers, works and currents of thought. Strongly recommended for English majors. Prerequisite: sophomore standing. cor.

202 The Tradition of English Literature: Romanticism to the Present (3). Historical survey of English literature from Romantic period to present; emphasizes important writers and significant intellectual and cultural movements. Strongly recommended for English majors. Prerequisite: sophomore standing.

203 Topics in Poetry (3). Topics announced at time of registration. Prerequisite: junior standing.

204 Topics in Fiction (3). Topics announced at time of registration. Prerequisite: junior standing.

205 Topics in Drama (3). Topics announced at time of registration. Prerequisite: junior standing.

206 Special Themes in Literature (3). Topics announced at time of registration. Prerequisite: junior standing. May repeat to 6 hours maximum.

221 Comparative Literature: Beginnings Through the Renaissance (3). Selected masterpieces of Continental literature. Prerequisite: junior standing.

223 Comparative Literature: Modern Continental Literature 1700 to the Present (3). Selected masterpieces of European literature studied for intrinsic value and historical significance: special emphasis on major literary movements—Neoclassicism, Romanticism, Realism, Modernism and Existentialism.

271 Approaches to Comparative Literature (3) (same as Germanic & Slavic Studies 271, Classical Studies 271, Comparative Literature 271).

285 Introduction to Folklore (3). Introduces the study of folklore, including the methodology, approaches and genres of folklore.

301 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated with departmental consent.

304 Afro-American Literature (3). Surveys literature written by Black American authors beginning with the Harlem Renaissance and continuing to the present. Major genres. No prerequisite.

309 Topics in Linguistics (3) (same as Linguistics 309). Topics announced at time of registration. May repeat to 6 hours maximum.

316 The Practice of Criticism (3). Develops student's ability to use critical techniques through regular exercises in practical criticism and study of recent criticism of poetry and prose.

317 History of Criticism (3). Examines representative theories of literary criticism by the major figures from classical antiquity through the Romantic period: Plato, Aristotle, Horace, Longinus, Sidney, Dryden, Pope, Johnson, Wordsworth, Coleridge, Shelley.

- 318 History of Criticism (3).** Surveys modern and contemporary theories of literary criticism: historical, archetypal, generic, formalistic, phenomenological, and interdisciplinary. Emphasizes key writers in each field.
- 319 The Structure of American English (3)** (same as Linguistics 319). For prospective teachers. Required of M.A. candidates in English and English majors in Education. Study of current English: sounds, grammar, usage.
- 320 History of the English Language (3)** (same as Linguistics 320). Development of English from its beginnings to modern times.
- 322 Regional and Social Dialects of American English (3)** (same as Linguistics 322). Pronunciation, vocabulary and grammar of English as used by different social and age groups in the various regions of the United States. Prerequisite: 319 or equivalent.
- 323 Principles of Teaching English as a Second Language (3)** (same as Linguistics 323). Linguistic and pedagogical principles of language teaching; study of phonology and grammar of English; contrastive linguistic analysis; review of textbooks; lesson plans. Prerequisite: 319 or equivalent.
- 325 Chaucer (3).** *Canterbury Tales* and other works; social background of Chaucer's England; introduction to Middle English.
- 326 Medieval English Literature (3).** Representative works largely in translation, from the Anglo-Saxon and Middle-English periods.
- 331 Elizabethan Poetry and Prose (3).** Surveys non-dramatic literature of 16th century including Ascham, Elyot, Wyatt, Surrey, Sidney, Spenser, Daniel, Drayton.
- 333 Elizabethan Drama (3).** Surveys English drama from 1500 to 1642; emphasis on Marlowe, Jonson.
- 335 Shakespeare (3).** Chronological study of the early works from the beginnings through *Hamlet*.
- 336 Shakespeare (3).** Chronological study of the later works from *Hamlet* through the last plays.
- 345 Milton (3).** Milton's life and work.
- 350 Special Readings (cr. arr.)** Individual work with conferences adjusted to needs of student. Prerequisites: 300-level course in area of proposed work & written consent of instructor. Restricted to senior English majors in their final semester.
- 351 Early Seventeenth-Century Poetry and Prose (3).** Surveys poetry and prose from 1600 to 1660.
- 352 The Metaphysical Poets (3).** Intensive study of major 17th-century metaphysical poets: Donne, Herbert, Vaughan, Crashaw, Marvell.
- 355 Literature of the Restoration and Early Eighteenth Century (3).** English literature from 1660 to 1740; Rochester, Bunyan and Dryden, the court wits, and dramatists of the Restoration, Defoe, Swift, Pope and Gay.
- 356 The Later Eighteenth Century (3).** English literature from 1740 to 1790; major emphasis on works of Dr. Johnson and his circle.
- 357 The Eighteenth-Century English Novel (3).** Representative novels and novelists to 1800.
- 365 The Romantic Poets (3).** Representative authors and major literary tendencies.
- 366 The Victorian Poets (3).** Representative authors and major literary tendencies.
- 367 The Age of Victoria: Prose, Poetry and Drama (3).** Survey of Victorian literature from 1830 to 1900, with representative readings in poetry, drama, non-fictional and fictional prose. Included are Tennyson, Browning, Dickens, Carlyle, Arnold, Mill and Wilde.
- 368 The Nineteenth-Century English Novel (3).** Representative novels and novelists, 1800 to 1900.
- 369 Late Victorian and Edwardian Literature (3).** Representative authors and major literary tendencies from 1880 to 1914.
- 375 American Romanticism (3).** American literature of early 19th century; emphasis on major figures: Emerson, Thoreau, Hawthorne, Melville, Poe, Whitman.
- 377 The Nineteenth-Century American Novel (3).** Intensive study of six or seven major 19th-century American novelists. For majors in English and English education and for eligible graduate students.
- 378 The Rise of Realism (3).** American literature from Civil War to 1900; emphasis on major figures: Mark Twain, Howells, James, Emily Dickinson, Henry Adams, Crane.
- 385 Topics in Folklore (3).** Intensive study in a selected area of folklore: folk narrative, folk song, myth and literature, etc. May be repeated for a maximum of 6 hours. Instructor's consent required for repetition.
- 391 Chief Modern Novelists Prior to 1940 (3).** Study of nine to twelve representative American and British novelists.
- 392 Chief Modern Poets Prior to 1940 (3).** Study of representative 20th-century poets in England and America.
- 393 Modern Short Story 1900 to Present (3).** Directions and tendencies in 20th-century short fiction.
- 394 Chief Contemporary Novelists (3).** Study of representative post-World War II American and British novelists.
- 395 Chief Contemporary Poets (3).** Directions and tendencies in recent poetry.
- 396 Modern Drama (3).** Survey of European and American drama from Ibsen to present.
- 400 Problems (cr. arr.)** Individual work not leading to preparation of dissertation. Prerequisite: departmental approval.
- 401 Bibliography and Methods of Research (3).** Principles and aims of literary scholarship and criticism; systematic study of bibliographic resources for research. Normally restricted to doctoral candidates.
- 404 Rhetorical Theory and the Teaching of English (3).** Current and historical rhetorical theories as applied to the classroom teaching of English language and literature.
- 411 Studies in English Education (3)** (same as Curriculum & Instruction D411). Resources and strategies for teaching English in secondary schools. May be repeated to a maximum of 9 hours credit by graduate students in Education.
- 416 Critical Approaches to Literature (3).** Survey of major critical methods: formalistic, generic, archetypal, historical, interdisciplinary. Emphasis on focus and limitation of each approach. Reading in theory and illustrative models.
- 417 Studies in the English Language (3)** (same as Linguistics 417). Descriptive and historical studies, ranging from the Germanic origins to modern syntactic analysis.
- 418 Introduction to Old English (3)** (same as Linguistics 418, German 418). Beginning study of Anglo-Saxon.
- 420 Beowulf (3).** Close reading of the Old English poem. Prerequisite: 418 or equivalent.
- 424 Medieval Drama (3).** Surveys English drama from ca. 1300 to ca. 1500; emphasis on craft cycles, morality plays.
- 425 Studies in Chaucer (3).** Problems of modern scholarship, criticism. Prerequisite: 325 or equivalent.
- 426 Studies in Medieval English Literature (3).** Representative works, such as *The Pearl* and *Sir Gawain and the Green Knight*, in the original language.
- 430 Spenser (3).** *The Faerie Queen* and selected minor works.

431 Studies in Tudor Literature (1-4). Study of limited number of major Tudor authors, considered in relation to particular literary tradition. May be repeated to a maximum of 6 hours. Prerequisite: restricted to graduate students.

433 Studies in Tudor and Stuart Drama (3). Intensive study of one or two playwrights other than Shakespeare.

435-436 Studies in Shakespeare (3 hrs. each). Study of selected plays in light of current scholarship. First semester: histories and comedies; second semester: tragedies.

445 Milton (3). Intensive study of Milton's poetry and prose; particular emphasis on modern scholarship.

451 Studies in Early Seventeenth-Century Poetry and Prose (3-6). English literature from 1600-1660. Bacon, Burton, Browne, metaphysical and Cavalier poets, prose writers of the Puritan Commonwealth. May be repeated once.

454 Restoration and Eighteenth-Century Drama (3). Studies in English drama from 1660 to 1800; Etherege, Wycherly, Congreve, Farquhar, Dryden, Sheridan and Goldsmith. Major emphasis on Restoration comedy and tragedy.

455 Studies in Restoration and Early Eighteenth-Century Literature (3). Intensive study in either the Restoration or the early 18th century. Selected readings in Dryden, Rochester and the Restoration dramatists: Defoe, Swift, Pope or Gay.

456 Studies in Literature of the Later Eighteenth Century (3). Intensive study of major writers 1740-1800, normally excluding the novelists. Selected readings in Johnson, Boswell, Goldsmith, Reynolds, Burke, Gibbon and their contemporaries.

457 Studies in Restoration and Eighteenth-Century Fiction (3). Intensive study of limited number of Restoration and 18th-century novelists.

464 The Earlier Romantics (3). Selected studies in the earlier generation of Romantics: Blake, Wordsworth, Coleridge.

465 The Later Romantics (3). Selected studies in Byron, Shelley, Keats and their circle.

466 Studies in Victorian Poetry (3). Intensive study of limited number of Victorian poets.

467 Studies in Victorian Literature (3). Selected writers of the period.

468 Studies in Nineteenth-Century Fiction (3). Intensive study of limited number of Victorian prose writers.

471 Studies in American Literature (3-12). Selected American writers of 19th century.

473 Colonial American Literature (3). American literature to 1800; emphasis on religious and political thought and expression.

475 American Literature 1800-1865 (3). Intensive study of major American writers of the period. Prerequisite: one upperclass course in American literature before 1900.

478 American Literature 1865-1914 (3). Intensive study of major American writers of the period. Prerequisite: one upperclass course in American literature before 1900.

480 Nineteenth-Century Thought (3). Historical development of American literature and theory underlying that development. Prerequisite: two upperclass courses in 19th-century American literature.

490 Research (cr. arr.) Leads to preparation of dissertation.

491 Studies in Modern Poetry (3). Comparative study of a few major 20th-century poets in England and America.

492 Studies in Modern Criticism (3). Principles and practices of selected modern critics. w.

493 Studies in Modern Fiction (3). Comparative study of a few significant contemporary novelists. f.

495 Studies in Modern Drama (3). Comparative study of a few significant contemporary dramatists. w.

499 Seminars for Doctoral Candidates. Prerequisites: undergraduate or graduate work in the field; instructor's consent. Offered as needed.

A. Seminar in the English Language (3).

B. Seminar in Medieval Literature (3).

C. Seminar in Renaissance Literature (3).

D. Seminar in 17th-Century Literature (3).

E. Seminar in 18th-Century Literature (3).

F. Seminar in Romantic Literature (3).

G. Seminar in Victorian Literature (3).

H. Seminar in American Literature (3).

I. Seminar in 20th-Century Literature (3).

Entomology

101 Insects in the Environment (3). Introduces the study of insects; emphasis on species important to man and general principles of integrated insect control. Designed for all students interested in a study of insects affecting man's environment. f. cor.

181 Pesticide Chemicals (3) (same as Agriculture 181, Pest Management 181). Properties of insecticides, fungicides, herbicides, nematocides, rodenticides and other chemicals used for pest control. For students in Agriculture. Prerequisite: Biochemistry 110 or a course in organic chemistry. w.

201 General Entomology (3) (same as Biological Sciences 201). Biology, classification, evolution, ecology of insects. For upper-class students in Biological Sciences, Education, Agriculture. Prerequisite: 10 hours biological science including Biological Sciences 1 & 11 or equivalent. No credit for students receiving credit for Entomology 101. w.

210 Forest Entomology (3) (same as Forestry, Fisheries & Wildlife 210). Primarily for forestry students, open to others by arrangement. Life histories, habits, injuries, methods of controlling more important insect pests of forests and forest products. w.

300 Problems (cr. arr.) By arrangement, students may take special problems in different entomology fields as preparation for research. Prerequisite: 10 hours entomology & biological sciences.

301 Comparative Morphology of Insects (4). Comparative study of external and internal structures and systems of insects, with emphasis on their functional forms. Prerequisite: 101 or 201 or 10 hours biological sciences. f.

304 Systematic Entomology (3) (same as Biological Sciences 304). General introduction to taxonomy of insects; emphasizes classification of orders and major families. Insect collection required. Prerequisite: 101 or 201 or 10 hours biological sciences. f.

306 Aquatic Entomology (3). Identification, life histories, ecology of aquatic arthropods; emphasizes fresh water insects. For students of wildlife, fisheries management, aquatic biology, advanced entomology. Prerequisite: 101 or 201 & Biological Sciences 11 & 304 or equivalent. alt. w.

311 Field Crop Insects (3). Identification, life histories, injuries, control of insect pests of field crops. Prerequisite: 101 or 201 or equivalent. w.

312 Bionomics of Insect Pests (3) (2 hrs. lecture, 2 hrs. lab). A study of insect pests attacking plants grown for food, fiber and ornamental purposes; their identification, bionomics, importance and control. Prerequisite: 101 or 201 or 210. w.

315 Medical and Veterinary Entomology (3). Insects, related pests of man, animals. Special attention to those transmitting diseases. For advanced students in entomology, medicine, sanitary engineering. Prerequisite: 101 or 201 & 304 or instructor's consent. alt. f. even yrs.

316 Principles of Insect Physiology (4) (same as Biological Sciences 316) (3 hrs. lecture, 2 hrs. lab). Major concepts of insect physiology emphasizing: functions of organ-systems; sensory physiology; hormones in development; nutrition. Prerequisites: 201 & 301 or equivalent. w.

319 Insect Ecology (3). General insect ecology. Zoogeography, physical factors, migration and dispersal, and population dynamics of insects. Prerequisite: 101 or 201 & 304. f. or w.

321 Entomological Literature and History of Entomology (2). Surveys entomological literature from early to modern times. History of development of the science; emphasizes prominent entomologists, their contributions. For advanced entomology students. Prerequisite: 10 hours entomology. alt. f. odd yrs.

322 Biological Control of Insects (3). Presents principles of biological control of insects, emphasizing parasites, predators, diseases of insects, characteristics of natural insect populations. Prerequisites: 319 & 304 or instructor's consent. f. or w.

350 Special Readings (cr. arr.) Publications in a chosen field will be studied to acquaint students with technical literature.

361 Insects in Relation to Plant Diseases (3) (same as Plant Pathology 361).

400 Problems (cr. arr.) Advanced individual studies; includes minor research problem.

405 Taxonomy of Immature Insects (3). Introduces identification of orders, families, genera, species of insects in immature stages. Surveys pertinent literature. Prerequisite: 304 or equivalent. f.

410 Seminar (1). Reviews of current literature, reports on original investigations. Prerequisite: 10 hours entomology. f,w.

414 Research Techniques in Entomology (3). Advanced course for students intending to enter economic entomology. Prerequisite: 10 hours entomology. w.

418 Acarology—Mites and Ticks (3). Taxonomy, phylogeny, biology, ecology of mites and ticks. Prerequisite: 101 or 201 & 304 & 3 hours biological systematics. alt. w. even yrs.

420 Insect Toxicology (3). Mode of action, metabolism, and relation of chemical structure to toxicity of insecticides. Recent developments in insecticides, attractants, repellents, and chemosterilants. Prerequisite: 10 hours entomology or instructor's consent. f.

422 Advanced Systematic Entomology (3). Theories, concepts of higher systematics. Taxonomy of insects; revisionary problems at the generic level. Prerequisites: 301 & 304 & 321 or 6 hours systematics in biological science exclusive of 304. w.

425 Topics in Entomology (cr. arr.) Instruction in specific subject matter areas in the field of entomology. Prerequisites: graduate standing & instructor's consent.

450 Research (cr. arr.) Original investigation not leading to preparation of dissertation.

490 Research (cr. arr.) Reading knowledge of French, German desirable. Original research in economic entomology, biological control of insects, insect taxonomy, insect toxicology, morphology, physiology, ecology, acarology, beekeeping. Prerequisite: 20 hours entomology.

160 Seminar (1-2). Designed for nontraditional students not on campus. Opportunity for faculty-student interaction; presents current information concerning production/management/marketing aspects of agriculture/agribusiness. May be repeated three times.

210 Fundamentals of Communications (3). Mass communications media and visual teaching aids available to workers serving agriculture. Prerequisite: junior standing. f,w.

400 Problems (cr. arr.) Independent investigations of extension problems. cor.

403 Program Development and Evaluation (3). Program development principles, teaching plans, evaluation principles applied to extension program development. Prerequisite: instructor's consent. w. cor.

405 Extension Organization and Administration (3). Principles of administration and organization; their application to extension work. Prerequisite: instructor's consent. f.

406 Fundamentals of Extension Teaching of Adults (3). Recommended for students who have work experience in extension or another informal adult education agency in the United States. Prerequisite: instructor's consent. cor.

408 Preparing Manuscripts for Scientific Journals (1). Introduces students to methods of planning, selecting, preparing, presenting and submitting articles for publication in scientific journals. Prerequisite: instructor's consent.

410 Seminar (1). Presentation, discussion of extension studies, literature. f,w.

411 Topics in Extension Education (cr. arr.) Current and new developments in extension education. Prerequisite: departmental consent required.

450 Research (cr. arr.) Independent investigations not leading to thesis, but terminating in research report.

Family Economics & Management (See Home Economics)

Family & Community Medicine

Community Health Preceptorship (10). Five-week assignment to a family physician in private practice.

25 Community Health (2). Overview of current personal, school and community health problems and issues. Emphasizes concepts of health and informed decision making. f,w. cor.

300 Problems (1-3). Directed exploration of community health problems. Prerequisite: instructor's consent.

305 Introduction to Community Health Education (3). Primary concepts, principles and methods of community health education and educational strategies applicable to public health and health care problems. Prerequisite: senior standing.

315 Group Process in Community Health (2). Concepts, principles, methods and application of group processes to the health field. Prerequisite: instructor's consent.

317 Planning for Change in Community Health (3). Individual, small group, organization, and community systems and change strategies; resistances to change and evaluation of change activities in these systems. Prerequisites: senior standing & instructor's consent.

330 Statistical Aspects of Public Health (3). Classification and summarization of data used in public health practice and research. Probability, sampling, hypothesis testing. Correct and incorrect use of statistics in the literature. Prerequisite: concurrent registration in 420 or instructor's consent. f.

Extension Education

150 Problems (cr. arr.) For advanced undergraduates majoring in Agricultural Journalism.

347 The Sociology of Community Health (3) (same as Rural Sociology 347, Sociology 347). The community as the basis for organizing and delivering health services. Prerequisites: Sociology 1 & Rural Sociology 1.

350 Special Readings (1-3). Extension reading and critical analysis of classical and current studies in selected areas of community health. Prerequisite: instructor's consent.

400 Problems (1-3). Intensive study of an area of community health. Prerequisites: graduate standing & instructor's consent.

410 Principles of Community Health Education (3). Various social, economic, psychological and cultural variables that motivate people toward health practices. Prerequisites: f. graduate standing; w. senior standing & instructor's consent.

411 Methods in Community Health Education (3). Study and practice in applying principles of administration, supervision, consultation, communication and the change process in the professional practice of a health education specialist. Prerequisite: 410.

412 Planning for Change I (2). Small group, organizational, and community systems and strategies for initiating change activities within these systems. Emphasizes health systems. Prerequisites: graduate standing & instructor's consent.

415 Health Aspects of the Environment (3). Covers the environmental crisis (air pollution, water pollution), radiation, effects of pollutants, environmental sanitation, the occupational environment and effects of selected trace elements. Prerequisites: completion of 330 & 420, or equivalent, or instructor's consent.

420 Principles of Epidemiology (3). Examines methods of study of disease frequency and distribution in populations. Utilizes small group discussions for understanding of current medical literature. Prerequisite: concurrent registration in 330 or equivalent, or instructor's consent. f.

421 Advanced Epidemiology (3) (same as Veterinary Medicine 421). Advanced epidemiologic theory and methods in the study and control of infectious and noninfectious diseases. Prerequisite: completion of 420 or instructor's consent. w.

422 Research and Evaluation in Community Health Education (3). Principles of designing community health research; techniques of community health education program evaluation. w.

431 Statistical Epidemiology (3). The application of statistics to epidemiology, including measures of disease incidence, association of epidemiologic variables with diseases, models for studying infectious and noninfectious diseases, and design of clinical trials. Prerequisites: completion of 330 & 420, or instructor's consent.

440 Public Health Administration (3). Local public and community health administration and functions. Influences of state and federal program authorities and financing. Includes community assessment, program priorities, staffing and budgeting for a local health program. Prerequisites: completion of 330 & 420, or instructor's consent. w.

441 Medical Care and Chronic Diseases (2). Study of medical care including supply, demand, distribution and utilization of physicians, other health personnel, hospitals, rehabilitation services, nursing homes, home care programs with public and private funds. w.

443 Public Health Social Work (2). Role and functions performed by social workers in public health; methods used; the implications of public health concepts and structure for social work practice. Prerequisites: completion of 330 & 420, or instructor's consent. w.

444 Community Health in Developing Societies (2-3). Behavioral and natural science factors in the etiology and control of diseases and community health problems, patterns of health practices, and provision of health services in developing countries. Prerequisites: completion of 330 & 420, or instructor's consent. f.

449 Epidemiology of Zoonoses (3) (same as Veterinary Microbiology 449).

450 Research (cr. arr.) Original research in community health not leading to a thesis but requiring a formal research report.

490 Research (cr. arr.) Independent investigation of some problem in community health to be presented as a thesis.

491 Field Experience in Community Health (cr. arr.) Supervised field experience in approved agencies practicing health and preventive medicine. Opportunity for observation and service participation in various fields of public health. f,w,s.

492 Field Experience in Community Health Education (cr. arr.) Field practice in a selected community setting under faculty or other competent supervision. Restricted to students specializing in Community Health Education. Prerequisite: consent of Community Health Education faculty.

Postgraduate Instruction. Residency programs in General Practice and General Preventive Medicine are offered to qualified physicians.

Finance

Certain courses offered by this department are accepted in the College of Arts and Science with approval of the area adviser and Dean of the College.

123 Principles of Finance (3). Financing business, consumer, and government activity; stocks, bonds, real estate and financial markets; risk; insurance; inflation; cash and income management; capital accumulation and appreciation. Students already admitted to B&PA cannot enroll. cor.

203 Corporation Finance (3). Methods, policy, institutions involved in financing the business corporation; financial analysis of corporations. Prerequisite: junior standing, Economics 41 or Economics 51, 6 hours accounting.

218 Risk and Insurance (3). Understanding nature of risk and its business and personal effects on people. Management of losses, emphasizing nature of insurance. Future of insurance in risk handling and as financial institutions. Prerequisite: sophomore standing.

235 Time Series Analysis and Index Numbers (3). Analyzes time series, index number theory and practice. Prerequisites: Statistics 31 & junior standing.

300 Problems (cr. arr.) Independent study, reports on selected topics.

305 Topics in Finance (3). Selected topics in finance, insurance or real estate. Offered on an experimental basis.

313 Personal Insurance (3). Principles of handling risk of income or extra expense loss from death, disability or retirement with analysis of private individual arrangements available with commercial insurance organizations. Prerequisite: 218.

316 Credits and Collections (3). Organization, operation of credit departments including credit information, collection methods. Prerequisite: senior standing.

318 Property Insurance (3). Principles of handling risk of property loss (capital and income) from causes other than government or market forces with study of appropriate use of commercial insurance organizations. Prerequisite: 218.

321 Liability Insurance (3). Principles, concepts and coverages for the management of losses involving tort liability, workmen's compensation and corporate suretyship. Prerequisite: 218.

323 Financial Management (3). Development, application of principles of business finance. Analysis of case materials illustrating problems encountered by firms of various sizes, operating characteristics. Prerequisite: 203.

333 Investments (3). The investment area, media, institutional aids, formulation of broad personal investment programs. Prerequisite: 203. cor.

335 Securities Markets (3). Primary and secondary securities markets: regulations relative to issue and trading of instruments; problems of investment bankers, security dealers, brokers and exchanges in performing their functions. Prerequisite: 333 or instructor's consent.

338 Business Journalism (3) (same as Journalism 338, Management 338, Marketing 338).

340 Principles of Real Estate (3). Principal factors influencing land use, practices in real estate business. Prerequisite: Management 254 or senior standing.

341 Real Estate Appraisal (3). Procedures for valuing industrial, commercial, residential realty by market, income, replacement cost approaches. Case method, field investigations. Prerequisite: 340.

353 Security Analysis (3). Classifies and analyzes securities, markets, industries. Formulates investment policy for institutions, aggressive personal investors. Prerequisite: 333.

363 Management of Financial Institutions (3). Operating principles of major financial intermediaries: commercial banking, savings, insuring, lending and investing institutions. Analysis of cases; study of current problems. Prerequisite: 203.

380 Statistical Forecasting (3) (same as Management 380, Marketing 380, Statistics 380).

400 Problems (1-3). For independent investigation and analysis, graduate students select topics suggested by the foregoing undergraduate courses.

403 Seminar in Business Finance (3). Readings, investigations, reports relating to current issues in private finance.

405 Topics in Finance (3). Selected topics in finance, insurance or real estate. Offered on experimental basis. Prerequisite: instructor's consent.

418 Business and Economic Research (3) (same as Management 418, Marketing 418). Role of theory, principles, concepts and hypotheses in research; models; data collection; basic and applied research; problem solving and decision making; planning and conducting research projects.

423 Advanced Financial Management (3). Organization, goals, tools of financial management. Examination of adjustment of financial policies of business to changing conditions. Prerequisite: Business Administration 344 or equivalent.

425 Capital Budgeting (3). Intensive examination of capital budgeting procedure; discounted cash flow approaches, buy or lease decisions, choice of rate of discount, cost of capital computations. Risk attitudes, utility measurement, diversification, pooling of risks. Prerequisite: 423 or equivalent.

428 Seminar in Risk Management (3). Application, evaluation of quantitative tools of analysis utilized in the risk management decision process. Emphasis on optimal control of pure risk in corporate enterprise. Selected cases and readings.

429 Management of Insurance Enterprises (3). Functional analysis of operations and problems of stock and mutual organizations in life, property and liability insurance industry. Emphasizes legal organization, administration, regulation, financial management of insurers. Prerequisite: instructor's consent.

433 Corporate Capital Markets (3). Examines the structure of market for corporate capital instruments and effect of capital market movements on financial decisions.

435 Seminar in Investment Analysis (3). Develops integrated theory and analytic techniques for evaluating investment potential of financial instruments. Emphasizes corporate securities. Selected cases and readings.

443 Financing Multinational Business (3). Unique problems of financing inter- and intranational investment, operation, trade of private multinational business. Analysis of cases illustrating theoretical, environmental, functional, institutional considerations.

453 Investment Policy and Portfolio Management (3). Intensive study of investment policies and procedures with emphasis on construction and management of portfolios of institutional investors. Applies programming techniques to selection and administration of securities.

463 Bank Administration (3). Study and analysis of cases dealing with policies, goals, practices and techniques of bank administration.

473 Case Research and Development (3). Planning, conducting, researching and writing business cases.

490 Research (cr. arr.) Thesis research for Ph.D. degree.

Food Science & Nutrition

20 Livestock and Meat Science (5) (same as Animal Husbandry 20). f.w.

30 Food Science and Nutrition (5). Basic concepts of processing, preservation, utilization, distribution, nutritive aspects of food for man. f.w.

40 Fundamentals of the Food Service and Lodging Industry (3). A basic course in food service and lodging operations. Development of the industry, current trends and an analysis of the various types of operations that make up the industry.

75 Attributes of Food Quality (3). Current and controversial issues relevant to food quality. Experiences in evaluation of quality of a variety of foods. Principles and characteristics of food quality as applied in production, processing, distribution and selection for consumption.

121 Principles of Food Preparation (5) (same as Human Nutrition, Foods & Food Systems Management 121).

135 Production Technology for Food Services (5). Identifies and evaluates food production technologies required for all market forms of food products procured for the food service operation. Prerequisites: 30 & Chemistry 1 or Chemistry 11 or equivalent.

145 Food and Beverage Management (3). Practices used by food service and lodging industry pertaining to purchasing, receiving and issuing of food and beverage. Principles of food and beverage cost control, management methods in goal setting, forecasting and controlling the operation. f.w. cor.

150 Food Service and Lodging Industry Operational Maintenance (3). Basic course in food service and lodging maintenance and operating principles emphasizing maintenance, utilization, rehabilitation, equipment layout and cost considerations. Prerequisite: Math 10. f.

200 Problems (cr. arr.) Supervised study in a specialized phase of Food Science and Nutrition. cor.

- 204 Advanced Meats (3)** (same as Animal Husbandry 204). Carcass yields, cut out values, fabrication, boning, cutting, pre-packaging, pricing. Wholesale, retail, institutional distribution. Includes field trip. Prerequisite: 20. w.
- 214 Meat Classification, Grading, Judging (2)** (same as Animal Husbandry 214). Factors affecting quality: classification, grading, judging of beef, pork, lamb. Field trip. Prerequisite: 20. f.
- 224 Meat Selection and Identification (3)** (same as Human Nutrition, Foods & Food Systems Management 224). Meat with reference to selection, identification, utilization, wholesale/retail buying. Includes field trip. Prerequisite: Human Nutrition, Foods & Food Systems Management 121 or instructor's consent. f.
- 228 Principles of Food Systems Management (3 or 4)** (same as Human Nutrition, Foods & Food Systems Management 228).
- 240 Operational Management in Food Service (3)**. Applies functions and tools of business management to the specialized operation of commercial food service establishments. Prerequisite: 121 and/or instructor's consent. f.
- 250 Physical Principles for Food Processing (3)** (same as Agricultural Engineering 250).
- 255 Management and Training of Food Service Personnel (3)**. Recruitment, training, management of personnel required for operation of commercial food service establishments at all employment levels. Prerequisite: introductory course in psychology, sociology, food service management, and/or instructor's consent. w.
- 275 Food, Lodging and Travel Services Marketing (3)**. Marketing of hospitality services: human factors, consumer demand, planning, professional considerations. Promotional methods: advertising, direct mail, outside/"in-house" selling, merchandising, pricing, public relations, sales promotion. Prerequisite: Marketing 204, Agricultural Economics 220, or equivalent.
- 300 Problems (cr. arr.)** Advanced problems in a selected field of Food Science and Nutrition.
- 301 Topics in Food Science and Nutrition (cr. arr.)** Instruction in specific subject matter areas in the field of Food Science and Nutrition.
- 304 Meat Technology (5)**. Characteristics of meat, meat products related to processing operation, manufacture, marketing. Includes field trip to meat research laboratory. Prerequisites: Biochemistry 193 & Biochemistry 195 or equivalent. w.
- 305 Food Analysis (3)**. The quantitative determination of the constituents of food. Prerequisites: analytical chemistry & biochemistry. f.
- 306 Poultry Meat Technology (3)**. Science of processing, preservation, quality control, utilization of poultry meat products, including freeze-drying. Prerequisite: general bacteriology. w.
- 307 Egg Technology (3)** (same as Poultry Husbandry 307). Science (bacteriology & biochemistry) of processing, preservation, quality control, utilization of shell, liquid, frozen and dried egg products, including spray-drying. Prerequisite: one course each in biochemistry and microbiology. w.
- 309 Food Chemistry I (5)**. Structure, composition and chemical properties of food. Prerequisite: 12 hours chemistry, including biochemistry. f.
- 327 Operations Analysis in Food Systems (2 or 4)** (same as Human Nutrition, Foods & Food Systems Management 327).
- 330 Food Processing (5)**. Applies science and technology to food processing. Prerequisites: 250 & one course each in biochemistry and microbiology.
- 335 Dairy Technology I (3)**. Fundamental physical, chemical and biological properties of milk; nutritive value of constituents; selecting, grading, testing, pricing and assembling milk; unit operations common to fluid milk processing.
- 336 Dairy Technology II (3)**. Applies chemical, microbiological and physical principles in the manufacture of milk products and their analogs. Processing and characteristics of frozen desserts, cultured products, concentrated dry products, butter and margarine. Prerequisite: 335. f. odd yrs.
- 340 Case Studies and Research in Food Service Management (3)**. Applies business, economic and social science principles to problem situations found in food service and lodging management. Prerequisite: 240, 255, or instructor's consent. w.
- 345 Advanced Food Production Technology for Food Services (3)**. Lecture course with project in food service laboratory; utilization of renewable and nonrenewable resources within food service operations; principles of effective food production technology emphasized. Prerequisite: 135, 240, or instructor's consent.
- 360 Food Quality and Sanitation (3)**. Interprets regulations concerned with protection of the nation's food supply. Applies protection and sanitary practices to insure consumers of wholesome and healthful foods. Prerequisite: general microbiology. w.
- 372 Food Microbiology (3)**. Study of bacteria, yeast and molds. Includes dominant flora, public health significance, characterization of organisms, examination of foods representative of major food groups, spoilage, preservation, food fermentations and physiological groups. Prerequisites: bacteriology & organic chemistry. w.
- 373 Food Microbiology Laboratory (2)**. Examination of foods for microorganisms and characterization of major species. Prerequisite: 372 or concurrently. w.
- 374 The Bacterial Spore (2)**. Sporulation, dormancy, activation, germination, synthesis of macromolecules, nucleic acid changes, chemical composition and resistance of spores. Significance of spore in food spoilage emphasized. Prerequisite: advanced microbiology and/or food microbiology & courses in biochemistry.
- 375 Sensory Analysis of Food (3)** (same as Human Nutrition, Foods & Food Systems Management 375). Principles, theory, methodology of sensory analysis. Recommended: a statistics course.
- 376 Microwave Heating of Food (2)** (same as Human Nutrition, Foods & Food Systems Management 376). Principles of microwave heating and experience in applying microwave heating to both model systems and food. Prerequisites: 30 or 121, & 250 and/or instructor's consent; upper-class or graduate standing. f.
- 390 Field Training (cr. arr.)** Provides additional study of specialized food operations not available in department laboratories. Prerequisites: 70 hours & instructor's consent.
- 400 Problems (cr. arr.)** Individual studies include a minor research problem.
- 401 Topics in Food Science and Nutrition (cr. arr.)** Specialized topics in the area of Food Science and Nutrition. Prerequisites: instructor's consent & graduate standing.
- 404 Meat Investigations (3)**. Discussion of literature, special reports, assigned readings, techniques, interpretation of results. Prerequisites: 304 & 309.
- 405 Advanced Microbiology of Foods (4)**. Principles of microbial physiology, taxonomy, analytical methods applied to study of microorganisms added to foods and those causing food spoilage or food-borne illness. Roles of microorganisms in manufacture/distribution of foods. Prerequisite: 372. f.

409 Food Chemistry II (4). Study of chemical content of food, emphasizing aspects that exist uniquely in food. Prerequisite: 309. w.

410 Seminar (1). Provides students with opportunities for development in depth of advanced aspects of food science through reviews of research in progress and of current scientific publications. f,w.

417 Food and Industrial Fermentation (3). Microbiological, physical and chemical aspects of the utilization of microbial cultures in controlled fermentations of foods and food constituents. Prerequisites: 6 hours microbiology & 5 hours organic chemistry or biological chemistry. alt. w. odd yrs.

450 Research (cr. arr.) Original investigations, usually in connection with one of the research projects of Agricultural Experiment Station. Written report required.

470 Advanced Studies in the Science and Technology of Food Preservation (4). Thermal processing of canned foods, fermentation, radiation and freeze-dehydration, food additives. Current literature, lectures, lab discussion. Prerequisite: 309, 330, 372 or instructor's consent. alt. w. even yrs.

490 Research (cr. arr.) Original investigation of advanced nature, leading to dissertation.

Forestry, Fisheries & Wildlife

Forestry

1 Forestry Orientation (1). Orientation to the professional opportunities and issues in forestry and to the School of Forestry, Fisheries & Wildlife at UMC. No credit for majors with more than 30 hours or for juniors or seniors from any field. Graded S/U. f,w.

105 Forest and Range Weather (2). Applies basic meteorological principles to daily forest and range weather. Emphasis on fire weather. f.

110 Farm Forestry (3). Not open to students in School of Forestry, Fisheries & Wildlife. Relation of farm forest products and services to agriculture. Special emphasis on principles and practices involved in their development and use. f.

140 Basic Forest Measurements (1). Field studies of measurement of trees, logs and wood products. Elementary growth analysis. Prerequisite: a course in statistics or instructor's consent. s.

141 Forest Ecology and Silviculture (2). Field studies of forest soils, vegetation, sites and types. Practice and application of intermediate and regeneration cutting methods to various types of stands. s.

143 Forest Utilization (1). A field study of logging and milling of timber. s.

144 Forest Engineering (2). Surveying, establishment of land boundary lines, topographic mapping, planning and construction of roads. Prerequisites: 154 & Civil Engineering 20. s.

151 Dendrology (4). Classification, nomenclature, identification, geographic distribution and economic significance of woody vegetation. Emphasis on North American trees of major importance. Prerequisite: Biological Sciences 12. f.

154 Forest Graphics (2). Fundamentals of drafting as related to construction, interpretation and use of maps, charts and graphs commonly employed in forestry and closely allied fields. f,w.

159 Utilizing Forest Resources (4). Forest resource creation and utilization. Man's role in maintaining a dynamic balance between forest resource creation and resource consumption. Relation between resource supply and societal demand. Technological, institutional, cultural and economic factors affecting forest resource availability. f.

195 Perspectives of Energy (2). A comprehensive approach drawing on lectures from agriculture, arts and science, and engineering. Topics include energy in nature, resources and their use, and prospect for the future. w.

201 Resource Measurements (3). Sampling methods and principles of measurement as applied to a variety of natural resources and uses, including fisheries, range, recreation, timber, water and wildlife. Prerequisite: a course in statistics, or instructor's consent. f,w.

202 Environmental Quality in Forest Systems (3). Effects of pollutants on plants and the forest ecosystem, effects of plants on pollution, effects of forest management practices on forests and associated ecosystems. Prerequisite: Biological Sciences 1, Biological Sciences 12, or Agronomy 30. f.

203 Forest Inventory (2). Sampling methods and measurements as applied to the timber resource. Correlation with aerial photographic interpretation to produce a timber inventory, data processing. Prerequisites: 140 & 306, concurrent with 201, or instructor's consent. f,w.

204 Wood Technology (3). Structure and identification of commercial woods. Relation of growth to physical and chemical properties of wood. f.

206 Wood Engineering (3). Mechanical properties of wood, including standard testing procedures, work stresses and variation in the strength properties of wood. The application of strength data and design of structural elements. f.

207 Forest Fire Control and Use (2). Fundamentals of all phases of fire protection. Objectives and techniques in the use of fire. f,w.

209 Professional Integration (1 or 2). Seminar. Discuss and analyze summer work experience in natural resource agencies. Prerequisites: instructor's consent, approved summer job. f.

210 Forest Entomology (3) (same as Entomology 210). w.

245 Wood Science (4). Basic physical and chemical properties of wood discussed in terms of wood structure. Prerequisites: 204 or Biological Sciences 12, & 5 hours each of chemistry & physics. w.

253 Light Construction (3). Planning, design and control of residential and light construction projects. Proper use of materials and approved methods of construction. Estimating unit and total materials and labor requirements from blueprints and specifications. f.

255 Wood Processes (3). Air seasoning and kiln drying of wood. Pressure and non-pressure methods of wood preservation. Agencies of wood deterioration and their control. w.

301 Introduction to Plant Pathology (3) (same as Plant Pathology 301, Pest Management 301). w.

302 Silvics (3). Relationships between site factors and growth, development and reproduction of forest vegetation. Structure, dynamics and productivity of forest ecosystems. Prerequisite: Geology 1 or 2, Chemistry 1 or 11, Agronomy 100, or instructor's consent.

303 Practice of Silviculture (2). Applies ecological principles, cultural practices and treatments to forest stands and other lands for systematic production of goods, services. Prerequisite: 302. f,w.

304 Silvics Laboratory (2). Field investigations of the growth and development of forest trees. Prerequisite: 302 concurrently or instructor's consent.

306 Forest Photogrammetry (2). Introductory interpretation of aerial photographs as these may be used in evaluating or measuring a variety of forest land uses and products. Prerequisite: 154 or instructor's consent. f,w.

- 309 Watershed Management (3).** Principles of managing watersheds, including effect of vegetation on soil erosion, soil moisture and stream flow. Prerequisite: 141 or instructor's consent. f,w.
- 310 Forest Hydrology (3).** Hydrology of forests and other wildlands. Effect of forest and range cover manipulation on the quantity, quality and timing of water yields. Hydrologic instrumentation and analysis in watershed management. Prerequisite: 309 or instructor's consent. w.
- 314 Timber Management (3).** Regulation of the forest for timber production. Forest land taxes and legal problems associated with timberland ownership and management. Prerequisites: 203 & 303 concurrently, or instructor's consent. f,w.
- 315 Natural Resources Management and Water Quality (3).** Water pollution problems arising from natural resources management; comparison of alternatives; abatement procedures to reduce effects. Prerequisite: 302 or Biological Sciences 362; Agronomy 100; Chemistry 205 or Biochemistry 110 or instructor's consent. f.
- 317 Forest Valuation (3).** Valuation of standing trees, forest land and non-market resources. Comparing alternative timber investments by several criteria. Prerequisites: 314 & Economics 51, or instructor's consent. f.
- 318 Forest Economics (3).** Economic principles applied to production/marketing of goods and services from forest land; emphasizes capital and land factors. Valuation of land, trees; investment alternatives related to time, short-term planning. Prerequisite: 141. f,w.
- 319 Advanced Forest Management (3).** Forest management planning of public agencies and private industry, with emphasis on inventory control and allowable cut determination; effect of federal income taxes on management practices. w.
- 320 Recreational Land Management (3).** Forest land potential and organizational patterns in the production of recreational opportunities. Prerequisite: 302 or instructor's consent. f,w.
- 321 Tree Genetics and Improvement (2).** Simple Mendelian, quantitative and population genetic mechanisms and concepts as they apply to forest tree species, natural and artificial forest stands, and forest stand improvement. Prerequisites: 302 & 303 concurrently, or instructor's consent. f.
- 322 Range and Wildlife Habitat Management (3).** Range management practices in U.S. and their ecological implications. Management of wildlife habitat, particularly that which is forest related, to maintain desired species. Prerequisites: 302 & Biological Sciences 362, or instructor's consent. f.
- 340 Recreation Land Management and Planning (3)** (same as Recreation & Park Administration 340). Review of available ecological, socio-economic, other data, and application to design for recreation use of large areas. Prerequisite: 320, Recreation & Park Administration 333, or instructor's consent. f.
- 353 Public Resource Policy (2).** National goals regarding natural resources. Principles of policy formation, implementation, review. Mission, organization, behavior of public agencies; response to change. Role of pressure groups; citizen organizations. Examines current issues. Prerequisite: senior standing or instructor's consent. f,w.
- 360 Management-Utilization Trip (1).** One-week field trip to study utilization and management practices of large operations. Prerequisite: senior standing or instructor's consent. Graded S or U. A \$20 transportation fee required. w.
- 361 Recreation Forestry Trip (1).** One-week field trip to study recreational land management in Missouri. Prerequisite: senior standing or instructor's consent. Graded S or U. A \$20 transportation fee required. w.
- 391 Land Use Planning (2).** Land use planning as applied to forest and related lands. Demographic, socio-economic and legal factors affecting land use. Role of zoning, deed covenants, laws and environmental impact requirements. Prerequisite: senior standing or instructor's consent. w.
- 392 Decision Making in Natural Resources Management (2).** Alternative decision-making processes, goals, values and choices. Systems analysis and decision models for allocating resources in management and planning. Quantitative methods and applications. Prerequisite: senior standing or instructor's consent. f,w.
- 403 Physiological Responses to Environment (3)** (same as Biological Sciences 403). f.
- 405 Forest Soils (3).** Physical, chemical and biological properties of forest soils in relation to tree growth. Prerequisite: 303 or instructor's consent. f.
- 407 Applied Silviculture (3).** Ecological and economic factors affecting application of silviculture in each of eighteen forest regions in United States. Prerequisite: 303. w.
- 412 Economic Analysis in Forestry (3).** Applies economic analysis to decision making in forest management. Evaluates alternative uses of resources. Case studies of complex operational problems. Prerequisite: 318. f.
- 416 Research Methods (3).** Interrelated roles of logic, observation, experience and experiment in scientific inquiry. History, bibliography, experimental methods, publication and selected readings in forestry research. f.
- 417 Advanced Forest Mensuration (3).** Statistical approach to forest inventory and experimental designs. Growth estimates. Use of computers in forest inventory. Reviews current literature on survey methods. Prerequisite: 203. w.
- 420 Advanced Forest Photogrammetry (3).** Use of aerial photographs in forest inventory, forest management and topographic mapping. Introduces remote sensing techniques. Review of current literature. Prerequisite: 306. w.
- 421 Plant-Water Relations (5).** Examines the properties of water, water potential, water absorption, movement and loss, development and effect of water deficits on plants. Measurement, analysis, using statistics, computer simulation. Prerequisite: Biological Sciences 313 or equivalent. alt. w. even yrs.
- 422 Woody Plant Physiology (3).** Lectures and discussions on physiological processes of woody plants. Prerequisites: one course in general plant physiology & one course in organic chemistry. w.
- 425 Wood Chemistry/Wood Anatomy Relationships (3).** Chemistry of extractives, cellulose, lignin in terms of cellular structure of xylem of commercial woods. Prerequisite: 245 or Biological Sciences 12 & minimum 3 credits organic chemistry, or instructor's consent. alt. w. odd yrs.

Fisheries & Wildlife

- 60 Ecology of Wildlife and Man (3).** Ecology and management of wild animal populations as related to current environmental issues. No credit beyond sophomore year unless transfer student. f,w.
- 150 Ornithology (3).** Structure, identification, habits, importance of regional birds. Field work, lectures, lab. Prerequisite: 5 hours biological sciences or instructor's consent. w.
- 307 Mammalogy (3-4)** (additional project required for 4 hours credit). Taxonomy, distribution, structure, habits, importance of mammals; emphasizes those of central United States. Prerequisite: junior standing or instructor's consent. f.
- 311 Ichthyology (3).** Taxonomy, distribution, life history, ecology of fishes; emphasizes those in Missouri. Prerequisite: 8 hours biology or equivalent training. w.

312 Fish Husbandry (3). Principles, practices and programs applied to the intensive and efficient production and utilization of hatchery fishes. Prerequisite: 311 or instructor's consent. f.

316 Waterfowl Biology (4). Emphasis on ecology, behavior, population dynamics, physiology and management of waterfowl. Prerequisite: 150, senior or graduate major, or instructor's consent. w.

323 Wildlife Management Laboratory (2). Appraisal of wildlife populations and their productivity. Prerequisite: restricted to majors, or instructor's consent. f.

324 Limnology (3-4) (lecture/lab: 4 hrs.; lecture only: 3 hrs.) Ecology of inland waters with emphasis on productivity. Prerequisites: senior standing & Biological Sciences 362. f.

404 Research Methods in Hydrobiology (4). Field, laboratory techniques in limnology and fishery investigations. Prerequisites: 311 & Biological Sciences 230, Biological Sciences 362. f.

415 Advanced Ichthyology (3). Identification, ecology, economics of selected freshwater, marine fishes. Bibliographic sources, current literature in fishery biology. Prerequisite: 311. alt. f. odd yrs.

418 Fishery Management (3). Theory and practice in present-day fishery management. Prerequisites: 311 & 324. alt. w. even yrs.

419 Wildlife Ecology (3). Backgrounds of land use, ecological forces basic to wildlife management and examination of literature. Prerequisites: 150 & 307 & 20 hours biology, including Biological Sciences 362; majors only, or instructor's consent. w.

424 Ecology of Aquatic Ecosystems (3). Principles and theory related to form and function in populations of aquatic organisms. Prerequisite: 324 or instructor's consent. alt. f. odd yrs.

426 Quantitative Fishery Science (3). Quantitative analysis, modeling of fish populations: recruitment, growth, natural mortality, exploitation, production, sampling. Method/theory relative to management goals. Prerequisite: introductory statistics or instructor's consent. alt. w. odd yrs.

427 Advanced Limnology (4). Physical, chemical and biological processes of lakes and streams emphasizing biological production, water quality and modern problems. Field, laboratory techniques in limnological research. Prerequisites: 324, Biological Sciences 362, Statistics 31. alt. w. even yrs.

General

300 Problems (cr. arr.) Topics in forestry, fisheries and wildlife. f,w,s.

350 Special Readings (cr. arr.) Critical review of current literature and research in forestry, fisheries and wildlife, and methods of presenting research results. f,w,s.

401 Topics in Forestry, Fisheries and Wildlife (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Prerequisite: instructor's consent. f,w,s.

410 Seminar (1). Discussions of current developments in forestry, fisheries and wildlife, and critical study of research programs. f,w.

450 Research (cr. arr.) Original research not leading to preparation of dissertation. f,w,s.

490 Research (cr. arr.) Original investigation for presentation in a dissertation. f,w,s.

French (See Romance Languages)

General Honors

25GH Independent Readings (2). Independent summer reading of prescribed list of approximately 12 books, selected for their significance to a liberal arts education. Final examination at close of summer. Prerequisite: B average. s.

35GH Honors Discussion Group (1). Informal discussion group in which students and faculty discuss problems of mutual interest. Prerequisite: B average.

50GH Honors Seminar (2-3). Freshman-sophomore seminar offering a small group opportunity to write about and discuss basic works chosen by instructor. Prerequisite: B average or Honors College freshman. f,w.

100GH Interdepartmental Colloquium (2-3). Content seminar at junior-senior Honors level involving material from more than one discipline. Subject matter differs from semester to semester. Prerequisites: B average & junior standing or instructor's consent. f,w.

101GH Humanities (3) f; 102GH (3) w; 103GH (3) f; 104GH (3) w (same as Humanities 101, 102, 103, 104). Four-semester sequence providing unified introduction to literature, philosophy, visual arts, religion. Selected masterpieces in these fields, from Homer to present day, studied for intrinsic values and significance in development of Western civilization. Students who take at least three of the four courses are regarded as having fulfilled the general education requirement of an upper-class course in humanistic studies. It is strongly urged, though not required, that the entire four-course sequence be taken, and in order.

125GH Honors Independent Study (1-3). Independent study under the supervision of a regular faculty member. Prerequisite: written proposal with professor's approval submitted in advance to Director of the Honors College for approval.

150GH Honors Preceptorship (2-3). Active participation in a professor's research for up to six hours a week. Prerequisite: written description of the work with professor's approval submitted in advance to Director of the Honors College for approval.

General Studies

Courses 125 and 175 open only to students admitted to the College of General Studies.

101 Topics in General Studies (cr. arr.) Experimental and/or interdisciplinary course open to students both in and outside the College of General Studies. Subjects and earnable credit may vary from semester to semester.

125 Independent Study (1-3) With adviser's approval, student works with a faculty member on a project; nature of project/evaluation determined by student and faculty member. Total credit may not exceed 12 hours toward B.G.S. degree. Prerequisite: departmental consent required.

175 Special Project (1-6). With adviser's approval, student works with a faculty member on a major reading, research or creative project, usually of interdisciplinary nature. Total credit may not exceed 12 hours toward B.G.S. degree. Prerequisite: departmental consent required.

Genetics (See Biological Sciences)

Geography

Regional Geography

1 Regions and Nations of the World I (3). Introductory survey of world geography designed for general education. Presents essential geographical characteristics and major problems of Europe, Anglo-America (United States and Canada), and Latin America. f. cor.

2 Regions and Nations of the World II (3). Introductory survey of world geography designed for general education. Essential geographical characteristics, major problems of Soviet Union, Middle East, Orient, Africa, Pacific world. May be taken independently of course 1. w. cor.

116 United States and Canada (3). Intensive examination of selected areas and distributions. Regional systems, problems and planning.

152 Themes in the Geography of Africa (2). Major concepts of African geography in current and historical perspective. Case studies of major African countries. Prerequisite: sophomore standing or one introductory course in geography.

171 Geography of Asia (3). An introductory survey of the geography of Asia from India through Southeast Asia to China and Japan, emphasizing factors contributing to cultural similarities and variations, conflicts of interest, and current development.

312 Geography of Europe (3). Survey of Europe's lands and peoples; emphasis on historical areal relationships as reflected in Europe's changing economic and political organization.

340 Mexico and the Caribbean (3). Physical environment and culture in the development of Mexico, Central America and the Caribbean. Prerequisite: one course in geography or instructor's consent. f.

341 South America (3). Physical environment and culture in the development of South America. Prerequisite: one course in geography or instructor's consent. w.

371 Rimlands of Asia (3) (same as South Asia Studies 371). Physical, cultural, regional geography of Asia (excluding Siberia). Emphasizes factors contributing to cultural similarities or variations from place to place, conflicts of interest and change.

372 Geography of South Asia (3) (same as South Asia Studies 372). Topical and regional analysis of India, Pakistan, Ceylon. Historical development of distinctive cultural regions. Relations with neighboring areas. Impact of westernization on economic activities, settlements, population.

396 The Soviet Union (3). General, regional and historical geography of Soviet Union; its strengths, weaknesses as world power.

406 Seminar in World Regional Geography I (1). Problems in the teaching of world regional geography on college level. f.

407 Seminar in World Regional Geography II (1). Continuation of course 406. w.

411 Geography of the South (2). Theory and practice of geographical investigation as applied to study of a specific region, the American South.

416 Seminar in the Geography of Anglo-America (1-3). Reading and research on problems in the geography of the United States and Canada.

472 Studies in the Geography of Asia (2) (same as South Asia Studies 472). Intensive investigation of selected aspects of geography of Asia or individual Asian countries or regions. Prerequisite: 371 or equivalent.

Physical Geography, Meteorology, & Climatology

11 Physical Geography I (3). Introductory study of man's physical environment: landforms and water. Man's effect on natural environmental systems. Emphasis on urbanization. Self-guided field trips. f,w. cor.

12 Physical Geography II (3). Introductory study of man's physical environment: elements of climate, climatic types, soils, vegetation. May be taken independently of course 11. w. cor.

50 Introductory Meteorology (3) (same as Atmospheric Science 50).

303 Meteorology of the Biosphere (3) (same as Atmospheric Science 303). w.

311 Advanced Physical Geography (3). Study of natural regions of the United States by integrating topics from landforms, geology, climate, soils, vegetation, resources and land use. Prerequisite: 11 or instructor's consent. w.

366 Climates of the World (3) (same as Atmospheric Science 366). Climatic elements, climatic classifications, climatic regions of world. Special attention to ecological, pedological aspects of climate. Prerequisite: 12 or 50 or instructor's consent. w.

Economic Geography

100 Economic Geography (3). Introduction to location and spatial organization of economic activity. Prerequisite: Math 10 or equivalent. cor.

125 Economic Geography of Missouri (2). Settlement patterns, resource development, regional relationships and organization. Prerequisite: grade of C or better in 100.

425 Advanced Economic Geography (3). Examination of location theory and regional planning/development, with special reference to the British, German and Swedish schools of geography. Prerequisite: 100 or graduate standing.

Geography of Settlement

495 Urban Geography (3). Study of cities: origin, development, distribution, social and economic importance. Considers modern theories of urban functional structure, hierarchy, economic base, "social physics," land use planning.

Political, Historical & Cultural Geography

105 Cultural Geography (3). Examines human culture as a geographical element; cultural aspects of man's relationship to the land emphasized. Prerequisite: two courses in geography or instructor's consent.

180 World Political Geography (3). Geographic factors and patterns in relation to selected aspects of world politics. Prerequisite: junior standing.

317 Historical Geography of North America (3). Analyzes selected geographical patterns in the continent's past.

480 Political Geography (3). Basic writings, core ideas, terminology, bibliography, research methods.

Geographic Philosophy, Techniques & Research

101 Topics in Geography (1-3). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon departmental consent.

200 Special Problems (cr. arr.) Independent investigation to meet the needs of the individual student. Prerequisite: instructor's consent.

201 Topics in Geography (1-3). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon departmental consent.

300 Special Problems (cr. arr.) Independent investigation leading to a paper or project. Prerequisite: instructor's consent.

301 Topics in Geography (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon consent of department. Prerequisites: junior standing & instructor's consent.

337 Cartography (3). Design and construction of maps for geographical uses. Prerequisite: four courses in geography. w.

350 Special Readings (cr. arr.) Independent readings selected in consultation with supervisory faculty member. Prerequisite: instructor's consent.

400 Special Investigations (cr. arr.) Advanced studies to meet the needs of the individual student. Prerequisite: instructor's consent.

401 Topics in Geography (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon consent of department. Prerequisite: instructor's consent.

402 Field Geography (3). Techniques of geographical investigation in the field. Lectures; Saturday field trips. f.

403 Bibliographical Techniques (1). Use of library materials for geographical teaching and research. f.

404 Quantitative Procedures (3). Analysis of quantitative procedures in geographic research. Lectures, discussions, problems. Prerequisites: graduate standing & 15 hours in geography; & Statistics 31 or equivalent; or instructor's consent.

405 Research Methods (3). Application of scientific methods in geographic research. Critical evaluation of current geographical methodology.

410 Seminar (1-3).

450 Research (cr. arr.) Research not leading to thesis. Prerequisite: instructor's consent.

490 Research (cr. arr.) Research leading to thesis. Prerequisite: instructor's consent.

Honors

150GH Historical and Literary Geography of Britain (3). The changing geography of Britain since prehistoric times, emphasizing the transformation of the landscape by man, evolution of distinctive regions and relationships between geography and literature. No previous training in geography assumed.

196-197 Honors (3) f; (3) w. Special work for Honors candidates in Geography.

Geology

Students enrolling in any advanced course in geology must have shown proficiency in the courses specifically listed as prerequisites (normally interpreted to mean grade C or higher).

1 Principles of Geology (5). Earth materials, geologic processes, earth history. f,w,s.

2 Physical Geology (3). Similar to 1, but omits earth history. Should not be taken by one who has had a college course in beginning geology. f,w. cor.

11GH Honors Geology (5). Earth: its fundamental processes and how they have shaped it. f,w.

101 Man and his Earth (3). Interaction of man and his natural environment. Topics include the energy crisis, pollution, mineral wealth of the oceans, and the prediction and control of earthquakes. Two Saturday morning field trips are required. s. cor.

123 Mineral Resources (3). Introduction to the geologic occurrence of mineral resources including metallic ores, industrial minerals, fossil fuels and radioactive materials. Considers problems of finding, extracting and processing mineral resources. Prerequisite: 1 or 2.

127 Surficial Earth Processes and Products (4). Semiquantitative analysis of geologic processes that shape the earth's surface. Includes topics in sedimentation and geomorphology. Prerequisites: 1 or 2 & at least a unit each of high school algebra & trigonometry.

128 Internal Earth Processes and Products (4). Study of the internal structure of the earth, plate tectonics, and igneous and metamorphic processes. Prerequisites: 1 or 2 & at least a unit each of high school algebra, trigonometry, chemistry, & physics.

190 Honors Proseminar in Geology (3). Prerequisite: admission to Department Honors Program. f,w.

205 Field Course (8). Offered at Camp Branson, Lander, Wyoming. Prerequisite: introductory course in geology and staff consent. s.

220 Geology of Missouri (3). Minerals, rocks, fossils and surface features of Missouri. Prerequisite: 1 or 2 or equivalent. w,s.

224 Historical Geology (3). Methods, principles of historical geology. Interpretation of physical history of North America. Prerequisite: 1 or 2.

225 Spring Field Trip (1). Field trip of at least four days duration to localities of exceptional geologic interest. w.

230 Common Rocks and Minerals (3). Identification of common minerals by physical properties; study, classification of rocks in hand specimens. Prerequisites: 1 or 2 and elementary chemistry. w.

234 Mineralogy (4). Introduction to crystallography. Systematic study of mineral groups. Includes identification of minerals by physical and chemical properties. Prerequisite: Chemistry 11 or concurrently. w.

250 Investigating Earth Science (2-3). One 4-hour session weekly during academic year (3 hours each semester). Study of earth science with particular attention to Earth Science Curriculum Project (ESCP) materials. Credit applicable toward degrees in College of Education only.

300 Problems (1-5). Prerequisite: permission of staff. f,w.

301 Topics (cr. arr.) Organized study of selected topics. Subject and earnable credit may vary from semester to semester. May be repeated upon departmental consent. Prerequisites: junior standing & instructor's consent.

303 Exploration Geophysics (3). Theory and techniques of conducting and interpreting results of seismic refraction and reflection, gravity and magnetic survey. Prerequisites: 128, 307, Math 80, & an introductory course in physics. f.

305 Introduction to Geochemical Processes (3). Application of geochemistry to fundamental problems and concepts of geology, with particular reference to geochemical cycles, chemical segregation within the earth, nucleosynthesis and geochronology. Prerequisite: 8-10 hours of inorganic chemistry.

307 Structural Geology (4). Analysis of the geometry of deformed rock. Mechanical behavior of earth materials under various geologic conditions. Evaluation of processes responsible for tectonism. Prerequisites: 128 & Math 80 or instructor's consent. w.

308 Sedimentation (3). Genesis of sediments and sedimentary rocks with emphasis on physical and chemical processes in environments of deposition. Prerequisites: 127 & elementary chemistry. f.

310 Advanced Geomorphology (3). Quantitative study of selected geomorphic processes and environments, with applications to polygenetic landscapes and paleogeomorphology. Prerequisites: 127 & Math 80.

- 323 Optical Mineralogy (3).** Identification of minerals by determination of their optical constants; principles underlying determinative methods. Prerequisite: 234. Students from other departments who have not taken 234 admitted by special consent. f.
- 324 Introduction to Petrology (4).** Rockforming processes, mineral associations in important rock types. Hand specimen and microscopic study of principal rock types. Prerequisites: 128, Chemistry 12 (may be taken concurrently).
- 325 Hydrogeology (3).** Analysis of geologic factors related to occurrence, distribution, recovery, use of ground water. Prerequisites: 127 & Math 80 or instructor's consent. w.
- 331 Introduction to Paleontology (5).** Introduction to principles of paleontology and most important invertebrate fossil groups. Prerequisites: 1 & upperclass standing or instructor's consent. f.
- 332 Introduction to Micropaleontology (3).** Introductory work on microfossils. Prerequisite: 331. w.
- 333 Paleontologic Systematics and Techniques (3).** Collecting, marshalling and interpreting paleontologic data; problems in rules of zoological nomenclature. Prerequisite: 331 or instructor's consent. w.
- 336 Field Course (8).** Offered at Camp Branson, Lander, Wyoming. Prerequisites: 20 semester hours of geology & permission of staff. s.
- 342 Geochemical Processes in Rock-Water Systems (4).** Application of chemical principles to geological processes and environments. Emphasis on chemical equilibria in natural waters and in rock-water systems. Prerequisite: Chemistry 12.
- 351 Organic Geochemistry (3).** Organic chemical groups; their carbon isotope distributions in sedimentary materials; their relation to origin of petroleum and early history of earth's atmosphere and hydrosphere. Pre-biotic synthesis of organic precursors of biological molecules. Prerequisite: 305 or instructor's consent.
- 360 Engineering Geology (3-4).** Effects of lithology, weathering, fractures, earth stresses, groundwater on engineering projects. Origin, exploration, description, analysis of geologic factors illustrated with case histories. Three- or four-day field trip an integral part of course. Prerequisite: 127 or instructor's consent.
- 390 X-Ray Mineralogy (3).** Introduction to X-ray crystallography and the theory and application of X-ray diffraction in the study of minerals and other solids. Emphasis on determination of compositional variation in mineral groups. Prerequisite: 234.
- 400 Problems (1-8).** Prerequisites: graduate standing & instructor's consent. f,w,s.
- 401 Topics (cr. arr.)** Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated with departmental consent. Prerequisite: instructor's consent.
- 402 Geotectonics (3).** Analysis of regional structures; mechanisms of mountain building. Prerequisite: 307.
- 403 Plate Tectonics (3).** Motions and interactions of plates; emphasizes tectonic, igneous and metamorphic effects, whole-earth structure and possible driving mechanisms. Prerequisite: 307, 324, or instructor's consent.
- 404 Advanced Structural Geology (3).** Advanced analysis of folding and fracturing of rocks. Styles of folding, strain markers associated with folding, metamorphic structures, fault mechanics. Prerequisite: 307.
- 410 Seminar (1-2).** f,w.
- 411 Advanced Sedimentology (3).** Discussion and analysis of current and future research thrusts in sedimentary geology. Prerequisites: 308 & instructor's consent. w.
- 413 Seminar in Solid-Earth Geophysics (2).** Prerequisite: 303 or equivalent & instructor's consent.
- 414 Stable Isotope Geochemistry (3).** Mechanism and fundamental concepts of fractionation of light stable isotopes in nature. Emphasizes application of hydrogen, carbon, oxygen and sulfur isotopes to igneous, metamorphic and sedimentary rocks and to waters. Prerequisite: 305 or instructor's consent.
- 415 Seminar in Geochemistry (3).** Prerequisites: 342 & instructor's consent. w.
- 418 Sediment Transportation Mechanics (3).** Movement of sediment by water and wind. Emphasis on understanding the results of laboratory and alluvial stream studies. Prerequisites: Math 175 & instructor's consent.
- 419 Carbonate Petrology (3).** Petrography and petrology of ancient carbonates in the light of recent analogues. Prerequisite: graduate standing in Geology. f.
- 420 Sedimentary Petrology (3).** Mineral composition, texture, structure of orthoquartzites, graywackes, arkoses, carbonate rocks and heavy mineral assemblages; univariate and multivariate statistical analyses of petrographic data. Prerequisite: 323. w.
- 421 Advanced Petrology (3).** Study of igneous and metamorphic rocks with reference to physical-chemical processes, and modern experimental data and theory. Emphasis on the history of formation of rock suites. Prerequisite: 324.
- 423 Electron Microprobe Analysis (3).** Principles and practice of qualitative and quantitative analysis with the electron microprobe. Prerequisite: instructor's consent.
- 424 Stratigraphy (3).** Principles, methods and nomenclature. Regional studies of sediments. Prerequisite: 224, upperclass or graduate standing. w.
- 425 Mathematical Methods in Geology (3).** Reviews mathematical theory pertinent to geological phenomena. Selection and application of analytical solutions. Prerequisites: 127 & 128, Math 201, or instructor's consent.
- 432 Invertebrate Paleontology (3).** Systemic and paleoecological treatment of invertebrate phyla. Prerequisites: 224 & 331. w.
- 440 Economic Geology (4).** Geochemistry of ore deposits. Prerequisites: 323 & 324.
- 445 Clay Mineralogy (3).** Mineralogy of clays. Includes identification. Prerequisite: 323. w.
- 450 Research (1-8).** Does not lead to dissertation.
- 451 Advanced Hydrogeology (1-2).** Evaluation of recent studies in hydrogeology and related sciences. Individual student problems in selected areas of the subject. Prerequisite: 325 or instructor's consent.
- 490 Research (cr. arr.)** Preparation of dissertation. Prerequisite: successful completion of department's qualifying examination.

Germanic & Slavic Studies

German

Courses in German, Language and Literature

1 Elementary German I (3).

2 Elementary German II (3). Prerequisite: C or better in German 1 or equivalent.

3 Elementary German III (3). Prerequisite: 2 or equivalent.

21GH Honors German I (4). Accelerated course for students without previous knowledge of German.

22GH Honors German II (4). Prerequisite: 21GH or departmental consent.

23GH Honors German III (4). Prerequisite: 22GH or departmental consent.

103 German Reading (3). Prerequisite: German 3 or equivalent. May be taken concurrently with German 106.

106 German Conversation and Composition I (3). Prerequisite: German 3 or equivalent. May be taken concurrently with German 103.

195 Honors Proseminar (1-3). Special topics in German literature or linguistics. Prerequisite: admission to departmental Honors Program.

196 Honors in German (1-3). Special problems in German literature or linguistics. Prerequisite: consent of departmental Honors director.

203 Advanced German Reading (3). Prerequisite: German 103 or equivalent.

206 German Conversation and Composition II (3). Prerequisite: German 106 or equivalent.

207 Intensive Beginning German (3). Designed to lead to a reading knowledge of German. Cannot be taken to fulfill undergraduate language requirement. Prerequisite: graduate standing or instructor's consent.

208 Intensive Advanced German (3). Continuation of German 201. Designed to lead to higher level of speed and comprehension in reading German texts. Cannot be taken to fulfill undergraduate language requirement. Prerequisite: 201 or equivalent & graduate standing, or instructor's consent.

210 Theory and Art of Literary Translation (3) (Same as Comparative Literature 210).

275 German Classics (3). Reading and discussion of selected works by major German writers. Prerequisite: German 203 or equivalent.

301 Topics in German (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated with departmental consent. Prerequisites: junior standing & instructor's consent.

303 Survey of German Literature I (3). From the origins to 1800. Prerequisite: German 275 or equivalent.

304 Survey of German Literature II (3). From 1800 to the present. Prerequisite: German 275 or equivalent.

306 German Conversation and Composition III (3). Prerequisite: German 206 or equivalent.

308 Enlightenment and Sturm Und Drang (3). Survey of literature and thought of 18th-century Germany, with emphasis on the works of Lessing, Wieland, Herder and the younger Goethe. Prerequisite: German 275 or equivalent.

312 German Drama of the Nineteenth Century (3). Prerequisite: German 275 or equivalent.

313 The German Novelle (3). Prerequisite: German 275 or equivalent.

314 German Baroque Literature (3). Prerequisite: German 275 or equivalent.

315 Faust (3). Prerequisite: German 275 or equivalent.

320 The Modern German Novel (3). Reading, discussion and interpretation of selected novels from 1900 to present, with emphasis on the origin, problems and trends of the 20th-century German novel. Prerequisite: German 275 or equivalent.

350 Special Readings (1-3). Independent study through readings, conferences and reports. Prerequisite: chairperson's consent.

351 German Romanticism (3). Prerequisite: German 275 or equivalent.

360 Recent German Literature (3). Prerequisite: German 275 or equivalent.

375 Medieval German Literature, 1170-1210 (3). Analysis of major narrative and lyric poetry of the Age of Chivalry. Prerequisite: German 275 or equivalent.

380 Study in the Techniques of Teaching German (3). (same as Curriculum & Instruction D380). Objectives, methods and problems related to the instruction of German. Prerequisites: 18 hours, or the equivalent, in German & chairperson's consent.

381 Advanced Grammar, Syntax and Stylistics (3). Considers complicated grammatical and syntactical structures. Prerequisite: senior or graduate standing, or instructor's consent.

382 Contrastive Phonology and Syntax (3). Contrastive analysis of phonemes and grammatical structures of English and German. Prerequisite: senior or graduate standing, or instructor's consent.

383 Internship in German (0-3). Supervised introduction to the methodology of the teaching of elementary German; conducted in a classroom environment. Prerequisite: junior standing, 275 or instructor's consent.

400 Problems (cr. arr.) Prerequisite: chairperson's consent.

401 Topics in German (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated with departmental consent. Prerequisite: instructor's consent.

402 Bibliography and Methods (1). Designed to acquaint students with bibliographical aids basic to research in German studies. Prerequisite: graduate standing or instructor's consent.

402 Bibliography and Methods (1). Designed to acquaint students with bibliographical aids basic to research in German studies. Prerequisite: graduate standing or instructor's consent.

403 Studies in German Literature (3-9). Course content varies. Prerequisite: graduate standing or instructor's consent.

410 Seminar (3). Course content varies. Prerequisite: graduate standing or instructor's consent.

418 Introduction to Old English (3) (same as Linguistics 418, English 418).

460 History of the German Language (3) (same as Linguistics 460). Prerequisite: graduate standing or instructor's consent.

461 Middle High German (3) (same as Linguistics 461). Prerequisite: graduate standing or instructor's consent.

462 Old High German (3). Historical linguistic phenomena pertinent to the development of OHG. Reading and analysis of selected works from the period. Prerequisite: German 460.

463 Gothic (3). Introduces Germanic philology. Reading and analysis of selected passages from Wulfila's translation of the New Testament. Prerequisite: German 460.

490 Research (cr. arr.) Prerequisite: chairperson's consent.

German Civilization & Literature in Translation

No knowledge of German required

110 German Civilization: Beginning to Weimar Republic (3). Major civilizational/cultural phenomena and trends to the end of World War I. Films and recordings. May be taken independently of 111. No foreign language credit.

111 German Civilization: Weimar Republic to Present (3). Prelude to Nazi period, National-Socialist regime, two Germanies after 1949. Historical, social, artistic, literary themes. Films/recordings. May be taken independently of 110. No foreign language credit.

201 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated to a maximum of 6 hours with departmental consent. Prerequisites: sophomore standing & instructor's consent.

250 Masterpieces of German Literature in Translation 1750-1850 (3). Analyzes major contributions to German literature by such authors as Goethe, Schiller, Kleist, Büchner and others. No foreign language credit. Prerequisite: sophomore standing.

251 Masterpieces of German Literature in Translation 1850 to the Present (3). Analyzes major contributions to German literature by such authors as Hebbel, Hauptmann, Mann, Kafka, Brecht, others. No foreign language credit. Prerequisite: sophomore standing.

271 Approaches to Comparative Literature (3) (same as Comparative Literature 271, English 271, Classical Studies 271).

316 Goethe's Faust in Translation (3). Introduction to Goethe's *Faust*; explication and commentary. No foreign language credit. Prerequisite: junior standing.

Russian

Courses in Language and Literature

1 Elementary Russian I (3).

2 Elementary Russian II (3). Prerequisite: C or better in Russian 1 or equivalent.

3 Elementary Russian III (3). Prerequisite: Russian 2 or equivalent.

103 Russian Reading (3). Prerequisite: Russian 3 or equivalent.

106 Russian Composition and Conversation (3). Prerequisite: Russian 3 or equivalent. May be taken concurrently with Russian 103.

195 Honors Proseminar (1-3). Special topics in Slavic literature or linguistics. Prerequisite: admission to departmental Honors Program.

196 Honors in Russian (1-3). Special problems in Slavic literature or linguistics. Prerequisite: consent of departmental Honors director.

203 Advanced Russian Reading (3). Prerequisite: Russian 103 or equivalent or instructor's consent.

207 Intensive Beginning Russian (3). Presents fundamentals of Russian vocabulary, grammar and syntax. Prerequisite: graduate standing.

210 Theory and Art of Literary Translation (3) (Same as Comparative Literature 210).

275 Russian Classics I (3). Read and discuss selected works by major Russian writers. Course conducted in Russian. May be taken after Russian 276. Prerequisite: Russian 203.

276 Russian Classics II (3). Read and discuss selected works by major Russian writers. Course conducted in Russian. Russian 275 is not prerequisite. Prerequisite: Russian 203.

301 Topics in Russian (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated with departmental consent. Prerequisites: junior standing & instructor's consent.

311 The Russian Realist Novel (3). Selected readings and discussions of major realistic writers of 19th century. Prerequisite: Russian 203 or equivalent.

312 Russian Literary Criticism (3). Survey and discuss various trends of Russian literary criticism from its beginnings to present. Prerequisite: Russian 203 or equivalent.

315 Russian Poetry (3). Survey of readings in Russian poetry from its beginnings to present. Prerequisite: Russian 203 or equivalent.

316 Russian Drama (3). Survey of and readings in Russian drama from its beginnings to present. Prerequisite: Russian 203 or equivalent.

350 Special Readings (1-3). Prerequisite: instructor's consent.

366 Structure of the Russian Language (3) (same as Linguistics 366). Examines the phonological, morphological and syntactic structure of contemporary standard Russian. Emphasizes both practical and theoretical aspects. Prerequisite: Russian 203 or equivalent or instructor's consent.

375 Proseminar in Russian Literature (3). Detailed discussion of selected periods, genres and authors in Russian literature. Topics to be announced. Prerequisites: Russian 203 or equivalent & two courses from the sequence 251-252-253-254.

Russian Civilization & Literature in Translation

No knowledge of Russian required

110 Russian Civilization (3). Survey of the arts and social thought in Russia, with emphasis on the modern period. Films/recordings. No foreign language credit.

111 Russia Today (3). Survey of current developments in Russian society.

201 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated to a maximum of 6 hours with departmental consent. Prerequisites: sophomore standing & instructor's consent.

251 Russian Literature from the Beginnings to Turgenev (3). Surveys Russian literature in English from its beginnings to 1880. Analyzes major works by such authors as Pushkin, Lermontov, Gogol, Goncharov, Turgenev. Readings and lectures in English. Prerequisite: sophomore standing.

252 Tolstoy and Dostoevsky (3). Analyzes major works of Tolstoy and Dostoevsky. Readings and lectures in English. Prerequisite: sophomore standing.

253 Russian Modernism (3). Reads and analyzes selected works from Russia's Modernist Period, 1895-1930, including works by such authors as Chekhov, Mayakovsky, Pasternak, Babel, Zamiatin and Olesha. Readings and lectures in English. Prerequisite: sophomore standing.

254 Contemporary Russian Literature (3). Surveys Russian literature from 1930 to present. Analyzes works by such authors as Nabokov, Pasternak, Bulgakov and Solzhenitsyn. Readings and lectures in English. Prerequisite: sophomore standing.

Greek (See Classical Studies)

Gynecology (See Obstetrics)

Health & Physical Education

1 Physical Education (1). Various games and sports may be selected, including bowling, volleyball, tumbling, swimming, golf, others. Two classes weekly.

11-12-13-14 Recreational Activities (1 hr. each). Two classes weekly.

Professional Physical Education Courses

27 Modern Dance (1). Dance from standpoint of use in education, physical education. Includes materials in fundamentals of movements, rhythm.

28 Modern Dance (1). Continuation of 27. Includes dance composition.

56 Games of Low Organization (2). Theory and practice in conducting games of low organization suitable for playgrounds, recreation centers and elementary and secondary schools.

58 First Aid (2). Theory and practice of basic emergency care procedures. Meets requirements for Red Cross and Heart Association certification.

66 S.C.U.B.A. Theory (2). Theory of skin and S.C.U.B.A. diving as it relates to physics, physiology, fundamentals of compressed gases, mechanics, first aid, environment, oceanography, marine life and how to plan a safe dive.

68 Water Safety Instructor (2). A two-part training course: (1) reviews lifesaving, basic swimming skills, strokes, diving; (2) gives candidates theoretical/practical knowledge and assistance in teaching Red Cross lifesaving and water safety courses. Prerequisite: current Advanced Life Saving Certificate.

103 Coaching of Individual and Dual Sports (2). Methods of instruction, management of golf, tennis, wrestling and gymnastics teams in interschool competition. Prerequisite: junior standing.

104 Coaching of Baseball (2). Methods of instruction, management of baseball squads in interschool competition. Prerequisite: junior standing or instructor's consent.

105 Coaching of Basketball (2). Methods of instruction, management of basketball squads in interschool competition. Prerequisite: junior standing or instructor's consent.

106 Coaching of Football (2). Methods of instruction, management of football squads in interschool competition. Prerequisite: junior standing or instructor's consent.

107 Coaching of Track and Field (2). Methods of instruction, management of track and field squads in interschool competition. Prerequisite: junior standing or instructor's consent.

122 Movement and Its Rhythmic Structure (2). Nature of rhythm and basic rhythmic motor experiences.

133 Teaching of Gymnastics (1). Methods, materials and equipment in teaching gymnastic skills for women.

134 Techniques of Swimming and Diving (1). Principles, methods of teaching swimming and diving.

135 Teaching of Modern Dance (1). Methods, materials and practice in teaching of modern dance.

146 Recreational Shooting Sports Instructor (2). Techniques of instruction, safety procedures, organization and management of shooting sports programs. Involves both classroom lecture and supervised firing on shotgun, rifle and pistol ranges.

155 Coaching and Officiating of Women's Sports (2). Methods, techniques, practice of coaching and officiating volleyball, swimming, field sports.

156 Coaching and Officiating of Women's Sports (2). Methods, techniques, practice of coaching and officiating in softball, tennis, basketball.

157 Officiating for Men's Sports (2). Methods, techniques of officiating in football, basketball, wrestling, swimming, diving. Supervised practice in officiating in intramural program required.

158 Officiating for Men's Sports (2) Methods, techniques of officiating in softball, baseball, track and field, volleyball, tennis. Supervised practice in officiating in intramural program required.

162 Advanced Recreational Dance (2). Analysis of dance patterns and dances, methods of instruction, practice teaching in folk, square, round and social dance. Prerequisite: 122.

181 Athletic First Aid (2). Theory, practice in prevention, emergency care, rehabilitation of injuries encountered in vigorous games. Prerequisite: anatomy.

328 Theory of Modern Dance (2). Brief history of the dance; its place in the curriculum as an educational and creative art activity. Prerequisite: two semesters of dance.

335 Philosophy of the Dance (2). Dance as related to art and education. Prerequisite: senior standing.

336 Advanced Rhythmic Structure and Dance Accompaniment (2). Analysis and synthesis of movements, with selection and experience in various accompanying media. Prerequisite: senior standing, 122.

337 Dance Composition and Production (3). Study of principles of dance composition. Special projects in analysis, planning and organizing dance productions. Prerequisite: senior standing, 328.

Professional Education Courses

H20 Introduction to Physical Education (2). Orientation to physical education as a profession. Historical background, teacher training, study of related areas.

H50 Activity Proficiency (½-1). For physical education majors only. Participation, leading to demonstrated proficiency, in a variety of prescribed and elected physical activities. Maximum credit: 10 hours. Prerequisite: departmental permission required.

H51 Underclass Practicum in Physical Education (1). An underclass experience as a teaching aide in an approved physical education setting. *S/U* grading only. Prerequisite: departmental consent.

H65 Elements of Health Education (2). Health needs of university students and school-age children are investigated by knowledge and decision-making activities concerning personal and community health problems.

H107 Introduction to Tests and Measurements in Physical Education (1). Experiences with activity and laboratory type tests in the area of physical education.

H119 Teaching of Physical Education (2). Teaching methods, selection of activities, program planning in physical education. Prerequisite: Educational Psychology A102.

H124 Dance for Elementary Schools (2). Elementary school dance, with emphasis on expressive movement plus introduction to selected singing games, folk dances and social dance.

H127 Physical Education Activities for the Elementary School (2). Objectives of physical education for elementary school child, with application of choice of activities, organization of program. Theory, practice in rhythms, games. Prerequisite: junior standing.

H152 Principles of Physical Education (2). Survey and analysis of scientific principles related to the teaching of physical activities.

H165 Teaching of Health (2). Considers basic subject matter in health teaching and its adaptation to the elementary, secondary curriculum. Prerequisite: an elementary or secondary education methods course.

H172 Teaching of Individual and Dual Sports (3). Prepares teachers of physical education in techniques, methods and materials for individual and dual sports.

H173 Teaching of Team Sports (2). Prepares teachers of physical education in techniques, methods and materials for team sports. Prerequisite: junior standing.

H185 Basic Driver Education (3). Introductory course in the preparation of teachers of driver education in secondary schools. Includes classroom instruction in the basic knowledge of driving and laboratory experience in basic skills of driving.

H186 Advanced Driver Education (2). Advanced course in the preparation of teachers of driver education. Modern teaching techniques in the classroom; driving simulators; testing range; in-car practice in the laboratory. Prerequisite: H185.

- H187 Introduction to Safety Education (2).** Review the total safety education program: traffic, school, civil defense, home, shops, etc. Provides a background for establishment of education programs to reduce accidents. cor.
- H199 Organization and Administration of Physical Education Programs (2).** Introductory course on problems, methods of organization and administration of physical education programs, relative to use of facilities, schedule of activities, budget, personnel, purchase and care of equipment. cor.
- H306 Drug Education (3).** The psychosocial, legal and pharmacological aspects of the recreational use of over-the-counter and street drugs are investigated with emphasis being placed on personal decision making, principles of school and community drug education, rehabilitation and community health services.
- H321 Health Education in the Elementary School (3).** Defines teacher's role in school health program; investigates health needs of school children; focuses on teaching strategies, health resources and development of elementary school health education curricula and materials.
- H327 Elementary School Physical Education (3).** Current theory and practice in physical education for the elementary school child. Programs and supervision of elementary school physical education: philosophy, methods, materials, problems. Prerequisite: 56, H124, Educational Psychology A102 or instructor's consent.
- H360 Topics in Health and Physical Education (1-3).** Social, medical and/or legal aspects of current issues in health and/or physical education, with special emphasis on the role of the teacher in relation to these issues.
- H361 Education in Human Sexuality (3).** The biological, psychosocial and educational aspects of human sexuality with special emphasis on instructional activities related to interpersonal communication, decision-making ability and clarification of values. Course is designed for both teachers and health-care personnel. Prerequisite: H65 or equivalent.
- H364 Problems of Physical Education for Elementary Schools (2).** Prerequisite: H127 or H327.
- H365 The School Curriculum in Physical Education (2).** Critical examination of physical education activities, programs leading to construction of general, special curricula for schools. Prerequisite: H152.
- H366 Intramural Sports (2).** Consideration of objectives, principles of administration in intramural sports in high schools, colleges.
- H380 Kinesiology (3).** Joint, muscular mechanisms of body; relationships of muscular activity to bodily development, efficiency. Prerequisite: Anatomy 201.
- H381 Theory and Practice of Remedial Gymnastics (2).** Analysis of postural problems, application of corrective measures. Prerequisites: H380, Anatomy 201 & Physiology 201.
- H382 Adapted Physical Education (2-3).** Principles and practice of physical education, recreation and motor therapy for the exceptional child and adult. Prerequisite: Educational Psychology A102, Anatomy 201 or Physiology 201, or instructor's consent.
- H383 Developmental Physical Activity (3).** Role and application of motor activities in the physical and educational development of children and youth. Prerequisite: Educational Psychology A102, Anatomy 201 or Physiology 201, or instructor's consent.
- H384 Movement Education and Recreation for the Handicapped (2-3).** Relationship of motor activity and the educational process in physical and recreational activities for the handicapped. Prerequisite: Educational Psychology A102 or Special Education L339; anatomy or physiology, or instructor's consent.
- H385 Physiology of Exercise (3).** Effects of exercise on the human organism; physiologic capacity and limitation for activity; role of exercise in health and fitness. Prerequisites: Anatomy 201 & Physiology 201.
- H391 Organization and Administration of Health Education Programs (3).** Considers the problem of the school health program, including health services, healthful school living and health instruction. Prerequisite: H65 or equivalent.
- H400 Problems (1-6).**
- H407 Tests and Measurements in Physical Education (3).** Measurements of aptitude and achievement in physical education activities, with particular reference to the determination of standards.
- H409 Administration of Physical Education (3).** Problems of administrators, supervisors: finances, construction, equipment, care of physical education plant, selection of staff. Prerequisite: H119 & H199.
- H410 Seminar in Physical Education (1-3).**
- H420 Administration of Interschool Athletics (3).** Organization, management of interscholastic, intercollegiate athletics.
- H440 Scientific Studies in Physical Education (3).** Survey, critical evaluation and methods of research in physical education.
- H444 Survey and Analysis of Professional Literature in Physical Education (3).** Review, analysis of outstanding professional literature in health, physical education, recreation and related fields of physiology, psychology, sociology and others. Critical analysis of selected publications.
- H450 Individual Research (1-3).** Independent research not leading to thesis. Prerequisite: H407 & H440.
- H480 Mechanical Analysis of Motor Skills (3).** The application of fundamental physical and mechanical principles to the performance of motor activities. Prerequisite: H380, Physics 123 or equivalent.
- H482 Practicum in Adapted Physical Education (2-6).**
- H485 Advanced Exercise Physiology (3).** Lectures, lab experiences, and readings in current literature to provide reasonable depth in selected areas of physiology as applied to activity and health. Prerequisite: H385; some chemistry suggested.
- H490 Research in Physical Education (cr. arr.)**

Health Services Management

- 300 Problems (1-3).** Directed exploration of health services management problems. Prerequisite: instructor's consent. cor.
- 310 The Health Care System (3).** Overview of health care system and relationship between its components. Focuses on changing nature of the system and issues confronting the future health care system. Prerequisite: senior standing. f.
- 376 Computers and Health Services Applications (3).** Examines administrative, clinical and research applications of the computer in health services delivery. Prerequisite: Computer Science 104 or 201, or instructor's consent. w.
- 400 Problems (1-3).** Intensive study of an area of health services management. Prerequisites: graduate standing & instructor's consent.
- 424 Public Health and Medical Care Economics (3)** (same as Economics 424).
- 442 Labor Relations in the Health Industry (3).** To identify role of organized labor in the health industry in its efforts to represent employees. Review history and legal status under appropriate federal and state law. Prerequisites: graduate standing & instructor's consent.

450 Research (cr. arr.) Original research in health services management not leading to a thesis but requiring a formal research report. Prerequisites: graduate standing & instructor's consent.

460 Administration of Health Care Organizations (3). Analyzes health care organizations, emphasizing management structure, board of trustees, medical staff. Attention focused on delivery of institutional patient care, role of professionals, departmental interrelatedness. Prerequisites: 310, Business Administration 301 & instructor's consent. w.

470 Community Health Planning (3). Analyzes health planning process and planning strategies, techniques that can be applied in various health care settings. Classroom/field activities focused primarily around community, consumer, provider. Prerequisites: 310, Business Administration 301 & instructor's consent. w.

471 Application of Management Science to the Health Care System (3). Applies principles/techniques of computer-based management science (systems theory, operations research etc.) to complex health care system problems. Prerequisites: 460, Computer Science 201, Statistics 207, & instructor's consent. f.

472 Financial Management for Health Care Organizations (3). Application of concepts, tools and techniques of financial management and their interrelationships as they apply to current and future operation of health care organizations. Prerequisites: 460, Business Administration 344, & instructor's consent. w.

473 Decision Making for Health Care Organizations (3). Applies decision-making models to health care organizations demonstrated through the use of case studies, role-playing exercises, simulations and games. Prerequisites: 470 & 471. w.

474 Health Care Law (1). Applies health care law and regulations to the operation of health care organizations. Prerequisites: 460 & instructor's consent. f.

475 Advanced Community Health Planning (3). Advanced analysis of topics in health planning, resources development and agency management. Prerequisites: 470 & instructor's consent. w.

478 Organization and Management for Mental Care (3). Organizational, management and economic aspects of mental hospitals and mental health programs, administration. Emphasizes differences between mental hospitals and general hospitals. Prerequisite: 310 or 460. w.

489 Field Experience in Health Services Management (cr. arr.) Supervised field experience in approved health agencies and institutions. Opportunity for observation and service participation in various fields of health. Prerequisites: graduate standing & instructor's consent.

Higher & Adult Education

K260 Topics in Higher and Adult Education (cr. arr.) Lectures, discussions and field experiences of special interest to students enrolled in all undergraduate divisions; not a professional course for preparation of college teachers. May be repeated for credit. Graded *S/U*.

K301 Foundations of Adult Education (3). Provides a conceptual and historical base for the field of adult education; presents European origins of adult education and the development of adult education in the United States; introduces basic concepts of adult development and learning.

K400 Problems in Higher Education (cr. arr.) Prerequisite: departmental consent.

K410 Seminar in Higher Education (cr. arr.)

K411 Seminar in Adult Education (1-3).

K420 Administration and Supervision of Adult Education (2-3). Principles and problems of the administration of adult education programs in the following settings: agencies, other non-school organizations, private and public schools, including community colleges. f,s.

K440 Improvement in Instruction in Adult Education (2-3). Processes and procedures utilized in planning, conducting and evaluating various teaching techniques in adult education.

K460 Topics in Higher and Adult Education (cr. arr.)

K465 The Junior College (2). Survey course dealing with problems of the junior college.

K468 College Teaching (2-3). Primarily for students who expect to teach in junior or senior colleges. Principles and practical issues in college teaching are considered.

K475 College Administration (2-3). Considers problems of organization and administration in institutions of higher education.

K480 Internship in Higher Education (cr. arr.) Internship experience under supervision in institutions of higher education. Prerequisite: departmental consent.

K490 Research in Higher Education (cr. arr.) Prerequisite: departmental consent.

History

There are no specific prerequisites for courses in the Department of History with the exception of the usual class standing.

1 Foundations of Western Civilization (4). Development of characteristic ideas and institutions of Western cultural tradition, from origin of civilization in ancient Near East to beginning of rapid social, political, intellectual transformation of Europe in 18th century. f,w. cor.

3 Survey of American History to 1865 (3). Introduction to U.S. history through the Civil War, surveying political, economic, social and cultural development of the American people. cor.

4 Survey of American History Since 1865 (3). Introduction to U.S. history since 1865, surveying political, economic, social and cultural development of the American people. cor.

11 Themes in American History (3). Selected major themes in American history from colonial period to present. Attention focused on social, cultural and economic changes; meaning of significant political events; role of United States in world affairs.

20 American History (5). Broad survey of political, economic, social, intellectual, diplomatic and constitutional development of American people from the first English settlements to present day; emphasizes evolution of American culture and institutions. f,w.

History 3, 4, 11 or 20 satisfies the General Education Requirements and the state law requirement for training in the federal and state constitutions. Students who expect to take only one American history course are encouraged to enroll in either 11 or 20. The 3-4 sequence is recommended, but not required, for majors in history, the humanities and the social sciences. Students may take any one of the following courses: 3-4, 11 or 20, except that students may (and are encouraged to) take both 3 and 4. For those electing the 3-4 sequence, 4 should be taken after 3.

95 America as a Post-Industrial Society: 1920 to the Present (3). Designed for freshmen and sophomores, the course explores social and cultural change. Lectures and readings focus on technology, population, values and political economy. Relationships between identity and change are examined.

- 100 History of Modern Europe (3-4)** (same as Peace Studies 100). Selected major themes in European history from French Revolution to recent times. Breakdown of traditional institutions, ideas; political, social revolution; industrialization; nationalism; imperialism; world wars; democratic, totalitarian ideologies, movements; quest for international order, European unity.
- 101 Undergraduate Topics in History (1-3).** Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon departmental consent.
- 102 The Ancient World (3).** Survey of institutional and cultural development of ancient Near East, Greece and Rome.
- 103 Ireland: Revolution and Nationalism, 1780-1976 (3).** Investigates Ireland as an early example of the kind of colonial revolt later typical of the third world. Emphasizes growth of nationalism, republicanism and the failure to create one Ireland.
- 105 England Before the Glorious Revolution (3).** Survey of English institutions, culture and politics from the Roman invasion to the Revolution of 1688.
- 106 Britain: 1688 to the Present (3).** Surveys British history from 1688 to present. Emphasizes social and economic change.
- 110 Civilization of India (3)** (same as Anthropology 110, South Asia Studies 110).
- 111 The World of the Middle Ages (3)** (same as Peace Studies 100). Survey of European development from the fall of Rome to the 16th century.
- 130 Afro-American History (3).** Survey of social, political and economic development of the black man in American life from 1619 to present.
- 131 History of American Expansionism (3)** (same as Peace Studies 131). History of the American empire from revolutionary times to present.
- 138 Foundations of Russian History (3).** Survey of Russia from earliest times to 17th century.
- 139 Russia in Modern Times (3)** (same as Peace Studies 139). Survey of Russian history from Peter the Great to present.
- 140 Chinese Civilization: The Great Tradition (3).** A broad interdisciplinary survey of China from classical to early modern times. Examines traditional Chinese society, culture, art, government, science, religion. Topical approach; emphasizes dynamic aspects of traditional Chinese civilization.
- 141 Imperial China (3)** (same as Peace Studies 141). Survey of China under the Manchu Ch'ing dynasty. Within framework of the dynastic cycle, examines imperial rule, Chinese society, culture, art, internal rebellion, Western intrusion, modernization.
- 142 Twentieth-Century China (3).** History of China from Nationalist Revolution of 1911 to present. A problem-oriented course; special emphasis on Mao and Maoist ideology. Social, literary and cultural history also receive attention.
- 143 Japan in the Age of the Samurai (3).** An exploration of basic patterns of Japanese culture, religion and rule, from early times until the beginning of modernization in the 19th century.
- 145 Modern Japan and China—A Comparative Survey (3).** A structured, comparative examination of the histories and cultures of Japan and China, from the mid-19th century to the present. Orientation towards broad social, intellectual and political developments.
- 150 Film and Society in Modern Europe (3).** A study of the major social and cultural developments in Europe since the 1930's, employing feature films from the time as the principle documentary resource.
- 167 Colonial Latin America (3).** Survey of Latin America, 1492-1810. Exploration and conquest; European settlement; colonial government and institutions; economy and society; cultural and intellectual life.
- 168 Latin America Since Independence (3).** Independence movement; political, social and economic problems; European immigration; U.S. influence; economic modernization; growth of nationalism; cultural and intellectual life.
- 170 The Origins of Scientific Thought (3).** Survey of the development of scientific ideas from Babylonia and Egypt to the age of Newton. Emphasis on the development of science as a part of intellectual history.
- 171 Scientific Thought in the Modern World (3).** Continuation of 170 from the age of Newton to the modern period.
- 181 Asian Civilizations (3)** (same as South Asia Studies 181, Political Science 181).
- 182 History of British India (3).** Introduction to traditional India; the Muslim experience; European rivalry and British hegemony; problems of Crown rule; social and political reforms in the making of modern India.
- 186 Undergraduate Seminar in European History (3).** Readings in selected problems in European history; reports and discussion on selected topics. Course subject depends on instructor. May be repeated.
- 187 Undergraduate Seminar in American History (3).** Readings in selected problems in American history; reports and discussion on selected topics. Course subject depends on instructor. May be repeated.
- 188 Undergraduate Thesis (3).** Individually directed research leading to a senior thesis.
- 189 Undergraduate Thesis (3).** Continuation of 188.
- 197 Honors (3).** Special readings, research for graduation with Honors in History. f.
- 198 Honors (3).** Continuation of 197. w.
- 201 Topics (cr. arr.)** Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon consent of department.
- 202 America's Environmental Experience (1-8).** Team-taught analysis of American thought and action on physical environment during 19th-20th centuries. Relation between politics, economics, technological change, environmental quality; roles of science, law, regulatory agencies, grassroots action. Topical satellite courses offered concurrently.
- 205 Survey of Greek History (3).** Political and social institutions, intellectual life of Greek city-states to time of Alexander.
- 206 Survey of Roman History (3).** Origin and development of Roman institutions, Rome's expansion and culture through reign of Marcus Aurelius.
- 210 History of Missouri (3).** Survey of Missouri's development from the beginning of settlement to present. cor.
- 221 Europe in the Nineteenth Century (3).** Political, social, economic and cultural development of Europe from French Revolution to outbreak of World War I.
- 231 Contemporary Europe (3).** Political, social and economic development of Europe from 1900 to the present, with emphasis on the period between the two world wars. cor.
- 246 Structure of American Religion: Churches and Denominations (3).** Historical survey of major denominational patterns and religious movements in America from 1600 to present. Attention given to contemporary religious groupings.
- 251 Twentieth Century America (3).** Survey of American development from 1900 to present. For students who have not taken advanced courses in American history, especially 356, 357, or 358.

- 300 Special Problems (cr. arr.)** Independent investigation leading to a paper or project.
- 301 Topics (cr. arr.)** Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon consent of department.
- 302 Alexander the Great and the Hellenistic World (3).** Alexander's conquest of the East to 323 B.C.; political, social, economic development of Hellenistic kingdoms from his death to 31 B.C.
- 303 The Development of Greek Democracy (3).** Study of Athenian democratic institutions from Solon to 404 B.C.
- 307 The Roman Revolution (3).** Analysis of the dissolution of Republican institutions and the origins of autocracy, from the Gracchi to the Augustan settlement in 23 B.C.
- 310 The Roman Empire (3).** Acquisition and development of Empire by the Romans; administration of the Empire; Romanization of the West; cultural interaction between Rome and the provinces.
- 311 The Later Roman Empire (3).** Political, social, economic and cultural life in the Roman Empire, especially in the West, from Diocletian to the rise of the barbarian kingdom.
- 317 History of Socialist Thought (3).** Survey of European socialist thought from 18th century to present. Topics include Enlightenment "Presocialists," Utopian socialism, Marx, Proudhon, the Fabians and the "new left."
- 318 Medieval Culture (3)** (same as Peace Studies 318). Development of medieval culture covering a broad range of topics such as university life, scholasticism, technology, social change and the lives of artisans, merchants, women and peasants.
- 319 Intellectual History of Europe, Seventeenth and Eighteenth Centuries (3).** Foundations of modern thought in 17th and 18th centuries.
- 320 Intellectual History of Europe, Nineteenth and Twentieth Centuries (3).** Development of modern thought in 19th and 20th centuries.
- 321 Tudor England (3).** Treatment of period covering social, political, religious, imperial development.
- 322 Stuart England (3).** Treatment of period covering social, political, religious, imperial development.
- 323 English Legal and Constitutional History (3).** Development of English institutions; chief emphasis on their relation to general social, economic backgrounds.
- 325 British Empire (3).** Surveys growth, organization.
- 326 Modern England (3).** Surveys British history in the 18th and 19th centuries. Emphasizes social and economic change.
- 327 The Age of the Renaissance (3).** Major changes in European economic, social, political, religious and intellectual life between 1250-1500. Humanism and Renaissance. The "Renaissance problem."
- 328 The Age of the Reformation (3).** State of Europe about 1500. Political, diplomatic, social and intellectual changes to 1648. Humanistic reform movements, Protestant-Catholic Reformation. Development of the modern state and international relations.
- 329 Europe from Reformation to Revolution (3).** Interplay of intellectual, political, economic forces in Europe from 1543 to 1789.
- 331 Revolutionary France, 1789-1851 (3).** Revolutionary upheavals of the revolutionary-Napoleonic era, 1830 and 1843, which destroyed traditional French society and laid the basis for modern France.
- 333 Germany in the Nineteenth Century (3).** Cultural, social and political history of Central Europe from 1800 to 1914. A case study in incomplete modernization, focused on industrialization, unification, cultural crisis and imperialism.
- 334 Germany in the Twentieth Century (3).** Cultural, social and political history from 1914 to present day. Focus on world wars, national socialism, the holocaust, the cold war and the emergence of East and West Germany.
- 335 Modern France, 1851 to the Present (3).** Principal social, economic and political developments in modern French history from beginning of the Second Empire to present day.
- 336 Germany and Central Europe from 1517-1815 (3).** Political, social history of Germany from Reformation to end of Napoleonic Wars.
- 337 Germany and Central Europe from 1815 to Present (3).** Rise of modern Germany from 1815 to present.
- 338 Medieval Russian Culture (3).** Detailed analysis of religion, literature and arts of the Kievan and Muscovite states, 9th through 17th centuries.
- 339 Imperial Russia, 1682-1825 (3).** Russia in the Age of Enlightenment and the Napoleonic era; special emphasis on the reigns of Peter I and Catherine II.
- 340 Modern Russia, 1861-1921 (3).** Analysis of transformation of Russian society from Great Reforms to Bolshevism triumph. Particular attention to appearance of social diversity, revolutionary movement, formation of political parties, industrialization, revolutions of 1905 and 1917, initial policies of Lenin.
- 341 Sino-Soviet Conflict (3)** (same as Peace Studies 341). Survey of relations between Soviet Union and Communist China, 1921 to present. Internal developments in both countries; governmental and party relationships before, during and after Communist victory in China.
- 342 Age of Jefferson (3).** Political, constitutional, cultural and economic developments in United States during formative period of Republic, 1787-1828. Special attention to Constitutional Convention, formation of national political institutions.
- 343 Age of Jackson (3).** Continuation of 342 from election of Jackson to 1850.
- 344 American Constitutional History to 1860 (3).** Historical analysis of origins of American constitutional system to eve of Civil War.
- 345 American Constitutional History Since 1860 (3).** Historical analysis of American constitutional system from eve of Civil War to present.
- 348 American Social History to 1865 (3).** Origins and development of society and social institutions, colonial times to 1865. Immigration as a social phenomenon; urbanization and industrialization; national character; interrelations among values, political institutions, social stratification; the family, education and religion.
- 349 American Social History Since 1865 (3).** Continuation of 348.
- 350 Special Readings (cr. arr.)** Individual work, with conferences adjusted to needs of student.
- 351 American Intellectual History to 1865 (3).** Survey of development of American ideas in their social and cultural context from colonial period to Civil War.
- 352 American Intellectual History Since the Civil War (3).** Continuation of 351. From Civil War to present.
- 353 American Urban History (3).** Growth, development and implications of the city in American history; historical analysis of urban problems.
- 354 Economic History of the United States to 1865 (3).** Survey of structure and tendencies of American economic life from colonial times to Civil War.
- 356 Origins of Modern America, 1877-1918 (3).** Political, social, economic and intellectual evolution of America into a modern society, 1877-1918.
- 357 Recent United States History 1918-1945 (3).** Detailed examination of American history from end of World War I to end of the World War II.

- 358 Our Times: United States Since 1945 (3).** Detailed examination of American history from end of World War II.
- 359 History of the Old South (3).** Study of the South to 1860.
- 360 History of the New South (3).** Study of the South and its national role since 1861.
- 361 The Trans-Mississippi West (3).** Historical development of major regions, with emphasis on response to environment, public land policy, role of government in economic and resource development, citizen action and cultural pluralism.
- 362 The Ordeal of the Union, 1848-1877 (3).** All major aspects of the period considered; rivalry between nationalizing and sectionalizing forces emphasized.
- 363 American Colonial History to 1760 (3).** Study of Colonial America; special emphasis on creation of a native American culture prior to 1760.
- 364 The Period of the American Revolution, 1760-1789 (3).** Analysis of the Revolution, its causes and consequences, through establishment of the new government in 1789. cor.
- 365 History of the American Environment (3).** Reading and discussion; explores diverse responses to the changing American environment from early man to the present, including ecological, institutional and philosophic aspects.
- 366 Westward Expansion in American History (3).** Lecture course dealing with process of expansion; American response to the challenge of abundant land and resources, and the impact on American institutions and attitudes.
- 367 American Legal History to 1870 (3).** Development of American law from its English beginnings. Covers reception of the common law, codification movements, law of slavery, frontier legal systems and beginnings of formalism.
- 368 American Legal History Since 1870 (3).** History of American law in modern times: emergence of modern doctrines in torts, contracts, administrative law; jurisdictional and procedural law innovations; growth of federal court system and its business; attitudes of American bar and bench.
- 369 History of Caribbean America (3).** Comparative regional study of insular and mainland Caribbean nations. Emphasis on modern period. Independence; abolition of slavery; U.S. hegemony; economic, social and political upheaval.
- 370 American Foreign Policy from Colonial Times to 1898 (3)** (same as Peace Studies 371).
- 373 History of United States Foreign Relations, 1898 to the Present (3)** (same as Peace Studies 373). History of American foreign policy from the development of an insular empire to present.
- 374 European Diplomatic History (3).** Survey of European diplomatic relations since 1815.
- 377 History of Mexico (3).** Survey of Mexican history from Cortes to present day.
- 378 Social Revolution in Latin America (3).** 20th-century social revolutions in selected Latin American countries.
- 380 Economic History of Modern Europe (3).** Major developments in industry, transportation and governmental economic policies since 1500.
- 384 Religion and Politics in Modern India, 1857-1947 (3)** (same as South Asia Studies 384). Attention to religious revival and reform as important elements in the development of regional and national political patterns.
- 391 Afro-Americans in the Twentieth Century (3).** Survey of political, social, economic and intellectual development of the Negro in America since 19th century.
- 399 Quantitative Methods in Historical Study (3).** Introduces quantitative approaches to the study of history. Emphasizes opportunities, limitations and dangers involved in several common forms of quantitative study.
- 400 Problems (cr. arr.)** (same as South Asia Studies 400). Individual work not leading to dissertation. Prerequisite: prior written consent of instructor.
- 401 Topics (cr. arr.)** Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon consent of department. Prerequisite: instructor's consent.
- 402 European Historiography (3).** Analysis of the art of history and historical writings as revealed by leading European historians and major European schools of historical interpretation.
- 403 Readings in South Asian History (1-6)** (same as South Asia Studies 403). Readings in the modern history of India and Pakistan, with particular emphasis upon historiography and sources.
- 404 Seminar in South Asian History (1-12)** (same as South Asia Studies 404). Directed studies in Indian historical literature and problems, 1600 to 1947. Reading knowledge of a modern Indian language is desirable but not required.
- 405 Seminar in Russian History (1-12).** Russian social, intellectual, political, economic, administrative history. Reading knowledge of Russian, French or German desirable; Russian and French or German required of students specializing in Russian history.
- 406 Seminar in Ancient History (cr. arr.)** Readings and research on selected problems in ancient history.
- 407 Readings in Ancient History (cr. arr.)** Reading of standard works and recent scholarship on selected problems in ancient history.
- 410 Introduction to Historical Research (3).** Introduction to historical methods, source problems, bibliographical aids, source criticism, use of related techniques. Required of graduate students in history.
- 411 Readings in Russian History (1-6).** Reading standard works and current scholarship on selected problems in Russian history. Reading knowledge of Russian, French or German helpful but required only of students specializing in Russian history.
- 415 Seminar on the College Teaching of History (3).** Colloquium on problems and methods of teaching introductory courses in history at postsecondary level. Group inquiry into aims, content, methods supplemented by supervision and critique of participants' classroom teaching.
- 420 Independent Readings in Preparation for the Comprehensive Examination for the Ph.D. in History (cr. arr.)** Independent readings for Ph.D. comprehensives. Open only to graduate students formally admitted to candidacy for Ph.D. in history.
- 421 Seminar in British History (1-12).** Group investigations of social, intellectual problems of modern England.
- 423 Readings in English History (1-6).** Readings in historical literature covering period since 1660; particular reference to new interpretations of political, social developments.
- 425 Seminar in Medieval Culture (1-12).** Investigates cultural developments in the medieval period.
- 426 Readings in Medieval Intellectual History (1-6).** Readings in standard historical works and recent scholarship concerning medieval intellectual history, from patristic age to later Middle Ages.
- 427 Seminar in the Renaissance and Reformation (1-12).** Analyzes problems of the period 1300-1600; emphasizes intellectual history.

428 Readings in Early Modern European History (1-6). Readings in historical classics and current scholarship on Renaissance, Reformation, Baroque and Enlightenment periods. Problem of modernity.

431 Readings in Modern European History (1-6). Readings in recent research material; class periods consist of critical discussion of reports on special topics.

432 Seminar in Modern European History (1-12). Group investigation of problems of modern Europe. Reading knowledge of either French or German required.

433 Readings in German History (1-6). Readings in selected problems in the history of Germany and Central Europe.

434 Seminar in German History (1-12). Readings and research in the history of Germany since World War I. Reading knowledge of German required.

435 Readings in French History (1-6). Readings in selected problems in the history of France since 1789.

436 Readings in American Colonial History (1-6). Readings in American history from beginning of English settlements to adoption of the Constitution.

437 Seminar in the History of Colonial America (1-12). Directed research in the colonial and revolutionary period of American history.

438 Readings in Afro-American History (1-6). Readings on selected topics in Negro history from 1619 to the present, with emphasis on conflicting interpretations.

439 Seminar in Afro-American History (1-12). Directed research in selected topics in Afro-American history.

440 Research Seminar in Urban History (3). Directed research in problems in American urban history. May repeat to 12 hours maximum.

441 Seminar in the National Period of United States History (1-12). Directed research in the period 1787-1861.

442 Readings in the Age of the Federalists and the Jeffersonians (1-6). Directed readings in American history from the Constitution to election of Jackson; class periods devoted to critical evaluation.

443 Readings in the Age of Jackson 1824-1850 (1-6). Continuation of 442, from election of Jackson to Civil War.

444 Readings in American Urban History (1-6). Class meetings devoted to critical evaluation of writings in the field.

447 Readings in Sectional Controversy, Civil War and Reconstruction (1-6). Directed readings and group discussions of major issues in the period of national unification of the United States, from 1850 through 1877.

448 Readings in American Social History (3). Introduction to a problem-centered approach to American social history through examination of historical and social science literature relating to such topics as national character, values, social change and urbanization.

449 Seminar in American Social History (3). Introduction to research in field of social history.

450 Research (cr. arr.) Work equal to research done for a dissertation, but not leading to thesis. Written consent of instructor requirement for enrollment.

451 Seminar in American Intellectual History (1-12). Directed research in American intellectual history.

452 Readings in American Intellectual History (1-6). Class meetings devoted to critical evaluation of writings in the field.

453 Seminar in United States Sectionalism, Civil War and Reconstruction (3). Directed original research on political and related topics of the period 1848-1877. May repeat to 12 hours maximum.

454 Readings in the History of the American West (1-6). Readings concerning the various American frontiers.

455 Seminar in American Western and Environmental History (3). Directed research in problems in American western and environmental history. May be repeated to maximum of 6 hours.

457 Readings in American Economic History (1-6). Readings in evolution of American capitalism; class periods consists of critical discussion of reports.

458 Seminar in American Economic History (1-12). Directed research in problems in American economic history.

460 Readings in the History of the South (1-6). Group readings and appraisal of controversial interpretations in Southern history.

461 Seminar in the History of the South (3). Directed research in the history of the American South.

462 Readings in History of Missouri (1-6). Directed readings in the history of the State from the Territorial Period to the Modern Period.

464 Readings in the Origins of Modern America (1-6). Selected studies of major issues in American history, 1877-1929.

465 Readings in Recent United States History (1-6). Critical evaluation of writing in American history in period 1929-present.

467 Seminar in the Origins of Modern America (1-12). Selected topics and studies in American political, social and intellectual history, 1877-1929.

468 Seminar in Recent United States History (1-12). Advanced seminar in American history from 1929 to present.

469 Seminar in Latin American History (1-12). Research in 20th-century Latin American political and social history.

470 Readings in Latin American History (1-6). Readings in standard and recent historical literature, with critical discussion of reports on special topics.

480 Readings in the History of American Diplomacy (1-6). Readings in evolution of American diplomacy from the Revolution to present.

481 Seminar in Recent American Diplomatic Problems (1-12). Directed research in problems of 20th-century American diplomacy.

490 Research (cr. arr.) f,w.

491 Seminar in European Intellectual History (1-12). Research on selected problems in the intellectual history of Europe in 18th, 19th and 20th centuries. Reading knowledge of one of the following required: French, German, Italian, Russian.

493 Readings in the History of Science (1-6). Readings in the historical development of various physical and biological sciences, with emphasis on sciences in the sciences.

497 Seminar in Early American Diplomacy (1-12). Seminar in early American foreign policy.

Home Economics

General

10 Introduction to Home Economics (1-2). Lecture-discussion of professional opportunities and their relationship to contemporary issues. Elective for freshmen and transfers. Graded S/U.

110 Demonstration Techniques (2). Open to all subject matter fields. Fundamental principles of demonstration. Professional and student demonstrations. Not open to freshmen. Prerequisite: 6 hours in major field.

112 Seminar (1-2). Individual study of discussion of critical issues facing our society with particular emphasis on the role of the professional, substance of the course to be generated by student initiative. Graded S/U. Prerequisite: 12 hours credit.

310 Senior Seminar (0). Non-credit course for seniors; open to Home Economics Education majors. A series of seminars relating to philosophy and responsibilities in preparation for a profession.

412 Introduction to Research in Home Economics (1). Introduces research trends and needs in areas of interest to Home Economics; location and interpretation of research bearing on specific subjects; planning research projects, analysis of results and drawing conclusions.

Child & Family Development

66 Principles of Human Development (3) Concepts and principles basic to an understanding of human development.

160 Early Childhood (3). Physical and psychosocial development of the child under six. Observation of young children is integral part of course.

163 Interpersonal Relationships, Marriage and the Beginning Family (3). Psychosocial factors of interpersonal relationships during courtship and early stages of marriage and family life.

263 The Child from Six through Adolescence (3). Physical and psychosocial development of the child from six through adolescence.

264 Child Development Laboratory (3-6). Experience in working with young children (2-5 years), adult-child relationships, general guidance principles and techniques and methods of fostering curiosity and creativity. Prerequisites: 160 or equivalent; instructor's consent required.

300 Problems in Child and Family Development (cr. arr.) Independent work on special problems in Child and Family Development. Prerequisite: instructor's consent.

318 Topics (cr. arr.) Selected current topics in field of interest.

330 Child Nutrition (3) (same as Human Nutrition, Foods & Food Systems Management 330).

350 Readings (cr. arr.) Readings in recent research; critical discussions.

355 Recent Trends (1-2). Review of current research and/or practice in child and family development. Prerequisite: instructor's consent.

360 Community Programs for Children and Families (3). Study of group organization and dynamics combined with experience in community programs.

361 Working with Parents (2-3). Understanding of parents and their perspectives, interpersonal communication and relationships, conference and group meeting techniques. Includes experience with parent groups.

362 Fostering Intellectual Development in Early Childhood (3). Analyzes activities and programs which foster intellectual growth of young children; review of current early childhood programs.

363 Family Development (3). Analyzes developmental stages of the family life cycle; special emphasis on alternative life styles. Prerequisites: psychology & sociology or instructor's consent.

364 Advanced Child Development Laboratory (3-6). Work with young children (2-5 years) includes developing early childhood program and manipulative, representational, language and discovery experiences for young children; study of program models. (Consult instructor to schedule lab hours.) Prerequisites: 264 or equivalent & instructor's consent.

365 Infant-Toddler Development and Programs (3). Physical, cognitive and self-social development of children under age two; facilitation of development, design and administration of infant-toddler and parenting programs. Prerequisite: junior standing or instructor's consent.

366 Working with Parents Practicum (2-3). Practicum experience in working with parents/families of young children. Focuses on developing interpersonal skills in daily contacts with parents, group meetings and conferences in both home and school setting.

367 Aging in the Near Environment (3). Course covers basic perspectives and issues related to aging, in an attempt to enhance understanding of the many facets involved in the aging process.

368 Family Interaction (3). Analysis of intrafamilial interaction and its determinants; includes study of socialization, bonding, decision making, power and conflict. Prerequisite: 163, 363 or Sociology 214.

369 The Development of Sex-Role Behavior (2). Emphasis on development of sex-role behaviors. Considers alternative theories of identification and the influence of biological, familial and cultural variables. Prerequisite: 6 hours Child & Family Development or instructor's consent.

390 Field Training (cr. arr.) Prerequisites: senior standing & instructor's consent.

400 Problems (cr. arr.) Prerequisite: instructor's consent.

410 Seminar (1-4). Reports and discussion of recent work in area of concentration.

415 Readings (cr. arr.) Readings in recent research; critical evaluation. Prerequisites: graduate standing & instructor's consent.

418 Topics (cr. arr.) Selected current topics in field of interest.

450 Research (cr. arr.) Independent research not leading to a thesis. Report required.

460 Leadership Roles in Programs for Children and Families (3). Includes design and operation of programs (staffing, equipment, finances, etc). Field experiences arranged. Prerequisite: 264, 364 or equivalent.

462 Cognitive Development of the Young Child (3). The child's perception of reality, acquisition of language, concept formation and development of reasoning in early childhood.

463 Theories Seminar (3). Students compare, contrast and synthesize the major theoretical frameworks in Child and Family Development.

490 Research (cr. arr.) Independent research leading to thesis or dissertation.

Clothing & Textiles

81 Clothing Construction (3). Compares techniques; analyzes quality in garment construction.

83 Clothing Selection (3). Freshmen and sophomores only. Study of line, form, space, color and texture in selection of clothing as related to requirements of individual. Wardrobe planning.

182 Textiles (3). Not open to first-semester freshmen. Textile fibers and their processing as it relates to selection, care and performance of end product.

183 Fashion Illustration (2). Development of techniques and media for portraying the fashion figure and dress. Prerequisites: 81, 83 & Art 60.

186 Fashion Merchandising (3). Surveys fashion merchandising and retailing principles. Specific applications through case studies, problems and guest lecturers. Prerequisite: Clothing & Textile majors only or instructor's consent.

281 Fashion and Costume Design (3). Evaluation of fundamentals of fashion and design. Design experience. Problems which develop judgment and originality. Prerequisites: 81, 83 & 183.

282 Apparel Production Processes (3). Apparel production processes used by designers and by industry. Garments constructed using designer patterns and processes. Prerequisites: 81, 83, 182.

285 Buying of Textiles and Clothing (2). Consumer problems in buying textiles and clothing for home and family members. Legislation, quality standards and construction of current textile and clothing items. Prerequisites: 81, 182.

300 Problems (cr. arr.) Prerequisites: junior standing & instructor's consent.

318 Topics (cr. arr.) Selected current topics in field of interest.

350 Readings (cr. arr.) Prerequisites: senior standing & instructor's consent.

355 Recent Trends (1-2). For upperclass and graduate students who wish additional knowledge and understanding in specific subject matter areas.

380 Tailoring (3). Selection and tailoring of a wool suit or coat; comparison and emphasis of fundamental tailoring techniques. Prerequisite: 282.

381 Costume History (3-4). Survey course showing sources of costume design inspiration. Prerequisites: senior standing & History 1.

382 Applied Costume Design (3). Draping and modeling costumes of original design. Prerequisites: 381 & 387.

383 Advanced Fashion Illustration (3). Techniques of representing costumed figures in various illustrative media; develops original designs for contemporary dress. Prerequisites: 183 & 281.

384 The Fashion World (2). Survey of fashion business. Discussion and field trips to manufacturers and retailers. Prerequisites: 186, 282, 3 hours marketing, senior standing & instructor's consent.

385 Textile Fibers (3). Advanced study of textile fibers; emphasis on their structure, composition, physical and chemical properties. Prerequisites: 182 & 6 hours organic chemistry.

387 Flat Pattern Design (3). Principles of designing by flat pattern methods and construction of original designs. Prerequisites: 182 & 281.

388 Clothing Behavior and Society (3). Behavioral aspects of clothing as related to the individual and society. Prerequisites: senior or graduate standing, 81, 182 & two courses from sociology, psychology, or economics.

390 Field Training (cr. arr.) Prerequisites: 186, senior standing & departmental approval.

400 Problems (cr. arr.) Prerequisites: 300-level course in field of problem & instructor's consent.

410 Seminar (1-4). Reports and discussion of recent work in area of concentration.

412 Research Methods in Clothing and Textiles (3). Research planning, technique, sampling and measurement, data collection, analysis and interpretation. Prerequisite: Statistics 207 or Sociology 375.

415 Readings (cr. arr.) Readings in recent research material in textiles and/or clothing. Prerequisites: graduate standing, 20 hours Clothing & Textiles, & instructor's consent.

418 Topics (cr. arr.) Selected current topics in field of interest.

450 Research (cr. arr.) Independent research not leading to a thesis. Report required.

480 Textile Fabrics (3). Advanced study of textile fabrics with emphasis on dyeing, finishing and physical testing. Prerequisites: 182 & senior or graduate standing.

481 Advanced Costume History (3). Emphasis on late 19th and 20th centuries. Study of influences and trends (economic, physical, political, psychological and social) affecting design and repetition of design. Prerequisite: 381 or equivalent, senior or graduate standing, or instructor's consent.

488 Cultural Interpretations of Dress and Adornment (3). Diversity in functions and patterns of dress and adornment. Prerequisite: 388 or instructor's consent.

490 Research (cr. arr.) Independent research leading to thesis or dissertation.

Communications

115 Media Techniques (2) (one extra credit hour may be arranged as lab). Survey of mass media techniques and methods of combining them effectively to disseminate home economics information. Includes projects and field trips. Prerequisite: sophomore standing, English 60 or equivalent.

300 Problems (cr. arr.) Library or lab problems selected for study by student, with guidance of staff member. Report required. Prerequisites: 200-level course in field of problem & senior standing & instructor's consent.

318 Topics (cr. arr.) Selected current topics in field of interest.

350 Readings (cr. arr.) Prerequisites: 200-level course in field of subject & instructor's consent.

355 Recent Trends (1-2). Prerequisite: at least one course in specific subject matter area or instructor's consent.

390 Field Training (4). Prerequisites: senior standing & instructor's consent.

400 Problems (cr. arr.) For students emphasizing home economics communications. Independent investigation. Prerequisites: senior standing & instructor's consent.

410 Seminar (1-4). Reports and discussion of recent work in area of concentration.

415 Readings (cr. arr.) For graduate students emphasizing home economics communications. Readings in current research and other publications. Prerequisites: 300-level courses in field of problem & instructor's consent.

418 Topics (cr. arr.) Selected current topics in field of interest.

450 Research (cr. arr.) Independent research not leading to thesis. Report required.

490 Research (cr. arr.) Independent research leading to thesis or dissertation.

Family Economics & Management

72 Management in Family Living (2). Principles of management of resources for effective personal and group living. Prerequisite: freshmen & sophomores only, or instructor's consent.

73 Introduction to Rehabilitation (1). Reading discussion and field trips to provide an overview of the field of home economics rehabilitation. *S/U* grading system only.

170 Work Simplification in Home Processes (2). Limited to rehabilitation majors and handicapped students. Problems in simplifying work to conserve time and energy in home processes. Prerequisites: 72, 174, 370.

171 Working with the Visually Limited (1). Limited to home economics rehabilitation majors. Prerequisites: 73, 174 and Human Nutrition, Foods and Food Systems Management 121.

172 Home Management Laboratory (2). Lab experience with emphasis on application of the home management process, use of time and energy. Prerequisites: 72, 174 & Human Nutrition, Foods & Food Systems Management 21 or 121.

173 Personal and Family Finance (3). Individual and family finance, with particular emphasis on financial planning, savings, insurance, investments, taxes and use of credit. Prerequisite: junior standing.

174 Selection of Home Equipment (3). Fundamental principles of selection and operation of home equipment.

175 The Consumer in Our Society (3). The economic system and the marketplace from the consumer point of view; consumer problems, protection, representation. Prerequisites: sophomore or above standing and 3 to 5 hours Economics.

178 Community Agencies (1). Required for all majors in Family Economics and Management.

300 Problems (cr. arr.) Supervised and independent work. Prerequisites: a 100- or 200-level course in field of problem & senior standing & instructor's consent.

318 Topics (cr. arr.) Selected current topics in field of interest.

350 Readings (cr. arr.) Prerequisite: 2-3 hours in subject.

355 Recent Trends (1-2). For upperclass and graduate students who wish additional knowledge and understanding in specific subject matter areas.

370 Housing the Family (3). Planning housing for families; emphasis on family composition, interests, activities, socioeconomic status. Consideration of environment, plans and space requirements which promote efficient utilization of family resources for attainment of maximum satisfactions. Prerequisite: junior standing.

372 Family Values and Resource Management (2). Consideration of differing value systems of families, impact of values on family resource allocation, and resulting life styles. Effects of mass media and current social movements on values. Prerequisites: junior standing & 72; 173 recommended.

373 Financial Problems of the Individual and Family (3). Individual, family problems involving finances. Analysis of financial planning, saving and investment media, credit, taxes, insurance. (No credit for students who have completed 173.) Prerequisite: graduate standing.

374 Use and Care of Home Equipment (3). Experience in use and care of appliances for food preparation, laundering, cleaning. Prerequisites: 174 & a foods course. Recommended: a textiles course.

375 The Consumer and the Market (3). Economic systems and role of consumers; marketing practices; consumer behavior, problems, legislation. (No credit for students who have completed 175.) Prerequisites: graduate standing, introductory economics.

376 Management of Financial Resources (3). Analysis of elements and principles of family finance, with application to case problems, impact of general economic conditions on families; principles and processes of financial counseling. Prerequisites: 173 or 373 & an introductory economics course.

377 Economics and the Consumer (3). Consumption as an economic activity; theory of consumer choice; consumer implications of various market structures; economic policies affecting consumer interests. Prerequisite: 175 or 375.

390 Field Training (cr. arr.) Prerequisites: junior standing & instructor's consent.

400 Problems (cr. arr.) Prerequisites: 300-level course in field of problem & instructor's consent.

410 Seminar (1-4). Reports and discussion of recent work in area of concentration.

412 Research Methods in Family Economics (3). Introduces the scope, purpose and methods of research in family economics, with emphasis on economic survey methods. Prerequisites: graduate standing, an introductory course in statistics (Sociology 375 or Statistics 207).

415 Readings (cr. arr.)

418 Topics (cr. arr.) Selected current topics in field of interest.

419 Field Training (cr. arr.) Internships and/or field experiences under supervision. Prerequisites: graduate standing & instructor's consent.

450 Research (cr. arr.) Independent research not leading to a thesis. Report required.

473 Family in the Economy (3). Analyzes the family as an economic unit. Standards, levels of living. Examines determinants, significance of family income and wealth. Policies and programs affecting family income. Prerequisites: graduate standing; 376 & 377; introductory economics.

475 Human Resource Development and Allocation (3). Economic analysis of conditions, programs and policies related to development and use of human resources, with special reference to impact on families and households. Prerequisites: introductory economics; 473 or instructor's consent.

476 Social Policy and the Family Economy (3). Economic analysis of public programs that directly affect well-being of families; income maintenance, goods transfers, employment, housing, health transportation, taxes, etc.; consideration of underlying philosophies, policy alternatives. Prerequisite: 377 or instructor's consent.

477 Food Economics (3). U.S. and world food supply and population situations. Factors affecting food consumption and expenditures. Analyzes U.S. and international food programs. Prerequisites: introductory economics; 377 or intermediate course in general or applied economics.

490 Research (cr. arr.) Independent research leading to thesis or dissertation.

Housing & Interior Design

40 Principles of Environmental Design (3). Lecture. Basic principles, elements, physical properties and history of design as they relate to interiors, housing, and the community.

41 Design I (3). Studio experience. Two dimensional aspects of visual composition: space, line, form, texture; emphasizes properties of color. Prerequisite or corequisite: 40 or equivalent.

42 Design II (3). Studio experience in three-dimensional concepts. Construction in paper, wood, plastics, light metals, plaster and other materials to promote understanding of space and form. Prerequisite: 40, 41 or equivalent.

140 Residential Interiors I (3). Interior space planning, furniture arrangement and selection, with emphasis on color, fabrics and accessories. Floor plans, elevations and/or models. Prerequisite: 40, 41 or equivalent (Mechanical & Aerospace Engineering 20 for majors).

141 Architectural Design I (3). Man's intimate environment and shelter with emphasis on life style patterns. Investigates components, materials and space enclosures relative to human scale and habitability. Prerequisite: 140.

142 Construction Techniques for Interior Components (3). Lab study of the techniques and technologies in furniture design and construction. Prerequisites: 41, 42.

147 Presentation Graphics (3). Interior perspectives and presentation techniques. Prerequisites: 40, Mechanical & Aerospace Engineering 20.

148 Design III (3). Advanced studio experience in interior perspective and presentation techniques. Prerequisite: 147.

149 Contract Design I (3). Contract design procedures, singular spaces, public environment; emphasis on problem solving, data gathering, resource research, studio procedures in layout, verbal and graphic presentation technique, construction drawings. Prerequisite: 140.

300 Problems (cr. arr.) Supervised independent work. Prerequisites: 200-level course in field of problem & junior or senior standing & instructor's consent.

318 Topics (cr. arr.) Selected current topics in field of interest.

340 History of the House and Its Furnishings (3). Historic residential architecture, interior treatment and furnishings. Prerequisites: Art History & Archaeology 10 & junior or senior standing.

341 Computer-Graphic Applications to Design (3). Introduces applications of computer graphics to design and art; includes previsualization, drafting and creative development. Using a variety of program packages for graphic output, pure and applied design will be generated. Prerequisite: junior standing.

342 Residential Interiors II (3). An in-depth interior design experience involving residential clients, with emphasis on business procedures and resources, including consultation, design solutions and presentations. Prerequisite: 149.

343 Contemporary Designers (3). Historical survey of contemporary designers and craftsmen. Interviews, studio visits, discussion with practicing designers and craftsmen. Prerequisites: Art History & Archaeology 10 & junior or senior standing.

344 Architectural Design II (3). Design of architectural projects influenced by form and function within the dictates of zoning and codes. Critique of projects by architects or by other professionals. Prerequisite: 149.

345 History of Textiles (2). Textiles from earlier periods to present day. Prerequisite: junior or senior standing.

346 Contract Design II (3). Contract design and specification procedures relative to multiple spaces, public environment. Advanced problem solving on specific projects related to business and the community. Advanced graphic and presentation procedures, team projects. Prerequisite: 149.

347 Design Techniques for Environmental Components I (3). Studio experience in designing environmental art for specific locations. Prerequisite: 141.

348 Design Techniques for Environmental Components II (3). Studio experience in the design of components for environmental spaces with emphasis on fabrics, floor coverings and wall coverings. Prerequisites: 141, 148.

349 Housing Fundamentals (3). Documentary film study of U.S. housing and the social and technological factors that influence housing design. Housing viewed as an accommodation for human life. Prerequisite: junior standing.

350 Readings (cr. arr.) Readings in recent research materials. Prerequisite: graduate standing.

355 Recent Trends (1-2). For upperclass and graduate students who wish additional knowledge and understanding in specific subject matter areas.

390 Field Training (cr. arr.) Field experience in design under professional and educational supervision. Prerequisites: advanced standing & instructor's consent.

400 Problems (cr. arr.) Prerequisites: 300-level course in field of problem & instructor's consent.

410 Seminar (1-4). Reports, discussion of recent work in area of concentration.

412 Research Methods in Housing and Interior Design (3). A comparative case study of classic and current studies in housing and design, with emphasis on research results and methodologies employed. Lectures and seminar discussions. Prerequisite: 12 hours advanced design.

415 Readings (cr. arr.) Readings in recent research materials. Prerequisites: graduate standing, 350.

418 Topics (cr. arr.) Selected current topics in field of interest.

441 Advanced Interior Design (4). Design of modern functional interiors; modern adaptations of historic material; design for residential and professional establishments. Prerequisites: 342, 346 & instructor's consent.

446 History of Accessories in Interior Design (3). Historic study of decorative arts (pottery, china, glass, metal-work, etc.). Prerequisites: 340 or equivalent; 345 & 6 hours art history.

450 Research (cr. arr.) Independent research not leading to a thesis. Research project and report required.

490 Research (cr. arr.) Independent research leading to thesis or dissertation.

Human Nutrition, Foods & Food Systems Management

21 Elementary Food Preparation (3). Lab course. Emphasizes principles of selection, preparation, combination of foods.

38 Introduction to Dietetics (1). Introduction to concepts of the roles of a dietitian and various settings in which these roles are performed.

121 Principles of Food Preparation (5) (same as Food Science & Nutrition 121). Scientific principles underlying selection and preparation of food. Lecture & lab. Prerequisite: Chemistry 1 or Chemistry 11 or equivalent.

122 Food Buying and Meal Management (2 or 3). Factors affecting cost of food. Applies principles of food buying and food preparation to menu planning, meal preparation and service. Prerequisite: 21 or 121.

130 Nutrition in Health (3). Food nutrients essential for good health; emphasis on food sources, their selection for adequate diet. Cannot be taken concurrently with 234.

131 Basic Concepts of World Nutrition (3). Cultural approach to nutrition, interrelating biological, sociological, economic, geographical and psychological aspects of man's diet.

132 Experimental Laboratory Animal Nutrition (3). Students design and conduct experiments in such areas as vitamin, mineral and protein nutrition. Prerequisite: instructor's consent.

221 Science of Food Preparation (3). Principles of food preparation as related to chemical and physical properties of foodstuff. Prerequisite: 121, organic chemistry.

224 Meat Selection and Identification (3) (same as Food Science & Nutrition 224).

228 Principles of Food Systems Management (3 or 4) (same as Food Science & Nutrition 228). Organizational structure and relationships; policy making and implementation; budgeting and cost control; menu as a management tool; sanitation and safety; food preparation; and food delivery systems. Prerequisite: 121, Biological Sciences 212 or Microbiology 205.

234 Human Nutrition I (3). Only 1 hour credit if student has completed 130 or equivalent. Basic concepts of nutrition with application to patient-centered nutritional care. Prerequisite: organic chemistry & physiology or instructor's consent.

235 Nutrition Education (3 or 5). Concepts and techniques used in nutrition education. Five hours include guided experience for medical dietetic students in application, analysis and evaluation of knowledge in the professional environment. Prerequisite: 234, sociology, psychology or instructor's consent.

236 Evaluation of Nutritional Status (3). Application of methods of evaluating nutritional status and development of nutritional care plans for hospitalized patients. Prerequisite: 235.

238 Diet Therapy for Health Professionals (2 or 3). Disease processes and principles underlying diet therapy. Guided experience in planning, delivering and evaluating dietetic care. Prerequisite: 234.

300 Problems (cr. arr.) Library or lab; problems selected for study by student with guidance of staff member. Prerequisites: 200-level course in field of problem & senior standing & instructor's consent.

- 318 Topics (cr. arr.)** Selected current topics in field of interest.
- 320 Cultural Food Patterns (2).** World food patterns including their nutritional significance. Applies scientific principles to preparation of these foods. Lecture & lab. Prerequisite: 21 or 121.
- 321 Experimental Foods (3).** Introduces scientific method of problem solving with food. Group and individual research. Prerequisite: 221 or instructor's consent.
- 322 Food Experiences for Children (3).** A combination of food and nutrition concepts with laboratory experiences for teaching the child, followed by planning and developing materials and activities for teaching these concepts to children. Prerequisite: junior standing.
- 323 Modern Methods of Food Preservation (3).** Survey of literature and lab work on improvements in traditional methods and new methods of home food preservation. Prerequisites: 121 & organic chemistry.
- 324 Food Procurement and Production in Foodservice Systems (5).** A lecture and lab course to meet entry level management competencies in food procurement, quality food production and food microbiology. Prerequisites: 121, 228 & instructor's consent.
- 325 Management of Food Procurement and Production in Foodservice Systems (4).** Lecture-practicum course meeting entry level management competencies for quality food attributes, nutritional applications, organizational components, personnel administration, materials management. Prerequisites: 324 & senior standing in Food Systems Management.
- 326 Development, Utilization and Maintenance of Physical Resources (2 or 4)** (same as Food Science & Nutrition 326). Systems approach to planning and team approach to layout of facilities; preparation of specifications for equipment. Prerequisite: 325.
- 327 Operations Analysis in Food Systems (2 or 4)** (same as Food Science & Nutrition 327). Application of concepts of quantitative methods of management science to optimize decisions concerning policies, design and procedure for control and evaluation of food systems. Prerequisite: 228, Computer Science 104 or Computer Science 203.
- 328 Management of Food Systems (1-8).** Principles of organization/management in various facilities; staff responsibility experiences; independent study; bimonthly joint conference with medical dietetic majors, emphasizing mutual concerns. Prerequisites: 325, 327; senior standing in FSM CUP. Majors only take 8 hours.
- 330 Child Nutrition (3)** (same as Child & Family Development 330). Applies nutrition principles to feeding of children from infancy through adolescence. Prerequisite: a course in nutrition.
- 333 Human Nutrition II Laboratory (1).** A techniques course in nutrition, usually taken concurrently with 334. Prerequisites: 234, biochemistry & instructor's consent.
- 334 Human Nutrition II Lecture (3).** Physiological and biochemical aspects of nutrition; functions of nutrients; methods of measuring nutritional status; various aspects of applied nutrition. Prerequisite: 234, biochemistry, or instructor's consent. Continuation of 234.
- 335 Nutrition During the Life Cycle (3)** (same as Nutrition 335). Nutritional, physiological and environmental influences on the aging process of man from conception through senescence. Prerequisite: 334 or equivalent.
- 338 Diet Therapy (3 or 6).** Physiological and biochemical anomalies of disease and the principles underlying diet therapy. Six hours include guided experience for medical dietetic majors in nutritional care of selected patients. Prerequisite: 334 or instructor's consent.
- 339 Medical Dietetics (3 or 12)** (same as Nutrition 339). Applies concepts of sciences, humanistic studies and dietetics to planning, evaluating and administering the nutritional care of people. Prerequisite: 338 or instructor's consent. Only medical dietetics majors may take 12 hours.
- 350 Readings (cr. arr.)** Prerequisites: 8 hours of course work in field of subject & instructor's consent.
- 355 Recent Trends (1 or 2).** For upperclass and graduate students who wish additional knowledge and understanding in specific subject matter areas.
- 375 Sensory Analysis of Food (3)** (same as Food Science & Nutrition 375).
- 376 Microwave Heating of Food (2)** (same as Food Science & Nutrition 376).
- 390 Field Training (cr. arr.)** Prerequisites: junior or senior standing & instructor's consent.
- 400 Problems (cr. arr.)** Prerequisite: instructor's consent.
- 410 Seminar (1-4).** Reports and discussion of recent work in area of concentration.
- 412 Research Methodologies for Food Systems Management (2).** An overview of research methodologies for food systems management; emphasis on the logistics of performing graduate research. Prerequisite: graduate standing in Food Systems Management or instructor's consent.
- 415 Readings (cr. arr.)** Prerequisites: graduate standing with 15 hours Human Nutrition, Foods & Food Systems Management & instructor's consent.
- 418 Topics (cr. arr.)** Selected current topics in field of interest.
- 419 Field Training (cr. arr.)** Internships and/or field experiences under supervision. Prerequisites: graduate standing & instructor's consent.
- 421 Advanced Experimental Foods (3).** Further development of the concepts and experience in planning, conducting, interpreting and reporting food preparation research. Prerequisites: 321 & statistics at 200 level.
- 428 Advanced Food Systems Management (3).** Intensive study of the application of current management concepts and management science techniques to financial and professional accountability in food systems. Prerequisite: graduate student in Food Systems Management or instructor's consent.
- 431 Nutritional Perspectives (3).** Surveys various factors relating to man's food habits and nutritional status; emphasis on national and international nutrition problems. Prerequisite: a course in nutrition.
- 432 Nutritional Integration of Metabolism (3).** Discusses mammalian metabolism; emphasizes relationships between nutrient intake and biochemical and physiological events occurring in cell, organ and whole organism. Prerequisites: 334 & advanced biochemistry.
- 433 Methods of Nutrition Research (3).** Work in various methods and techniques used in nutrition research. Prerequisite: Biochemistry 270 or equivalent.
- 436 Advanced Nutrition (3).** Lecture-discussion of current and classical literature, emphasis on normal nutrition. Prerequisite: 334 or instructor's consent.
- 450 Research (cr. arr.)** Independent research not leading to a thesis. Report required.
- 490 Research (cr. arr.)** Independent research leading to thesis or dissertation.

Home Economics Extension
(See Extension Education)

Home Economics Rehabilitation (See Family Economics & Management)

Horticulture

10 Landscape Appreciation (3). Open to all students. An inquiry into the quality of natural and man-planned landscapes. f,w.

20 Basic Home Horticulture (3). Discussions and scientific rationale of the current cultural practices for the growing of home horticultural plants. f,w.

30 Plant Science (5) (same as Agronomy 30).

60 Flower Arranging (2). Flower care, arrangements. Applies design principles to floral decorations for all occasions; interior decoration with plants. f,w.

150 Micro-Environmental Design (3). Interprets natural environments into the design, construction and maintenance of miniature landscapes. f,w.

151 Plants for Interior Design (2). Plants adaptable to or capable of becoming acclimated to interior environments. f.

160 Garden Flowers (3). Annuals, biennials, perennials, bulbs, house plants, water plants; their identification, nomenclature classification, culture, uses. w.

201 Ornamental Woody Plants I (3). Identifies and evaluates trees and coniferous evergreens for landscape use. Prerequisite: 30 or Biological Sciences 1, 12 or 21. f.

202 Ornamental Woody Plants II (3). Identifies and evaluates shrubs, vines and ground covers for landscape use. Prerequisite: 30 or Biological Sciences 1, 12 or 21. w.

203 Plant Propagation (3). Principles, practices of propagation of horticultural plants. Prerequisite: 30 or Biological Sciences 12. f,w.

204 Plant Environments (3). Effects of water, light, temperature and gases upon growth and physiology of plants; their control in plant production. f.

205 Plant Nutrition (3). Nutrient element requirements of horticultural crops. Detection of deficiencies; correction through management, fertilizer practices. Prerequisites: Agronomy 30 & Chemistry 1, 5 or 11. w.

206 Plant Protection (3). Control measures for diseases, insects, weeds and other pests of horticultural crops. Prerequisites: 30 & Entomology 101, or instructor's consent. w.

207 Plant Origin and Development (3). Traces development of horticultural plants by civilization from centers of origin to present, continuing improvement by modern methods of plant breeding. Prerequisite: 30 or Biological Sciences 12. w.

250 Landscape Graphics (3). Techniques of perspective and tools for man-inhabited spatial design. f,w.

252 Planting Design I (3). The art and science of plant selection based on aesthetic and environmental determinants, functional and visual requirements and expected maintenance. Prerequisites: 201, 202 & 250. w.

254 Landscape Design (3). Historical overview of the human and environmental relationships with respect to design on the land. Prerequisite: sophomore standing. f,w.

255 Landforms (3). Basic site engineering correlating design and technical aspects of site development and suitability. Prerequisite: Geology 1 or 2. f.

257 Construction Materials (3). Physical and aesthetic properties of inanimate materials and structural designs commonly used to organize landscape spaces. Prerequisites: 250 & Mechanical & Aerospace Engineering 20. f.

266 Plant Forcing Structures (2). History of plant forcing structures; location, arrangement; structural parts, erection, heating, ventilation; repair, maintenance. alt. f. odd yrs.

268 Floral Design (3) (Commercial Floristry). Principles and practices in commercial floral designing of corsages, gift arrangements, memorial tributes, wedding and party decorations. Prerequisites: 60 & Art 2 or Art 55, or instructor's consent. f. even yrs.

269 Flower Store Management (3). Organization, store layout, policies and application of principles of marketing and business management to the operation of a retail flower shop. Prerequisites: 268 & Marketing 204. w.

272 Planting Design II (3). Spatial arrangement, understanding, compatibility, aesthetics and perceptual qualities of planting design. Prerequisites: 250 & 252. f.

300 Problems (cr. arr.) Prerequisite: consent card required.

301 Post-Harvest Physiology (3). Physiological processes occurring after harvest in flowers, fruits, vegetables, nursery stock; control of preservation of quality. Prerequisite: 204. f. even yrs.

330 Fruit Production (5). Advanced study of fruit industry; emphasizes production, management of deciduous tree, small fruit enterprises. Prerequisites: 203, 204, 205, or instructor's consent. f. odd yrs.

344 Commercial Vegetable and Truck Crop Growing (5). Advanced study of commercial vegetable enterprises including growing areas, management, production problems, practices. Prerequisites: 204 & 205 & 206, or instructor's consent. f.

345 Vegetable Forcing (3). Specific problems encountered, practices employed in production of lettuce, tomatoes, mushrooms in forcing structures. Prerequisites: 204 & 205 & 206, or instructor's consent. w. odd yrs.

350 Landscape Graphics Communication (3). Experimentation with various techniques and media of graphics. Prerequisites: 254 & 272; instructor's consent. w.

352 Planting Design III (4). Project-oriented planting design studio providing plans for projects. Prerequisites: 250, 254 & 272. w.

354 Advanced Landscape Design (4). Development of project presentation techniques by analysis of the social, cultural, historical and ecological aspects of landscape design. Prerequisites: 352 & instructor's consent. f.

355 Turf (3). Characteristics of turf materials, principles of establishment and maintenance. Prerequisites: 204 & 205 or instructor's consent. w.

357 Nursery Crop Production and Management (4). Operations, methods used by wholesale, retail, landscape nurseries. Field problems, observational trips. Prerequisites: 203 & 204. f.

361 Fall Greenhouse Crops (4). Business management problems of a commercial greenhouse range; culture of commercial cut flowers and potted plant crops. Prerequisites: 203 & 204 & 205 or instructor's consent. f.

362 Spring Greenhouse Crops (4). Continuation of 361. Production management problems and commercial culture of spring cut flowers and potted plants. w.

390 Horticulture Internship (3). Through practical work experience, under the direct supervision of an academic adviser and a horticulture business manager, a student develops and applies knowledge of horticulture. A student should consult an academic adviser for internship details. Prerequisites: junior standing, adviser's consent. f,w,s.

402 Topics in Horticulture (cr. arr.) Discusses highly specialized topics in the field of horticulture. Prerequisites: graduate standing & consent card required.

406 Plant Growth Regulating Substances (3). Chemistry, physiology and practical applications of plant growth regulating substances in the development of plants. Prerequisites: Biological Sciences 313 & 6 hours organic chemistry. w.

407 Breeding of Horticultural Plants (cr. arr.) Literature and original investigations on breeding, selection of horticultural plants. Prerequisites: graduate standing; Agronomy 179 or Biological Sciences 202 & 341, & instructor's consent. f,w.

408 Nutrition of Horticultural Plants (3). Important nutrient elements; their absorption, utilization. Prerequisite: 205 or equivalent. f. odd yrs.

410 Seminar (1). Recent investigations in horticulture and related fields. f,w.

415 Methods of Horticultural Research (3). Methods of procedure in investigations, outlining problems; assembling and analyzing data; presenting results. alt. f. even yrs.

444 Advanced Olericulture (3). Physiological factors affecting growth, harvesting, storage of vegetable crops. Survey of fundamental literature. Prerequisites: graduate standing, 344, 345. w.

450 Non-Thesis Research (cr. arr.) Prerequisite: consent card required.

490 Research (cr. arr.)

Housing & Interior Design (See Home Economics)

Human Nutrition, Foods & Food Systems Management (See Home Economics)

Humanities

101 Humanities (3) f; 102 (3) w; 103 (3) f; 104 (3) w (same as General Honors GH101, GH102, GH103, GH104). Four-semester sequence providing unified introduction to literature, philosophy, visual arts, religion. Selected masterpieces in these fields, from Homer to present day, studied for intrinsic values and significance in development of Western civilization. It is strongly urged, though not required, that the entire four-course sequence be taken, and in order. Lectures and reading assignments are identical to Honors sections of this course. Written work varies.

Independent Study Courses (Through Correspondence Instruction)

Many of the graduate and undergraduate courses listed in the various departments are also offered by correspondence instruction. Such courses are marked in this catalog with the abbreviation cor. and are available in the following subject matter areas:

Accountancy
Agricultural Economics
Anthropology
Classical Studies
Curriculum & Instruction
Economics
Education
Educational Psychology
English
Entomology
Extension Education

Family & Community
Medicine
Finance
Food Science & Nutrition
French
Geography
Geology
Health & Physical
Education
Health Services
Management
History
Journalism
Management
Marketing
Mathematics
Political Science
Poultry Husbandry
Psychology
Recreation & Park
Administration
Religion
Romance Languages
Rural Sociology
Sociology
Spanish
Special Education
Statistics

High School and non-credit courses are also available.

For information write the Center for Independent Study through Correspondence, 514 South Fifth Street, Columbia, Missouri 65211.

Industrial Engineering

17 Experimental Course. For freshman-level students. Content and credit hours to be listed in *Schedule of Courses*.

117 Experimental Course. For sophomore-level students. Content and credit hours to be listed in *Schedule of Courses*.

281 Industrial Systems Design I (3). Sequence of simple systems design problems. Several numerical analysis techniques integrated into the design problems. Opportunities provided for building skill in computer programming. Prerequisite: a course in introductory computer programming.

300 Problems (1-4). Supervised investigation in industrial engineering presented in form of engineering report.

301 Topics in Industrial Engineering (3). Current and new technical developments in industrial engineering.

307 Operations Research Methods (3). Quantitative methods necessary for analysis, modeling and design of optimal industrial systems. Prerequisite: Math 175.

337 Reliability I (3). Use of Boolean algebra in design and analysis of complex engineering systems. Reliability of system in terms of component reliabilities. Poisson process as basic failure model. Life testing techniques. Maintainability. Reliability demonstration procedures. Prerequisite: 339 or equivalent.

339 Evaluation of Engineering Data (3). Use of statistical methods to aid in analysis and interpretation of simple engineering experiments and surveys. Sampling procedures, estimation, testing of hypotheses. Linear and nonlinear relationships. Introduces multivariate situations. Prerequisite: Math 175.

340 Experimental Design (3). Principles and procedures of design and analysis of engineering experiments and sampling surveys. Prerequisite: 339.

349 Engineering Quality Control (3). Analyzes quality in manufacturing; design of quality control systems using statistical and other engineering methods. Prerequisite: 339 or equivalent.

351 Plant Layout and Materials Handling (3). Facilities arrangement and economic selection of materials-handling equipment in a plant or office. Emphasizes optimization of materials and information flow. Prerequisites: 358, 360, 361.

358 Economic Studies in Engineering (3). Engineering economy models for evaluating alternatives in design, selection, use of system components.

360 Measurement of Human Work (3). Methods of measuring human performance in work systems. Emphasis on techniques used in developing standard allowed times. Introduces measuring physiological parameters in work systems. Prerequisite: Engineering 132 or equivalent.

361 Introduction to Human Factors Engineering (3). Examines problems and processes involved in designing man-machine systems considering capabilities and limitations of human component.

376 Survey of Operations Research Models (3). Introduces queueing models, competitive games, replacement models, inventory models, scheduling models, and network theory. Prerequisite: Engineering 132 or a course in introductory probability.

381 Industrial Systems Design II (3). Series of industrial systems design problems, each structured to integrate material presented in several theory or methods courses. Prerequisite: senior standing.

382 Industrial Engineering Seminar (1). Selected topics in industrial engineering. Oral presentations and engineering reports. Prerequisite: junior standing in department.

383 Management Information Systems Design (3). Review of management and organizational structure and theory, concepts of information and data structures, transaction processing, computer hardware, software, and telecommunications considerations. Prerequisite: junior standing in Industrial Engineering or instructor's consent.

384 Industrial Process and Distribution Control Systems (3). Use of computers information systems (including minicomputers and microcomputers) in controlling manufacturing and related processes. Distribution function including inventory, transportation. Prerequisite: junior standing in Industrial Engineering or instructor's consent.

385 Manufacturing Systems Design (3). Design project involving development, analysis and comparison of alternate methods of manufacturing a product. Extensive survey of a variety of manufacturing methods included.

387 Linear Programming (3). Theory and application of linear programming.

388 Industrial Systems Simulation (3). Construction of simulation models: methods of generation of stochastic variates, time incrementation, verification. Design of simulation experiments; use of special purpose simulation language. Prerequisites: 339 or course in introductory computer programming & course in introductory statistics.

397 Operations Research Models (3). Formulates mathematical models and determines optimal policies for inventory, replacement, competitive and queueing systems. Introduces dynamic programming. Prerequisite: Engineering 132 or a course in introductory probability.

398 Scheduling Systems (3). Quantitative methods for forecasting, scheduling and controlling production in complex manufacturing systems. Prerequisite: Math 80.

400 Problems (cr. arr.) Supervised investigation in Industrial Engineering to be presented in the form of an engineering report.

401 Advanced Topics in Industrial Engineering (3). Current and new technical developments in industrial engineering.

404 Industrial Engineering Graduate Seminar (1). Selected topics in industrial engineering. Oral presentations and engineering reports.

405 Research Methods in Industrial Engineering (1). Development of research approach. Selection of topic area, including techniques of literature search with special emphasis on problem definition. Topics pertinent to planning, organizing and carrying out industrial engineering research or design project.

408 Management of the Engineering Function (3). Design of procedures for the planning, evaluation and control of the engineering function. Analysis of alternative management styles and operational policies. Prerequisite: 411.

411 Scientific Management (3). Theory and basic principles of scientific management in engineering. Writings of Taylor, the Gilbreths, Gantt and other pioneers of scientific management. Growth of modern industrial management from principles of scientific management.

415 Advanced Economic Studies in Engineering (3). Theoretical basis for engineering economy methods, problems of parameter estimation, depreciation and replacement studies.

431 Stochastic Service Systems (3). Develop and apply stochastic models in the design of service systems in which either the demands for service or the services supplied, or both, have a probabilistic nature. Prerequisite: Statistics 325.

432 Advanced Stochastic Service Systems (3). Operating characteristics of simple models; development and application of more complex models; special reference to group arrivals, batch service, priority disciplines. Prerequisite: 431.

437 Reliability II (3). Develops and applies quantitative models for planning and evaluation of the performance of engineering systems. Prerequisite: 337 or concurrent with Statistics 326.

439 Quality Control Systems (3). Design of acceptance sampling plans and quality control tests based upon the power function criterion and the Bayesian minimum cost criterion. Prerequisite: concurrent with Statistics 326.

440 Advanced Evaluation of Engineering Data (3). Application of advanced statistical methods for the analysis of engineering design and experimental problems. Prerequisite: 339.

460 Design and Measurement of Work Systems (3). Process of work system design, principles of alternative development and evaluation, testing and implementation of work systems, and measurement of system performance. Prerequisite: 339 or a course in introductory statistics.

461 Health Care Systems Design I (3). Health care systems design principles and major problems, basic organization within health care system, alternative system design strategies, factors affecting design process success. Prerequisite: Health Services Management 310 concurrently or instructor's consent.

462 Health Care Systems Design II (3). Solutions to specific health care systems design problems utilizing field work/case studies. Study areas, based on significance/existence of established methodologies, include nurse staffing, patient scheduling, procedure costing, blood banking, technology evaluation. Prerequisite: 461.

463 Disease Diagnosis and Treatment (3). Methods used/resources required in diagnosis/treatment across disease spectrum. Information for health care system designers on delivery system capabilities relative to health professionals/patients' needs. Prerequisite: 461 or Health Services Management 310.

465 Human Work Performance (3). Develops human performance theory, subjective and objective measurement of performance and their problems; effect of psychological and physiological factors on performance degradation. Prerequisite: 360.

468 Human Factors (3). Human factors inputs, outputs and environment and their influence on design and evaluation of man and machine systems. Prerequisite: 361.

470 Operations Research Applications (3). Applications of operations research methods including queueing, inventory, sequencing, competitive strategies, replacement and networks. Prerequisite: 339 or a course in introductory statistics.

471 Advanced Methods of Operations Research (3). Theory, computational methods and application to operations research models of continuous and discrete variable optimization. Prerequisite: 307 or a course in linear algebra.

472 Nonlinear Optimization (3). Introduces computational nonlinear mathematical programming procedures; their use in solving complex industrial systems design problems. Prerequisites: 387 & 471.

475 Inventory Control Systems (3). Design of optimal inventory control systems. Includes selection of operating doctrine, development of several deterministic, stochastic, static and dynamic models and methods of collecting appropriate demand and cost data. Prerequisites: 471 & Statistics 325.

480 Linear Programming Applications (3). Theory and computational method of the simplex algorithm. Applies linear programming in solution of transportation problems, competitive games, scheduling problems, product mix problems.

483 Advanced Management Information Systems Design (3). Develops requirements for management information, staffing, cost estimating, evaluation and the design of management communication systems. Includes case studies. Prerequisite: 383.

484 Dynamic Programming (3). Introduces theory and computational aspects of dynamic programming; its application to sequential decision problems. Prerequisites: 387 & 471.

487 Advanced Linear Programming (3). Advanced study of linear programming: revised simplex, duality, primal-dual methods, capacitated transportation problem, decomposition principle; introduces quadratic programming. Prerequisite: 387.

488 Integer Programming (3). Comprehensive appraisal of integer programming problem and current solution procedures. Prerequisites: 471 & 487.

490 Research (cr. arr.) Independent investigation in field of industrial engineering to be presented as a thesis.

Information Science

101 Computers in Library and Information Science (3). Introduces use of computers in bibliographical problems; thorough coverage of PL/I; emphasizes character string manipulation and logical operations, including Boolean operators. Course utilizes computer in an interactive mode. Prerequisite: junior standing, f, s.

300 Problems (cr. arr.) Individual work not leading to dissertation. Prerequisite: departmental consent, f, w, s.

301 Introduction to Information Science (3). Introductory survey to information science. Includes topics in the information transfer chain, spatial transfer of information, temporal transfer of information and information systems. w.

302 Information Systems I (3). Objectives, components, organization and performance of systems for transfer of information. Prerequisite or concurrent: 101 or equivalent, f, alt, s.

330 Computer Organization I: Design Fundamentals (3) (same as Computer Science 330).

400 Problems (cr. arr.) Special problems in information system design and evaluation, for individual directed study. Prerequisites: graduate standing & departmental consent, f, w, s.

401 Library Information Systems (3) (same as Library Science 401). Computer-oriented techniques for mechanizing non-numeric information processes, with emphasis on the library and on bibliographic record systems. Prerequisites: 302 & departmental consent, f.

402 Information Systems II (3). Continuation of 302. Information center management and planning; tools for decision making; measures for evaluation; client/information considerations. Prerequisites: 302 & graduate standing, or departmental consent, w.

410 Seminar in Information Science (1-3). Discussion and critical study of current developments in Information Science. Prerequisite: departmental consent, f, w.

412 Information Storage and Retrieval (3). Introduces student to those techniques and models which are currently topics of research in information science. Emphasizes techniques useful in an automated environment. Automatic indexing, automatic classification and bibliometrics included. Prerequisite: departmental consent, w, alt, s.

413 Abstracting and Indexing (3) (same as Library Science 413). Representational components of information systems presented in context; emphasizes creation of abstracts, and characteristics and use of post-coordinate indexing languages. Practical experience in use and evaluation of indexing systems stressed. Prerequisite: departmental consent, f, alt, s.

424 Micrographics and Libraries (3) (same as Library Science 424).

432 Automated Reference Services (3) (same as Library Science 432). General summary of available systems and their characteristics; particular emphasis on those available to the general library community. Machine searching experience with major brokers provided. Prerequisites: 101, 413, Library Science 332 & departmental consent.

441 Information Systems Resource Management (3) (same as Library Science 441). Use of bibliometric techniques for management decisions in effective utilization of resources of information systems. Intensive study of selected topics related to library and information center management. Prerequisites: Library Science 341 & departmental consent, w, alt, s.

Italian (See Romance Languages)

Journalism

History, Media & Society, Law

100 History and Principles of Journalism (3). History of the mass media in America, tracing the development from the colonial press through the complex mass media of today, f, w, cor.

300 Mass Media and Society (2) (same as Peace Studies 300). Introductory course designed to acquaint student with concepts and functions of journalism in American society. Stresses the basic issues and problems facing journalists and the mass media, f, w, s.

304 Communications Law (3). Legal limitations and privileges affecting publishing, advertising, broadcasting. Consideration of legal philosophy bearing on media of communication. Prerequisite: 104 or 105, f, w.

308 Law and the Courts (2). Lectures, readings, discussions, writing assignments relating to justice system reporting from the view of attorneys, prosecutors, judges, correction and probation officers, with the cooperation of the Missouri Bar. Prerequisite: 104 or 105. f,w.

390 History of Mass Media (3). Impact of the past as it affects today's media. Includes study of ethics, personnel, events, technological developments in newspapers, radio, television, photography, magazines. Project paper. Open to graduate students. Prerequisite: for undergraduates, instructor's consent. f.

International Journalism

302 The Foreign Press (2). Major press systems of the world; emphasis on the print media and differing journalistic concepts. Leading newspapers and magazines of the principal nations, with some consideration given to news agencies and broadcasting. f,s.

303 International Journalism (2) (same as Peace Studies 302). News facilities around the world, barriers in international communications, press problems of developed and especially of developing nations, and friction and understanding created by the press. w.

Reporting & Editing

104 News and Editing Practicum (4). Integrated instruction in fundamentals of news and editing for students entering graduate program, replacing 105 News and 110 Editing. f,w,s.

105 News (3). Typing skill of 35-40 words a minute is essential. Introduction to fundamentals of news writing. Lectures, discussions and lab work provide training under deadline pressure in writing basic news stories. Students cover several "live" assignments. f,w,s.

110 Editing (2). Prepare local and wire service articles and photographs for newspaper publication; headlines and cutlines; introduces newspaper design, and experience with video display terminals. Basics of editing copy for radio-television. Prerequisite: 105. f,w,s.

238 Basic Business Communications (3). Designed to improve communications skills of nonjournalism majors, especially business students. Overall business communications including advertising, public relations, employee and shareholder relations and community affairs. w.

306 Reporting (3). Assignments on a daily city newspaper covering community news, city, county and state affairs, sports, women's interest news. Experience in gathering and writing news, rewrite under day/night deadline situations. Prerequisites: 104 & 105. f,w,s,ss.

307 Advanced Reporting (3). Assignments to more difficult beat areas, team reporting, and some investigative reporting for community newspaper. Individual conferences and weekly class sessions on contemporary reporting problems. Prerequisite: 306.

310 Newspaper Editing (2). Lab work on *The Columbia Missourian* plus lectures on page make-up and news evaluation. Prerequisite: 110. f,w,s,ss.

311 Advanced Newspaper Editing (2). Continuation of desk editing plus the opportunity for qualified students to design pages for *The Columbia Missourian*. Seminars led by faculty supervisors. Prerequisite: 310. f,w,s,ss.

314 Basic Issues in the News (3). Current issues in journalism and American society discussed in seminar. Writing of and criticism of articles suitable for editorial page. Emphasis is on thorough research and on writing. Prerequisites: 306 or 353 and instructor's consent.

315 Reporting of Public Affairs (3). Designed to acquaint reporter with public issues. Each reporter writes three special papers and five news stories. Students meet weekly with instructor for editorial suggestions. Prerequisite: 307. f,w.

316 Science Writing (3). Reporting in field of science, including medicine and environment. Prerequisite: 307 or 360 & basic science courses or instructor's consent. f,w.

317 Reporting Local Government (2). Examines local government with the aid of local officials. Readings, lectures, discussions with city and county officials and with experts in such areas as welfare, criminal justice, education, medical care. f,w.

338 Business Journalism (3) (same as Finance 338, Management 338, Marketing 338). Advanced writing course concentrating on business, financial and regulatory news. Each student "invests" in the market, meets weekly with the instructor for editorial suggestions and attends evening seminars. Prerequisite: 306. f,w,s.

395 Area Seminar (3). Special lectures, readings, discussions relating to the urban journalism, state government reporting or local public affairs reporting programs. f,w,s.

Advertising

120 Advertising Principles and Practice (3). Prerequisite to all other advertising courses. Advertising fundamentals in relation to modern business activities. Two hours lab weekly. f,w,s.

320 Dynamics of Advertising (3). Survey of factors influencing advertising. Emphasis on the basic values, functions, procedures, evaluation and organization of advertising. Term paper. Prerequisite: instructor's consent. f,w,s.

321 Advertising Copy, Layout and Production (3). Application of product and market research to specific creative problems in advertising. Prerequisite: 120 or 320 & 336 or 336 concurrently. f,w,s.

322 Psychology in Advertising (2). Application of psychological principles, learning, perception, motivation, attitudes to advertising. Emphasis on the increasing use of psychographics (the "life style" factor) to understand consumer wants and buying behavior. Prerequisite: 120 or 320. f,w.

323 Advertising Salesmanship (3). Professional sales techniques, account service, advertising production, cooperative advertising, offset techniques, market data. Students assigned retail and classified accounts, for which they prepare, sell and service advertising. Prerequisites: 321 & 328. f,w,s,ss.

324 Advertising Campaigns (2). Marketing-oriented approach to the total campaign. Interrelates managerial, creative and technical skills, with emphasis on problem-solving and marketing communication. Prerequisites: 321, 330. w.

325 Media Promotion (2). Use of promotional tools and methods in relation to specialized promotion of media. Prerequisite: 104 or 105 & 120 or 320. f,w,s.

326 Broadcast Advertising (3). Broadcast advertising and its business and creative functions. Emphasis on research, creative strategies, script/storyboard preparation and presentation and commercial analysis. Familiarization with procedures, techniques and facilities used in production. Prerequisite: 321 or instructor's consent. f,w.

327 Direct and Mail Order Advertising (2). Direct mail advertising and mail order promotion, retail and national; mailing lists, copy, production, postal regulations, strategy. Prerequisite: 321. f.

328 Retail Advertising (2). Basic concepts of marketing, advertising, merchandising and salesmanship, as they apply specifically to the retail firm, the advertising agency handling retail clients, and media retail advertising departments. Prerequisite: 120 or 320. f,w,s.

330 Advertising Markets and Media (2). National manufacturers' advertising procedures and policies, markets, media, organizations of the advertising functions, with heavy emphasis on the part of the advertising agency. Prerequisite: 120 or 320. f,w,s.

331 Advertising Management (2). Methods for gathering, evaluating and organizing material pertinent to the solution of advertising problems. Uses case studies. Recommended to precede 324. f.

332 Public Relations (3). Current methods of dissemination of public information as practiced by business, industrial, educational and social organizations. Strong emphasis on what the public relations practitioner actually does, and why. Prerequisites: 104 or 105, 120 or 320. f,w.

334 International Advertising (2). Designed to help selected students develop the special capacity to utilize their advertising skills in organizing and preparing successful advertising programs in foreign markets. Prerequisites: 321 & instructor's consent. f,w.

336 The Graphics of Journalism (2). Introduction to the tools and practices involved in editing, designing and specifying graphic elements for print media. The origins, personalities and specifications of type, methods of composition and layout for newspapers and magazines. Prerequisite: instructor's consent. f,w,s.

364 Business Communications in Public Relations (2). The role public relations plays in business communications. Press relations, news releases, employee publications and internal communications, shareholder relations, financial public relations, public affairs and corporate social responsibility. Prerequisite: 332. f,w.

Photojournalism

140 Basic Press Photography (3). Introduction to news photography. Basic camera and darkroom techniques, placing emphasis on the development of sensitivity to people, circumstances and events. Prerequisite: instructor's consent. f,w,s.

144 Intermediate Press Photography (2). Advanced techniques and problems in visual communication. Lighting (existing, studio, electronic flash), special lenses and cameras, macrophotography, copying, formal and informal portraiture, composition, illustration, sequences. Prerequisite: 140. f,w,s.

341 Staff Photography (3). A lab course in news, feature in advertising photography for publication in *The Columbia Missourian*. Enterprise pictures are required in addition to assigned photo coverage. Prerequisite: 144. f,w,s,ss.

342 Photojournalism (4). Production of picture stories/essays for newspapers and magazines: research, photography, text, layout and camera-ready mechanicals. Study of past and present in photojournalism with emphasis on contemporary publications, photographers, editors and designers. Prerequisite: 341. f,w,s.

Editorial Writing

352 Editorial Writing (3). Emphasizes writing and thinking. Discussion of current problems. Correct and effective use of English language. Mission, obligations and history of editorial pages. Students write editorials for *The Columbia Missourian*. Prerequisite: 306. f,w,s.

354 Editorial Page Direction (2). Emphasis on quality and conscience, and assuming responsibility. Policy, art, letters to editor, columns, cartoons, relations with newsroom. Laboratory work on *The Columbia Missourian*. Prerequisite: 352 or instructor's consent. f,w,s,ss.

Radio-Television

101 Introduction to Broadcast News (2). Introduction to broadcast news, the use of audiotape and videotape equipment, film cameras, film editing, and the ethics and responsibilities of broadcasting. Prerequisite: instructor's consent. f,w,s.

351 Television News Photography (2). Application of videotape recorders, sound and silent film cameras, and electronic and film editing equipment in preparation of television news stories for KOMU-TV. Prerequisite: 358 and instructor's consent. f,w,s.

353 Broadcast Reporting (3). Instruction in principles, ethics and techniques of gathering information, writing, and using film, videotape and audiotape in reporting news for radio and television. Prerequisite: 101. f,w,s.

355 Radio Reporting and Editing (3). Writing, reporting and editing newscasts. News beat and general assignment reporting; writing, producing and broadcasting news programs on KBIA; discussion of principles and techniques of radio news. Prerequisite: 353. f,w,s,ss.

356 Television News Production (3). Instruction in techniques of television newscast preparation and the work of the director and production crew in its presentation. Emphasizes role of television news producer. Prerequisites: 358 and instructor's consent. f,w,s.

357 Station Management (3). Broadcast administration, market analysis, policy determination, station organization, sales collections, programming, network relationships, community involvement, labor and FCC. Lab work at KBIA, KOMU-TV and other area stations. Prerequisite: 101 or instructor's consent. f,w.

358 Television Reporting and Editing (3). Study of problems in reporting and editing news stories for television broadcasts on KOMU-TV. Emphasis on use of electronic news gathering equipment, film cameras, writing and editing news stories. Work at KOMU-TV. Prerequisite: 353. f,w,s,ss.

359 Television Seminar (3). Deals with station policy, employee relationships, program analysis, ratings, counter-programming, community involvement, FCC, law, financial structuring, sales improvement, industry developments and network negotiations. Prerequisite: 101 or instructor's consent. Same as 459.

382 Broadcast Public Affairs (3). Investigative, in-depth reporting through radio and television. Emphasis on research, writing, interviewing and effective use of audiotape, film and videotape and other visual techniques for presentation on KOMU-TV and KBIA. Prerequisites: 355 or 358 and instructor's consent. f,w,s.

383 Television Documentary (3). Advanced use of sound camera and editing techniques in preparation of television documentaries and feature stories. Students must bear all production costs for films produced. Prerequisite: instructor's consent. f,w.

Magazine

305 Critical Reviewing (2). Book, movie, theatre and television reviewing. Reviews published in *Vibrations*. Prerequisites: 104 or 105 & instructor's consent. f,w,s.

360 Feature and Special Articles (3). Emphasis on finding the story behind the story under deadline pressure. Six weekly assignments; eight assignments with a 24-hour deadline; one major series assignment. Prerequisites: 306 & instructor's consent. f,w,s.

361 Magazine Article Writing (3). Each student writes six articles (three 1,000 words, two 2,000 words, one 3,000 words) for publication in *Vibrations* or in other magazines. Also, three queries must be made and three of the articles must be mailed to magazines. Prerequisites: 306 & instructor's consent. f,w,s.

362 Magazine Production (3). Introduction to typography of magazines from manuscript mark-up through layout to page proof. Extensions and limitations of typography are considered in light of current practice and economic possibility. Prerequisite: 336. f,w,s.

363 Magazine Editing (3). Review of grammar, punctuation, style rules; measuring articles, copy fitting; writing captions, titles; editing, proofreading, condensing, re-writing magazine articles. Prerequisites: 110, 306. f,w,s.

365 Advanced Magazine Writing and Editing (3). Editing, copy reading, cutline/headline writing, decisions on articles, etc., on *Vibrations* and on other magazine projects. Staff meeting and 9 hours lab weekly. Prerequisites: 361, 363, & instructor's consent. f,w,s,ss.

366 Magazine Layout (2). Continuation of 362. Class critiques of spreads, sequences and magazines are implemented by students who make typographic specifications and lay out individual spreads, and complete magazines for actual printed production. f,w,s.

367 American Magazine History (2). Review of American magazines with the major emphasis on contemporary publications. Project papers present analysis of today's magazines. w.

368 Magazine Publishing (2). The audience, economics, job opportunities and content of the American magazine. Deals with general audience and specialized magazines, business and institutional magazines, news magazines, etc. Case histories of individual magazines, guest lectures from various fields. w.

Newspaper Publishing

373 The Community Newspaper (3). The role of the newspaper in the community. Handling of news categories especially applicable to smaller newspaper. Field trips giving students experience in publishing newspapers in the state. Prerequisites: 104 or 105 & instructor's consent. w.

374 The Suburban Press (2). Examines the operation, management and news practices of America's suburban press. Emphasizes unique qualities, problems and advantages of suburban newspapers and the communities and governments they serve. Prerequisite: 104 or 105. f,w.

375 Newspaper Management (2). Organization, accounting methods, personnel, rate structures, equipment, production, laws and regulations of concern to newspaper management. Prerequisite: 120 or 320.

376 Newspaper Circulation and Marketing (2). The role of circulation in developing and maintaining newspaper readers. Marketing concepts, sales promotion, readership research. Laboratory work in the circulation department of *The Columbia Missourian*. Prerequisites: 120 or 320 & instructor's consent. f,w.

General Courses

112 Communications Practice (1-2). Special lab instruction for seniors in various departments of the School's media. Enrollment must be completed in office of the Dean, with permission of instructor. f,w,s,ss.

113 Internship (2). Credit for approved summer employment in journalism. Specifications for this course appear in the *Journalism Bulletin*. f,w,s.

189 Senior Assembly (0). A required course for all candidates for the B.J. A survey of opportunities and problems of the young professional journalist. Should be taken the second semester before graduation. Graded S/U only. f,w,s.

199 Problems (1-3). For undergraduates only. Individual research under direction of a faculty member. Project must be set up with instructor before registration. Approval of department chairperson required. f,w,s,ss.

266 The Agricultural Press (3). Survey of journalism for students in the College of Agriculture, so that they may better understand the function of farm publications, newspapers, and radio and television farm news. w.

301 Topics in Journalism (1-3). Selected current topics in journalism. Specific topics to be announced at time of registration. f,w,s,ss.

345 General Semantics in Journalism (2). The everyday usefulness of science methodology as applied to the journalist's personal-professional problems. The course deals with general effect of language habits on journalists and on their readers-listeners. f,w.

380 High School Journalism (2). Stresses the topics to be taught at secondary school level and how to teach them. Analysis of problems facing scholastic journalism, resources and aids available to the teacher. s. cor.

387 Journalism as Communication (2) (same as 487). Journalism from a scientific standpoint. Introduces scientific method, philosophy of science, with applications to the study of journalism and communication. Basics of quantitative research and theorizing about journalism and communication. f,w,s.

Courses for Graduate Students

400 Problems (1-4). Individual work on chosen and specified problems not associated with thesis or project. Topic must be arranged with supervising teacher prior to registration. f,w,s,ss.

401 Seminar in History and Principles of Journalism (3). Analyzes historical material involving the mass media. Project papers appraise leaders, media, trends, innovations and legal problems. w,s.

402 Theory of Mass Communication (3). Major communication theories and theorists. Intrapersonal and interpersonal theories are included as they relate to mass communication. f,w.

403 The Literature of Journalism (2). Reading of ten basic books about journalism. Several books assigned to everyone; several assigned on an individual basis, and several are electives. Oral reports, short papers and class discussion. f,w.

404 Theory of International Communications (2). Broad theories associated with flow of communication intranationally and internationally. Each student develops an original hypothesis and defends it in a term paper. f.

406 Advanced Seminar, Theory of Communication (2). In-depth investigation of communication theory, with emphasis on problems of theory-building in communication. Prerequisite: 402 or 404 or instructor's consent. f,w.

407 Information Theory (3). Concepts and functions; information storage, retrieval, indexing via electronic computer. w.

410 Philosophy of Journalism (2). Seminar deals with wide assortment of philosophical questions in journalism, but concentrates on epistemology, political-press theory and ethics. Such questions as "objectivity" in journalism, press responsibility, professionalism. f.

420 Readings in Journalism (1-5). Directed readings for doctoral candidates. Designed to supplement work in other courses, and to broaden student's knowledge of trends, interpretations and developments in the media. f,w,s.

422 Mass Media Seminar (3). Concepts, functions and major problems of print and electronic media in the United States. Two hours lecture and one hour of discussion lab each week. f,w.

424 Controls of Information (3). A detail of actions by society and by the communications media calculated to limit or alter the content of information in the United States. f.

425 Controls of Information (3). A detail of actions by government, largely the federal government, calculated to limit or alter the content of information in the United States. w,s.

428 Seminar in Communications Law (2). Discusses contemporary issues in press-bar relationships. Discussions led by law students and journalism graduate students, with occasional guests from each area. Prerequisite: 304 or instructor's consent. f,w.

433 Proseminar in Communications (2). Seminar on professional and academic issues in journalism and communication. Specific discussion topics selected by faculty and students on a per class basis. f,w.

459 Television Seminar (3). Deals with station policy, employee relationships, program analysis, ratings, counter-programming, community involvement, FCC, law, financial structuring, sales improvement, industry developments and network negotiations. Prerequisite: 101 or instructor's consent. Same as 359.

487 Journalism as Communication (2) (same as 387). Journalism from a scientific standpoint. Introduces scientific method, philosophy of science, with applications to the study of journalism and communication. Basics of quantitative research and theorizing about journalism and communication. f,w,s.

488 Research Methods in Journalism (2). Research methods of utility in journalism; philosophy of science. Emphasis on survey research, sampling procedures, questionnaire construction and interviewing techniques. Prerequisite: 6 hours of journalism or instructor's consent. f,w,s.

489 Advanced Research Methods (2). Experimental design, factor analysis, semantic differential and Q methodology as tools for the researcher in journalism/communication. Prerequisite: 488. f,w.

490 Research (1-8). Guidance for graduate students engaged in Plan A for the M.A. degree and for all doctoral candidates engaged in investigations looking toward production of theses. f,w,s,ss.

491 Graduate Assembly (0). Required of all graduate students in their first semester in the journalism graduate program. Graded S/U only. f,w.

495 Area Seminar (3). Seminar designed to accompany 499, Area Problem. Through readings and discussions to Plan B student examines the special area related to the project. f,w,s.

499 Area Problem (4-8). Work project enabling Plan B student to demonstrate professional competence; may be one offered in a graduate reporting program or a creative project designed to meet a particular interest of student. f,w,s,ss.

Laboratory Animal Medicine Area

400 Problems (cr. arr.) Advanced studies not expected to terminate in a thesis. f,w,s.

410 Seminar (1). Discussion of current research in laboratory animal medicine. f,w,s.

437 Pathology of Laboratory Animals (3) (same as Veterinary Pathology 437).

438 Primatology (3) (same as Veterinary Pathology 438).

444 Diseases of Laboratory Animals (3) (same as Veterinary Microbiology 444).

450 Research (cr. arr.) Research not expected to terminate in a thesis. f,w,s.

458 Facilitative Surgery (3) (same as Veterinary Medicine and Surgery 458).

468 Laboratory Animal Biology (3) (same as Veterinary Medicine and Surgery 468).

469 Laboratory Animal Colony Management (3) (same as Veterinary Medicine and Surgery 469).

475 Methodology of Animal Experimentation (1). Application of specific species or strains of animals and techniques to various types of medical investigation. Prerequisite: departmental consent. alt. w. odd years.

490 Research (cr. arr.) Research expected to terminate in a thesis. f,w,s.

Latin (See Classical Studies)

Law

All courses in Law are open to graduate students with consent of the instructor. These courses have been approved by the Graduate School for graduate credit. For the purpose of graduate programs the courses will be considered as numbers in the 200 series.

First Year (all required)

101L Contracts I (3). Agreement process and interpretation; consideration and its equivalents; third part beneficiaries; assignments, delegation. f.

102L Contracts II (3). Interpretation, performance and discharge of contracts. w.

103L Torts I (3). Principles and practices governing recovery of damages for injuries to person or property. f.

104L Torts II (3). Defamation, invasion of privacy, dignitary wrongs, products liability, fraud liability insurance, immunities and a survey of various "no fault" proposals. w.

105L Procedure I (2-3). Fundamental and recurrent problems in civil actions in federal and state courts. Survey of litigation; pleading; discovery; trial; jurisdiction; former adjudication; parties. f.

106L Procedure II (3-4). Continuation of 105L. w.

107L Property I (3). Classification of property; personal property: possession, bailment, lien, gift, bona fide purchase; land conveyancing at common law under Statute of Uses; freehold estates in land; concurrent estates in land; and introduction to future interests. f.

108L Property II (3). Land titles, modern conveyances; adverse possession; dedication; contracts for sale of land; deeds: formalities, delivery, boundaries, implied easements, covenants for title, estoppel by deed; priorities, including recording system; title examination, other title assurance; clearing title defects. w.

111L Criminal Law I (3). Procedure in criminal cases with emphasis on constitutional limitations in the criminal process. w.

115L Criminal Law II (2). The purposes of criminal law; nature of criminal responsibility; characteristics of particular crimes. (Criminal law I and II are continuation courses and the order of subject matter may be altered from year to year.)

116L Legal Research and Writing (1). Study of legal research methods and their application to problem solving, legal writing exercises, preparation of briefs and oral argument of appellate cases.

117L Advocacy and Research (1). Introduction to the techniques and materials of legal research, legal bibliography, the use of law library computer-assisted research technique, and the writing of legal memoranda, opinion letters, agreements and appellate briefs.

Second Year

(required unless otherwise indicated)

220L Constitutional Law (4). Study of federal judicial review and limitations; sources of federal legislative power; commerce, taxing, spending, treaty, presidential, military powers; power of states to regulate, to tax interstate commerce; intergovernmental immunities; due process; equal protection, and first amendment rights.

221L Evidence (4). The basic law of evidence; use in trials, relevancy, circumstantial proof and real proof; use of witnesses, methods of examination; presumptions and burden of proof; functions of judge and jury.

223L Legal Accounting (2). Not required for those having six accounting credits. Use of accounting in management of capital, and control of business enterprise, bookkeeping and accounting fundamentals; interrelationship of accounting principles and rules of law; analysis and interpretation of accounting and financial data. f.

224L Remedies (3). History of equity; coverage of various equitable remedies and their adequacy, practicability, defenses, procedural problems, enforcement of decrees, merger of law and equity, contempt.

225L Business Organizations (4) Examination of common types of business organizations including partnerships and corporations. Study of formation and purposes of the corporate entity; internal structure of corporation responsibilities of shareholders, directors, officers; introduction to corporate securities, common and preferred stock, corporate bonds, hybrid securities.

227L Basic Federal Income Taxation (4). Covers primarily federal income tax problems of individual taxpayers: nature of income; when and to whom income is taxable; exclusions from tax base, deductions, credits; tax effects of exchange or other disposition of capital assets.

228L Decedents Estates and Trusts (3). Intestate succession; family protection, restrictions on testation; execution, revocation, revival of wills; integration, incorporation by reference, events of independent significance; will construction; elements/creation of trusts; modification/termination of trusts; beneficial interests under trusts. w.

232L Appellate Advocacy (1). Analysis and issue determination of transcripts on appeal. Familiarization with rules of procedure in regard to appellate courts, argument and pleading before appellate tribunals. Offers training for Moot Court competition. Course is elective. f.

Third Year

300L Administrative Law (3). Principles, factors and statutory provisions which govern availability of relief (both judicial and administrative) to persons or entities aggrieved by the actions or inactions of governmental officials or agencies. w.

301L Admiralty Law (2-3). Definition of navigable waters, locational and subject matter jurisdiction, federal jurisdiction, jurisdiction in rem, attachment, substantive admiralty law, maritime lien, carriage of goods, salvage, general average, collision, torts, industrial accidents, limitations on liability.

302L Advanced Business Organizations (2-3). Advanced study of corporations law emphasizing formation of corporations; tax principles; mergers and reorganizations, share-holder rights; trading limitation; non-profit and professional corporations. Prerequisite: 225L.

304L Advanced Criminal Procedure (2). Problems of procedure in criminal cases; indictments and informations, discovery, motions, instructions, role of prosecution and defense attorneys.

305L Advanced Torts (2). Consideration of "business torts" (unfair competition, interference with contract, trade secrets, product disparagement), "relational torts" (wrongful death, survival, consortium, alienation of affections), and the public law implications of defamation and privacy actions beyond the basic torts course.

307L Antitrust Law (3). Introduces antitrust analysis, with emphasis on monopoly, horizontal restraints of trade, vertical restraints and merger problems. Some attention to price discrimination and patent problems. w.

308L Arbitration and Labor Problems (3). Covers labor arbitration, establishment and operation of a contractual grievance, the arbitration process, judicial enforcement of agreements, strikes and miscellaneous labor law topics not requested by the National Labor Relations Act.

310L Bankruptcy (2-3). Concentration on straight bankruptcy proceedings, some introduction to wage-earner plans, and chapter proceedings for businesses. Jurisdiction, property in the estate, dischargeability of unpaid debts, trustee's avoiding powers, proof of claims and distribution of available assets.

311L Basic Commercial Law (4). Commercial transactions, including sale of goods, sales security devices, financing sales and commercial paper, with special reference to the Uniform Commercial Code. f.

313L Business Planning (2). Common business transactions, emphasizing the closely held corporation. Corporate and taxation principles in connection with formation and sale of corporations; allocation of stock and control; issuance of securities and capital structure; valuation; dividends; reduction of capital. f.

314L Client Interviewing and Counseling (2). Course covers basic interviewing techniques, psychological factors affecting the interviewing process, facilitating and structuring the interview, clarification of statements and ascertaining legal issues, client resistance and hostility, the nature and conduct of counseling process.

316L Clinical Placement (1-3). Supervised training through experience in civil and criminal problems. Various placements are available in legal aid settings, prosecutor and defender offices, and state offices; problems in practice also required; credit hours flexible.

317L Commercial Paper and Banking Law (2-3). A concentrated study of Articles 3 and 4 of the Uniform Commercial Code, exploring the rights and liabilities of the various parties to negotiable instruments. Also covered are federal and state statutes governing the practices of the banking industry.

319L Comparative Law (2-3). Foreign legal systems and the comparative method in analysis and solution of legal problems, based on the legal systems of modern France and Germany. Major groupings of historically and structurally related legal systems. f.

320L Conflict of Laws (2-3). Study of jurisdiction and various choice of law methods in cases having extraterritorial contracts; recognition and application of foreign law in state and federal courts; effect of the federal constitution.

322L Constitutional Rights and Liberties (2). Advanced analysis of protections of civil liberties that derive from the United States Constitution and from federal statutes. The federal statutes which will be covered most extensively include 42 U.S.C. §§ 1981-1988 and the Civil Rights Acts of 1964 (except Title 7 thereof), 1965 and 1968.

323L Creditor's Remedies (3). Course deals with rights of unsecured creditors and debtors under law: individual and collective creditor and debtor state actions, law of fraudulent conveyances; prejudgment remedies and post judgment procedures; receiverships and debtor's rights in exempt property.

325L Criminal Law Administration (2). Seminar on current problems with administration of criminal law and current developments in criminal law.

328L Drafting of Legal Instruments (2). Problems frequently encountered in general office practice (land transfers, mortgages, leases, contracts, wills, business organizations, etc.), with drafting of the related instruments. Use and adaptation of legal forms. Graded S/U. f.

329L Employment Discrimination (2-3). Examination of laws prohibiting discriminatory practices in employment and the administrative and judicial processes available for dealing with them; affirmative action requirements and litigation problems in civil rights cases.

331L Estate and Gift Taxation (3). Study of the basic provisions of the federal estate and gift tax laws and the related provisions of the Missouri inheritance tax laws. Instruction on the grantor's trust rules of the federal income tax.

332L Estate Planning (2). The process of selecting particular arrangements for the devolution of wealth, including considerations of federal and state tax factors with emphasis on federal estate and gift tax laws. Prerequisites: 331 and 227. w.

334L Estate and Trust Administration (3). Probate and contest of wills; administration of decedents' estates and trusts, including appointment, removal, powers, duties and liabilities of executors, administrators and trustees; charitable trusts; will contracts and substitutes. f,w.

335L Family Law (3). Marriage, annulment, dissolution, maintenance and separation agreements, custody, support obligations, illegitimacy, adoption, abortion, and selected issues relating to domestic law.

337L Federal Courts (3). Jurisdiction of United States courts; their role in the federal system. Topics covered: federal question and diversity jurisdiction, the jurisdictional amount, removal, and the relations of state and federal courts. f.

338L Federal Income Taxation of Business Enterprises (3). Tax aspects of establishing corporations; of selling or liquidating or dividing corporations, of transferring or receiving assets, reincorporations; tax free acquisitions.

340L Future Interests (3). Types of future interests in real and personal property and their characteristic problems; construction of limitations, rule against perpetuities, powers of appointment and associated rules.

341L Government Regulation of Business (3). Legal/economic/political aspects of direct public regulation of business, emphasizing questions of economic planning, policy choices involved in deciding whether and how to regulate. Regulation of entry, rate regulation, regulation of quality of service. f.

343L Insurance (2-3). Creation of contract; warranties, misrepresentations; excepted risks; waivers and estoppel; insurable interests; facts maturing the policy, construction of various clauses; subrogation. f.

344L Intellectual Property (2-3). Patents: conditions for validity, subject matter patentability, Patent Office procedures, amendment and correction, interferences, infringement, assignment, licensing, litigation, patent claim drafting; copyright: subject matter copyrightability, common law and statutory protection, property rights, infringement, fair use doctrine, non-written material copyrightability; trademarks: common law and statutory protection, generic use.

346L International Business Transactions (2-3). A survey of legal problems and institutional arrangements involved in international trade and investment; private law of international trade, governmental regulation of international trade and investment, international regulation of international trade and investment.

347L International Law (3). Introduction to the international legal system, with emphasis on relations between nation-states or international entities. Topics include statehood and recognition, legislative and judicial jurisdiction, human rights and the status of the individual, treaties and international organizations.

349L International Transactions (3). Covers a variety of special legal problems presented to persons and enterprises whose activities cross national boundaries and includes: citizenship, immigration, sources of international law, international tribunals, transnational reach of national laws and sovereign immunity.

350L Jurisprudence (2). The nature of law; classical and contemporary theories of juristic thought, their development and comparison. f.

352L Juvenile Law (2-3). Study of the philosophy underlying juvenile law as well as specific provisions of the Juvenile Code and pertinent court decisions in areas such as delinquency, neglect, custody disputes and termination of parental rights and related court services.

353L Labor Law (3). The regulations of relations between employers and labor unions at common law and under federal and state legislation; primary emphasis on the National Labor Relations Act, as amended. f.

355L Land Use Controls (3). Private controls: nuisance, covenants running with the land, equitable servitudes; public controls: master plans and official maps, subdivision zoning, planned unit developments, building and housing codes, urban redevelopment, open space and historic preservation, development rights. f.

356L Law and Medicine (2). Selected medicolegal topics involving the law and the practice of medicine, particularly relationships between patient, physician and hospital; medicine and the practice of law, including medical proof and law and psychiatry. w.

358L Legal History (2). Development of the Roman legal system from 753 B.C and its reception in Europe, Asia, Africa and America; development of the English legal system from 519 A.D.; similarities and differences between Roman and English systems. May be taken as a seminar (with paper) to meet the seminar requirement, or as an ordinary course (no paper). w.

360L Legislation (3). The legislative process; principles of statutory construction; techniques of bill drafting. f.

362L Local Government Law (2-3). Structure and powers of local government units; state-local relations, including "home rule"; local government finance, including taxation and indebtedness; incorporation and annexation; eminent domain; licensing and franchising; municipal tort liability. f.

363L Mining, Oil and Gas (2-3). Severance and classification of mineral interests, mineral lease clauses, implied covenants, title and conveyancing problems, transfers by lessor or lessee, pooling and unitization, taxation, pollution and surface reclamation, surface and mineral owner relations.

365L Natural Resources (3). Water rights: diffused surface water, groundwater, riparian rights, prior appropriation, permit systems, public rights, governmental powers, pollution control, interstate problems; mining, oil, gas: types of mineral rights, leases, conveyancing, conservation methods, surface owners' rights, strip mine reclamation. f.

366L Negotiation (3). Theory, strategy and skill development in negotiating in the lawyer's role in a variety of legal contexts. Videotaped practice sessions, competition. Pass-Fail. Limited to 20 students. w.

368L Pension and Profit Sharing (2). Study of pension and profit sharing plans with consideration of benefits to individuals and effect on business entity. Heavy emphasis placed upon the tax consequences of any such plans in various contexts.

369L Problems in Environmental Control (2). Seminar on the environmental effects of energy resource production and consumption. Subjects include federal legislation concerning the environment, regulation and licensing.

371L Problems in Practice (1-2). Required of students enrolled in clinical program and designed to provide training for the practical aspects of clinical experiences; subject matter will be adapted to cover problems encountered in placement.

372L Professional Responsibility (2). Responsibilities of lawyer to client, courts and the public. Topics include: organization of the legal profession, fees, conflicts of interest, the confidential relationship, advertisement and solicitation, unauthorized practice, courtroom behavior. Course required. f.

374L Property III (2) (second or third year). Landlord and tenant; easements, profits and licenses; natural rights, including support, water rights and air rights. w.

375L Real Estate Finance (3). Real estate mortgages and financing substitutes—theory and practice; receivers; redemption; foreclosure; priorities; the Missouri Deed of Trust; subdivision development; leasehold mortgages; shopping centers; government intervention in the mortgage market. w.

377L Restitution (1-2). Form and nature of relief afforded by judicial process to prevent unjust retention of benefits acquired by fraud, mistake, conversion, illegality, and in other selected instances. w.

378L Sales (1-2). A concentrated study of the common statutory law governing sales of goods. The primary focus is on Article 2 of the Uniform Commercial Code, the case law interpreting Article 2, and the common law concepts which supplement its provisions.

380L Securities Regulation (3). Financing a new business enterprise through sale of securities. Examines Federal and State Securities Acts, Securities Registration, powers of SEC; private actions, injunctive and criminal sanctions; reporting, inside trading and proxy solicitation problems. f.

381L Social Legislation (2-3). Benefits for mental and physical disabilities, including workmen's compensation; social security; unemployment compensation and benefits for aged and children.

382L State and Local Taxation (2). A review of the taxing authority of state and local governments and the statutory and constitutional limitations thereon. The course will investigate the policy and philosophy of state and local taxation and its impact on land use, urban sprawl and related urban problems.

384L Trial Practice (3). Techniques of pleading, discovery, jury selection, opening statements, direct/cross examination of witnesses, prepares jury instructions, closing arguments. Each student participates in classroom problems selected from various phases of litigation, and in one complete trial. f,w.

386L Urban Problems (2). Examines selected legal problems which grow out of urbanization. Examples of topics: the federal grant-in-aid system; urban renewal; public housing; and the model cities program. w.

387L Water Law (2-3). Diffused surface water, groundwater, riparian rights, prior appropriation, permit systems, public rights, federal and state governmental powers, National Environmental Policy Act, federal and state pollution control, interstate and international allocation, bed ownership.

389L Selected Seminar Topics (2). Seminars are offered on communications law, family law, torts and constitutional law.

390L Law Review (1-2). Credit for work as prescribed by the faculty for members of the Editorial Board of the *Missouri Law Review*. (Limited to 2 semester hours.) f,w.

392L Research (1-3). Individual research and a written paper on a special problem under supervision of a faculty member. Prior approval of the Dean is necessary for initial or cumulative credit in excess of one semester hour. f,w.

Library Science

211 Elementary Cataloging (3). Cataloging of books with personal authors, using Anglo-American code and the Dewey classification. Prerequisite: junior standing. f,w,s.

221 Selection and Acquisition of Library Materials (2). Introduction to: types of materials in libraries; their sources of supply; bibliographies, catalogs and evaluative tools used in selection; acquisition procedures. Prerequisite: junior standing. f,w,s.

231 Elementary Reference (3). Introduction to reference materials and procedures. Prerequisite: junior standing. f,w,s.

241 Libraries and Librarianship (2). Types, objectives and functions of libraries; their internal organization and procedures for fulfilling their functions; duties and qualifications of librarians; role of professional associations. Prerequisite: junior standing. f,w,s.

300 Problems (cr. arr.) Individual work not leading to dissertation. Prerequisite: departmental consent. f,w,s.

312 Principles of Cataloging and Classification (3). Study of systems for bibliographic organization of knowledge, cataloging of more complex publications, familiarization with Library of Congress classifications. Prerequisite: 211. f,w,s.

321 Library Materials for Children and Youth (3). Background of library materials for children; philosophy of children, youth; characteristics in use of print, nonprint material; current publishing trends. Readers guidance, book talk techniques, story-telling resources. Prerequisites: 221 & departmental consent. f.

322 Literature of the Humanities (3). Development of religion, philosophy, literature, art and music in the Western world during the eras of humanism, discovery, enlightenment, revolution, and democracy versus totalitarianism. Prerequisite: 231. f. alt. s.

323 Literature of the Social Sciences (3). Publishing trends; major authors and their works; special library problems in history, political science, economics, geography, sociology, psychology and related fields. Prerequisite: 231. w. alt. s.

324 Literature of Science and Technology (3). Publishing trends; major authors and their works; special library problems in mathematical, physical and biological sciences and technologies based upon them. Prerequisite: 231. w. alt. s.

327 Preservation and Restoration (3). Theoretical and practical work with archival materials, rare books and media; concerned with legal aspects, methods and materials for preservation and restoration. Prerequisite: 211, 221, 231, 241 or departmental consent. f. alt. s.

332 Bibliography and Reference (3). Enumerative and evaluative bibliographies; subject bibliographies, abstracts, services; non-English general reference tools; principles of reference service in various types of libraries. Prerequisite: 231. f,w,s.

341 Management of Information Agencies (3). Concepts of management applied to libraries and information systems; management tools, programming, models and simulation in an environment of an information producing or disseminating agency. Prerequisite or concurrent: 241 & departmental consent. f,w. alt. s.

342 The Administration of School Libraries/Media Centers (3) (same as Curriculum & Instruction M342). Purposes, objectives, functions and activities of the school learning resource center; qualifications of personnel; physical facilities; standards. w,s.

380 Library Practice (2-3). Supervised work in a school, public, special or college library. Prerequisites: 211, 221, 231, & 241. f,w,s.

400 Problems (cr. arr.) Independent, directed study on a topic in the field of library science. Prerequisite: graduate standing; departmental consent. f,w,s.

401 Library Information Systems (3) (same as Information Science 401). Prerequisites: 211, 221, 231, 241, & Information Science 302, & departmental consent. f. alt. s.

410 Seminar in Library Science (1-3). Discussion and critical study of current developments in library science. Prerequisite: admission to candidacy for master's degree in library science or departmental consent. f,w.

413 Abstracting and Indexing (3) (same as Information Science 413). f. alt. s.

416 Medical Subject Analysis (3). Cataloging and classification systems used in health sciences libraries; efficiency of content analysis of books and periodicals; computerized retrieval systems; information centers and communication media. Prerequisites: 211, 221, 231, 241, & departmental consent. w. alt. s.

424 Micrographics and Libraries (3) (same as Information Science 424). Types of microforms and their acquisition, handling, interpretation and utilization. Basic technical considerations include evaluating hardware, building collections, bibliographic control and the microform environment. Prerequisite: departmental consent. f.

425 Government Publications (3). Survey of publications of local, state, national and international governments; emphasis on publications of the United States. Prerequisites: 211, 221, 231, 241 & departmental consent. f. alt. s.

426 Multimedia Resources of Libraries (3). Acquisition and utilization of non-book materials, with special attention to motion pictures and phonorecords; organization and operation of audiovisual departments; cooperative ownership; similar topics. Prerequisites: 211, 221, 231, 241 & departmental consent. f. alt. s.

427 The History of Books and Printing: The Manuscript Book (3). Prerequisites: 211, 221, 231, & 241; or departmental consent. f.

428 The History of Books and Printing: The Printed Book (3). Prerequisites: 211, 221, 231, & 241; or departmental consent. w.

429 Seminar in Rare Books and Manuscripts (3). Selected topics in the history of books and the antiquarian book trade. Prerequisite: 427 or 428 or 449; or departmental consent. w.

432 Automated Reference Services (3) (same as Information Science 432).

433 Services to Children (3). Collection development, organization of children's services, preschool activities, relations with the school library. Story-telling techniques. Prerequisites: 211, 221, 231, 241, & departmental consent. w. alt. s.

435 Studies in Library Services (3-6). Directed toward students' interests; individual projects a significant part of course. Attention given services to physically handicapped, culturally deprived, industry, adult education groups, etc. Prerequisites: 211, 221, 231, 241, & departmental consent. f. alt. s.

441 Information Systems Resource Management (3) (same as Information Science 441). w. alt. s.

443 The Academic Library (3). Development, objectives, organization and structure, nature of the collections and responsibility for their development, philosophy of library services, measurement and standards of library effectiveness. Prerequisites: 211, 221, 231, 241, & departmental consent. w. alt. s.

444 The Public Library (3). Objectives, relations with other institutions, scope of its services, public relations, standards. Prerequisites: 211, 221, 231, 241, & departmental consent. w. alt. s.

445 Special Libraries and Information Centers (3). Variety, functions of special libraries/information centers, relations with academic and public libraries, philosophies of service; problems of cataloging/classification peculiar to special libraries. Prerequisites: 211, 221, 231, 241, & departmental consent. w. alt. s.

446 Health-Science Librarianship and Bibliography (3). Administration, organization, functions, services and collections of health science libraries. Prerequisites: 211, 221, 231, 241, & departmental consent. w. alt. s.

447 Archive Administration (3). Principles and concepts of archival techniques and administration of archives and archival material. Includes legal, moral and sociological implications of archival theory and practice. Prerequisite: 211, 221, 231, 241 or departmental consent. f. alt. s.

449 History of Libraries (3). Development of libraries and library services from ancient times to present; role of libraries in different times, societies; identification of problems faced by librarians, analysis of solutions. Prerequisites: 211, 221, 231, 241, & departmental consent. w. alt. s.

450 Research (cr. arr.) Investigation and research into a topic, not leading to a thesis. Prerequisite: departmental consent. f,w,s.

451 The Biomedical Community (3). Environmental and institutional loci of medical education, practice and research in which the health sciences librarian works. Prerequisites: 211, 221, 231, 241, & departmental consent. f. alt. s.

Linguistics

20 Introduction to Language Science (3). General introduction to various aspects of linguistic study. Elementary analysis of language data, with some attention to application of linguistic study to other disciplines.

120 Languages of the World (3). Surveys the important language families of the world, where they are spoken, and important features presented with a minimal amount of technical detail. Prerequisite: some knowledge of one language other than English or instructor's consent.

154 Introduction to Anthropological Linguistics (3) (same as Anthropology 154).

190 Honors Thesis (3). Based on an original research project in theoretical or applied linguistics. Topic, director and second reader approved by Linguistics Committee, College of Arts & Science. Prerequisite: qualification for Honors degree.

201 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon consent of the chairperson.

306 Sociolinguistics (3) (same as Anthropology 306).

308 Historical Linguistics (3) (same as Anthropology 308).

309 Topics in Linguistics (3-6) (same as English 309).

310 American Phonetics (3) (same as Speech and Dramatic Art 311).

311 History of the French Language (3) (same as French 311).

312 Psychosocial Aspects of Speech (3) (same as Speech and Dramatic Art 312).

313 History of the Greek and Latin Languages (3) (same as Classical Studies 311).

314 Symbolic Logic (3) (same as Philosophy 314).

319 The Structure of American English (3) (same as English 319).

320 History of the English Language (3) (same as English 320).

321 Speech Science (3) (same as Speech and Dramatic Art 321).

322 Regional and Social Dialects of American English (3) (same as English 322).

323 Principles of Teaching English as a Second Language (3) (same as English 323).

335 Philosophy and Language (3) (same as Philosophy 335).

346 Language and Culture (3) (same as Anthropology 346).

350 Special Readings (1-3). Independent study through readings, conferences, reports. Prerequisites: one linguistics course & instructor's consent.

360 Phonetics (3) (Spanish Language) (same as Spanish 360).

361 History of the Spanish Language (3) (same as Spanish 361).

364 Analytic Philosophy (3) (same as Philosophy 365).

365 History of the Russian Language (3) (same as Russian 365).

366 Structure of the Russian Language (3) (same as Russian 366).

371 Introduction to General Linguistics (3) (same as Anthropology 371, Romance Languages 371).

372 Linguistic Analysis (3) (same as Anthropology 372, Romance Languages 372).

373 Phonology (3) (same as Anthropology 373, Romance Languages 373).

374 Syntax (3) (same as Anthropology 374, Romance Languages 374).

378 Structure of Modern French (3) (same as French 378).

379 Structure of Modern Spanish (3) (same as Spanish 379).

383 Studies in Linguistics (3). Topic varies according to instructor. May be repeated for credit with approval of instructor. Prerequisite: instructor's consent.

393 Field Methods in Linguistics (4) (same as Anthropology 393).

400 Problems (cr. arr.) Independent study through readings, analysis of special linguistic problems, reports. Prerequisites: one advanced linguistics course & instructor's consent.

411 Acoustic Phonetics (3) (same as Speech and Dramatic Art 411).

412 Physiological Phonetics (3) (same as Speech and Dramatic Art 412).

417 Studies in the English Language (3) (same as English 417).

418 Introduction to Old English (3) (same as English 418, German 418).

428 Studies in Psycholinguistics (3) (same as Psychology 428).

446 Seminar in Anthropological Linguistics (3) (same as Anthropology 446).

460 History of the German Language (3) (same as German 460).

461 Middle High German (3) (same as German 461).

483 Seminar (3). Topic varies according to instructor. May be repeated for credit with approval of instructor. Prerequisite: instructor's consent.

490 Research in Linguistics (cr. arr.)

492 Structure of a Language and Language Typology (3) (same as Anthropology 492).

493 Advanced Phonology (3) (same as Anthropology 493, Romance Languages 493).

494 Seminar in Advanced Syntax (3) (same as Anthropology 494).

255 Business Law B (3). Cases, problems dealing with law of agency, partnerships, corporations, negotiable instruments. Prerequisite: 254, f,w.

300 Problems (cr. arr.)

305 Elements of the Law of Business (3). Role of law in societies; body of law applicable to commerce and industry. Open only to graduate students. No credit given to those having prior courses in business law.

308 Operations Management (3). Managerial analysis of operating problems; emphasis on planning and control systems. Prerequisite: 202, f,w.

309 Organizational Process (3). Elements of the managerial process; emphasis on theory of organization structure and design and the impact of technology and culture on organization systems. Prerequisite: 202, f,w.

311 Collective Bargaining (3). Content, negotiation, administration of collective labor agreements and settlement of disputes. Prerequisites: 336 & junior standing or instructor's consent. f.

318 Management Science (3). Further development of models and quantitative analysis as applied to production management problems. Management research design and experimentation; computer applications; quantitative case analyses; individual industrial field studies. Prerequisite: 308 or instructor's consent. w.

319 Production Systems Analysis (3). Construction and quantitative analysis of models of inventory and production systems; uncertainty, risk and policy considerations; system design and simulation; analysis of networks; management problems in application. Prerequisite: 318.

320 Personnel Administration Law (3). Analysis and evaluation of legal and administrative regulations of terms of employment; Fair Labor Standards, discriminatory practices, safety and health regulations, other regulations. Prerequisites: senior standing & 336, or instructor's consent.

329 Organizational Behavior (3). Examines theoretical constructs and research findings on human behavior in work organizations such as businesses, especially individual differences, dyadic relations and small group behavior. Prerequisite: 202, f,w.

335 Topics in Management (3). Selected current topics in management. Offered on an experimental, one-semester basis only. Prerequisite: to be determined each time course is offered.

336 Personnel Management (3). Manpower policies, procedures of business enterprise. Prerequisite: 202 or instructor's consent. f,w. cor.

338 Business Journalism (3) (same as Journalism 338, Finance 338, Marketing 338).

345 Management of Service Operations (3). Selected operations management topics: applications of operations concepts, techniques and methodologies applied to service sector organizations—hospitals, government, agencies, schools, banks. Focus on designing, planning, controlling service operations. Prerequisite: 308 or instructor's consent.

347 Compensation Theory and Practice (3). Examines the empirical research and theory relating to the effect of compensation administration systems upon employee satisfaction and performance. Analysis of financial compensation systems and benefit programs in use in modern organizations. Prerequisite: 336.

353 Selected Problems in Personnel Management (3). Advanced studies in selected administrative and technical policies, practices in employee relations, with individual and group project work, research. Focuses on policy issues, research findings, advanced techniques. Prerequisite: 336 or instructor's consent. w.

Management

202 Fundamentals of Management (3). Introduces basic concepts of management and organization; their application to operations and personnel management. f,w. cor.

254 Business Law A (3). Discusses business relations in their legal aspects; introduction to law and courts; cases, problems on law of contracts, personal property, bailments, sales. Prerequisite: junior standing, f,w.

356 Business Law C (3). Discusses law relating to various security transactions; conditional sales, consignments, pledges, trust receipts, real and chattel mortgages, mechanics' and artisans' liens, suretyship. Prerequisite: 254. f.

360 Venture Management (3). Analytical study of requirements in starting and initially operating a new business organization. Lectures, readings, case studies and individual or team projects. Prerequisite: junior standing. f.

375 Management Policies and Problems (3). Enterprise-level case studies, simulations, similar exercises to integrate business functional decisions; assessment of environmental influences on business. Development, implementation of company strategies. Prerequisites: 202 & senior standing (B&PA) or instructor's consent. f,w.

380 Statistical Forecasting (3) (same as Finance 380, Marketing 380, Statistics 380). Examines statistical theory and techniques used in forecasting. Prerequisites: Statistics 234 & Statistics 250.

383 Management of Research and Development (3). Provides understanding of research and development function in framework of the organization. Prerequisite: senior standing.

400 Problems (cr. arr.) Graduate students may select topics for study and investigation from fields suggested by undergraduate courses listed above.

405 Seminar in Management (cr. arr.) Intensive studies of current research and issues. Readings, independent investigations, reports. Prerequisite: open to Ph.D. students, or instructor's consent. f,w.

418 Business and Economic Research (3) (same as Finance 418, Marketing 418)

434 Advanced Problems in Compensation Theory (3). Intensive analysis of financial compensation systems and benefit programs: wage and salary methods, pensions, time off with pay. Theoretical-empirical approach and analyses of current practices. Prerequisite: either 301, 336, 347, or instructor's consent.

435 Topics in Management (3). Selected current topics in management. Prerequisite: instructor's consent.

436 Advanced Personnel Management (3). Analysis of research and practice in planning for attracting, selecting, developing and disciplining of employees at work. Prerequisite: either 301, 336, or instructor's consent.

437 Management of Labor Relations (3). Managerial approaches to collective bargaining. Negotiation, grievances, agreement administration; emphasis on recent developments. w.

438 Organizational Behavior and Group Dynamics (3). Organizational and business applications of theory and research in individual differences, interpersonal relations, small group dynamics. f.

439 Behavioral Approaches to Organization Design (3). Organizational design; relationships to technical, cultural and environmental factors; problems of effecting change. w.

446 History of Management Thought (3). Literature in fields of industry and management to discover and evaluate trends in development of management theory and philosophy. w.

447 Advanced Operations Management (3). Operations planning and control. Analysis and modeling of operating problems such as inventory control; production planning, scheduling, control; quality control; item forecasting. Prerequisites: Business Administration 324, Business Administration 342 & Math 205, or their equivalents. w.

448 Manufacturing Policy (3) Cases dealing with manufacturing policy in selected industries, firms. Analysis as a basis of policy stressed. f.

490 Research (cr. arr.) Thesis research for Ph.D. degree.

Marketing

Certain courses in this department are accepted in the College of Arts and Science with approval of area adviser and the Dean of the College.

204 Principles of Marketing (3). Institutions, processes, problems involved in transferring goods from producer to consumers; emphasis on economics, social aspects. Prerequisite: Economics 51. cor.

206 Distribution Systems (3). Analysis of physical distribution function in marketing; emphasis on transportation, warehousing, materials handling and facility location as elements of an integrated system. Prerequisite: Economics 51.

300 Problems (cr. arr.) cor.

312 Marketing Management (3). Problems of marketing from point of view of a business enterprise. Prerequisites: junior standing & 204.

315 Management of Promotion (3). The promotion function; special problems associated with the sales force from the managerial point of view. Prerequisites: junior standing & 204.

316 Sales Management (3). Analyzes effective methods and tools employed by salesmen and field sales managers; emphasis on underlying behavioral and quantitative theory. Prerequisites: junior standing & 204.

317 Marketing Channel Design and Policy (3). Theory, practice in determining marketing channels for distribution of consumer, industrial goods. Particular emphasis on elements of product, promotion, price, control as relates to a given channel decision. Prerequisites: junior standing & 204.

338 Business Journalism (3) (same as Journalism 338, Finance 338, Management 338).

344 Analysis of the Consumer Market (3). Dimensions of the consumer market and decision-making process of consumers by analyzing economic, psychological and socio-psychological influences on consumer market and buying behavior. Prerequisites: junior standing & 204.

358 Purchasing (3). Organization, functions of purchasing departments; particular emphasis on industrial purchasing. Prerequisites: Management 202 & 6 hours marketing.

370 Market Analysis (3). Use of scientific method in solution of marketing problems. Round table discussions, practice in field investigations. Prerequisites: senior standing & 312.

371 World Marketing (3). Examines the rationale of international trade and the operational aspects of international marketing. Prerequisites: junior standing & 204.

373 Transportation and Logistics Strategy (3). Analysis of transportation and logistics policy and administration, emphasizing use of quantitative aids to decision making.

375 Marketing Society and Government (3). Critical examination of relationships and conflicts between marketing, society and government. Emphasis on contemporary issues pertaining to competition, monopoly, regulation by government. Prerequisites: junior standing & 204.

380 Statistical Forecasting (3) (same as Management 380, Finance 380, Statistics 380).

381 Transportation Policy and Problems (3). Problems in intra- and inter-modal competition, consolidation and integration, criteria for public investment, subsidy policies, urban transportation, and analysis of national transportation policy.

382 Quantitative Decision Problems (3). Applies quantitative tools of analysis to business and marketing decision problems. Emphasizes analytical techniques in making decisions; problems drawn primarily from field of marketing. Prerequisite: Math 60.

385 Contemporary Issues in Marketing (3) Intensive study of selected issues in marketing. Prerequisite: 6 hours marketing.

400 Problems (cr. arr.) Graduate students may select topics for study and investigation from fields suggested by undergraduate courses listed above. cor.

401 Seminar in Marketing (4). Intensive studies of selected current issues. Readings, independent investigations, reports.

418 Business and Economic Research (3) (same as Finance 418, Management 418).

423 Business Logistics (3) (same as Agricultural Economics 423).

444 Consumer Market Behavior (3). Basic factors influencing consumer decision making. Attention given to psychological, sociological, economic variables: motivation, attitude, learning, personality, small group, social class, demographic factors, culture; analyzes their effects on consumer decision-making process.

465 Advanced Marketing (3). Contributions of theory to marketing policies, practices.

466 Quantitative Methods and Marketing (3). Examines and appraises use of quantitative tools of analysis in solving marketing problems.

468 Distribution Management (3). The role of various modes of transportation, traffic management, warehousing and materials handling in the marketing system. Current transportation and traffic problems analyzed.

469 Research in Market Development (3). Evaluates the contribution of research to marketing management; special emphasis on development of markets for new and existing products.

470 International Marketing (3). Examines competition and market structure abroad including common market and trade bloc arrangements.

471 Markets in Transition (3). Analysis of selected industries; emphasis on marketing activities and environments. Particular emphasis given to forecasting major trends or changes anticipated in markets over the next decade.

490 Research (cr. arr.) Thesis research for Ph.D. degree.

Mathematics

3 Basic Algebra (3). For students with less than one unit of high school algebra. No credit toward a degree in Arts and Science and not recommended for credit toward any baccalaureate degree. cor.

4 Business Mathematics (3). For students in Education specializing in commercial education, distributive education; others on Dean's request. Application of elementary arithmetic and algebra to retailing, general business. No credit in B&PA. cor.

7 Algebra for Elementary Teachers (3). Open only to students majoring in Elementary Education. Focuses on development of real number system; other numeration systems; some elementary number theory; functions, relations, linear equations, inequalities, other polynomials. cor.

8 Geometry for Elementary Teachers (3). Devoted primarily to informal geometry: study of points, lines, planes, space similarity, congruence, measurement, elementary geometric constructions. Other topics discussed: probability and characteristics of other geometries. Prerequisite: 7. cor.

9 Trigonometry (2). Prerequisite: any of the following (a) $1\frac{1}{2}$ units algebra & 1 unit geometry; (b) 1 unit geometry & Math 10 concurrently. cor.

10 College Algebra (3). Review of topics from elementary algebra, sets, quadratics, systems of linear equations with introduction to determinants, graphing, progressions, inequalities, complex numbers, mathematical induction, binomial theorem, theory of equations, logarithms. Prerequisite: $1\frac{1}{2}$ units of high school mathematics including 1 unit in algebra. cor.

12 Basic Concepts of Modern Mathematics (3). Basic ideas in mathematics, with emphasis on its variety and structure. Gives an appreciation of mathematics in everyday life. cor.

Course 12 satisfies the basic skills requirement in Math for Arts and Science, but will not substitute for Math 10 as a prerequisite for other courses.

14 Algebra and Trigonometry (5). Review of elementary algebra. Background material for Math 80, including algebraic, trigonometric, logarithmic, exponential functions. Prerequisites: $1\frac{1}{2}$ high school units algebra, 1 unit geometry. No credit for both 14 and any of 9, 10 or 15.

15 Elementary Functions (3). Review of elementary algebra. Background material for Math 80, including algebraic, trigonometric, logarithmic, exponential functions. Prerequisites: 2 high school units algebra, 1 unit geometry. No credit for both 15 and any of 9, 10 or 14.

60 Finite Mathematics (3). Introduces matrices and linear programming and probability. Primarily for non-physical science students. Prerequisite: 10 or equivalent. cor.

61 Elements of Calculus (3). Introductory analytic geometry, derivatives, definite integrals. Restricted to students preparing to enter College of Business and Public Administration. No credit for students who have completed a calculus course. Prerequisite: 60 or equivalent. cor.

76 Plane Analytic Geometry (3). Straight lines, conic sections, graphing, polar coordinates, coordinate transformations, and parametric equations. Prerequisite: C in 9 & 10 or equivalent.

80 Analytic Geometry and Calculus I (5). Elementary analytic geometry, functions, limits, continuity, derivatives, antiderivatives, definite integrals. Prerequisite: C in 9 & 10 or equivalent. cor.

Courses 80, 175 and 201 are a three-semester course sequence of integrated material normally presented in analytic geometry and elementary calculus courses.

81 Calculus I (3). Functions, limits, continuity, derivatives with applications, antiderivatives. Prerequisite: 76 or equivalent high school training.

155 The Mathematics of Finance (3). Compound interest, annuities with variety of applications; introduction to mathematics of life insurance. Prerequisite: 10 or equivalent.

175 Calculus II (5). Definite integrals, applications and techniques of integration, elementary transcendental functions, infinite series. Prerequisite: a grade of C or better in 80 or 81 or equivalent training. cor.

198-199 Honors (2 hrs. each). Special work for senior A.B. Honors candidates.

201 Calculus III (3). Vectors, solid analytic geometry, calculus of several variables. Prerequisite: grade of C or better in 175 or equivalent training. cor.

203 Introduction to Mathematical Thought (3). Stresses conceptual nature of mathematics. Includes mathematical logic, set theory, real number system. Student may not receive credit for both 203 & 250. Prerequisites: completion of Basic Skills requirement in Math & instructor's consent.

205 Selected Topics in Analysis (3). Selected topics from analytic geometry and calculus of particular interest to non-physical science students. No credit for students who have completed a calculus course. Prerequisites: 10 or equivalent training & senior or graduate standing.

207 Calculus for Social and Natural Sciences I (3). The real number system, functions, analytic geometry, sequences, derivatives, maximum-minimum problems. No credit for students who have completed a calculus course. Prerequisite: 10 or equivalent. cor.

Courses 207 and 208 are a two-semester sequence of courses of integrated material consisting of selected topics from analytic geometry and elementary calculus with applications of interest to students in the social and natural sciences.

208 Calculus for Social and Natural Sciences II (3). Riemann integral, transcendental functions, techniques of integration, improper integrals and functions of several variables. No credit for students who have completed two calculus courses. Prerequisite: 207 or 205 or 61.

210 Concepts of Mathematics for Elementary Teachers (3). Open only to students majoring in Elementary Education. Elementary theory of equations. Coordinate geometry, polynomials and graphing. Introduction to mathematical models. Prerequisite: 8 or instructor's consent.

226 Discrete Mathematical Structures (3). Basic set theory, groups, semigroups, boolean algebra, graph theory and combinatorics. Applications oriented toward computer science. Prerequisites 175 and Computer Science 104.

231 Elementary Matrix Theory (3). Selected topics in linear algebra. Prerequisite: Math 175 or equivalent.

250 Survey of Mathematics (3). Selected topics from fundamental concepts of algebra, geometry, mathematical logic, history of mathematics. Recommended for students who plan to teach secondary school mathematics. Student may not receive credit for both 203 & 250. Prerequisite: 175.

301 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon consent of department. Prerequisites: 201 & instructor's consent.

302 Advanced Calculus with Applications (3). Numerical sequences and series, sequences and series of functions, uniform convergence, power series and improper integrals. Applications to special functions. Fourier series and orthogonal functions. Prerequisite: 201.

303 Vector Calculus (3). Vector algebra. Curves and surfaces. Calculus of functions of several variables. Applications. Prerequisite: 302 or 310.

304 Differential Equations (3). Common types of ordinary differential equations including many applied problems, operational methods. Prerequisite: 201. cor.

305 Introduction to Complex Variables (3). Complex functions, contour integration, power series, residues and poles, conformal mapping. Prerequisite: 302 or 310.

307 Operational Methods (3). Selected analytical techniques for applications to problems in applied sciences, including the study of Laplace and Fourier transformations. Prerequisite: 302 or 310.

308 Applied Mathematics I (3). Ordinary differential equations: analytical, operational, numerical, and series methods of solutions. Fourier series and boundary value problems. May be substituted for 304. Credit not awarded for both 304 and 308. Prerequisite: grade of B or better in 201.

309 Applied Mathematics II (3). Eigenfunction expansions. Multivariate calculus: line and surface integrals, potential functions, the divergence, Green's and Stokes' theorems, curvilinear coordinates, Lagrange multipliers. Partial differential equations of mathematical physics. Prerequisites: 304 or 308 & instructor's consent.

310 Advanced Calculus I (3). Basic topology of the real line, numerical sequences and series, properties of continuous functions, differentiation, Riemann-Stieltjes integration, uniform convergence. Prerequisite: 201. Recommended: a 300-level mathematics course.

311 Advanced Calculus II (3). Power series, elementary topology of Euclidean spaces, functions of several variables, implicit functions, partial differentiation, integration theory. Prerequisite: 310 or equivalent.

312 Introduction to the Theory of Ordinary Differential Equations (3). Course alternate to Math 304. Emphasis on common types of ordinary differential equations. Stresses theory more, deals with fewer applications. Prerequisite: 302 or 310 or concurrent registration in one of these.

320 Introduction to Mathematical Statistics (3) (same as Statistics 320).

323 Numerical Analysis (3) (same as Computer Science 323). Solutions of equations and systems of equations, interpolation and approximation, numerical differentiation and integration, and numerical solutions of differential equations. Selected algorithms programmed for solution on computers. Prerequisites: 201, Computer Science 104 or equivalent.

324 Numerical Linear Algebra (3) (same as Computer Science 324). Solution of linear systems of equations by direct and iterative methods. Calculation of eigenvalues and eigenvectors of matrices. Selected algorithms will be programmed for solution on computers. Prerequisites: 201, Computer Science 104 or equivalent.

325 Introduction to Probability Theory (3) (same as Statistics 325).

326 Statistical Inference I (3) (same as Statistics 326).

330 Theory of Equations (3). Study of polynomials and their zeros and elementary determinant and matrix theory. Prerequisite: 201.

331 Matrix Theory (3). Basic properties of matrices, vector spaces and determinants with some emphasis on applications. Prerequisite: 201.

333 Higher Algebra (3). Introduces rings, integral domains, fields, groups. Prerequisite: 201.

335 Theory of Numbers (3). Factorization, Euler phi-function, congruences, primitive roots. Prerequisite: 201.

337 Applied Modern Algebra (3) (same as Computer Science 337). Introduces modern algebra; emphasizes applications to computer science, engineering, related subjects. Basic concepts of modern algebra applied to computer design. Prerequisites: 201 & Computer Science 104 or equivalent.

340 Introduction to Abstract Algebra I (3). Introduces groups, rings, linear algebra and fields; special emphasis on groups and elementary properties of rings. Prerequisite: 201. Recommended: a 300-level mathematics course.

341 Introduction to Abstract Algebra II (3). Continuation of 340. Special emphasis on rings, vector spaces and fields. Prerequisite: 340.

350 Special Readings (1-3). Prerequisites: 201 & instructor's consent.

358 Mathematical Logic (3). Introduces classical modern logics as deductive systems; applications to foundations of mathematics. Prerequisites: junior or senior standing & interest and background in math or philosophy.

360 Synthetic Projective Geometry (3). Elementary treatment, without use of coordinates, of fundamental propositions of projective geometry. Prerequisite: 201.

362 Analytic Projective Geometry (3). Basic ideas and methods of projective geometry built around the concept of geometry as the study of invariants of a group. Extensive treatment of collineations. Prerequisite: 201.

364 Convexity With Applications (3). Properties of convex sets: convex functions, Helly type theorems, separation and support theorems. Applications. Prerequisite: 201.

366 Foundations of Geometry (3). Coordinatization of affine, projective planes by means of various kinds of algebraic structures; planar ternary rings, Veblen-Wedderburn systems, divisions rings, skew fields and fields. Prerequisite: 201.

367 Introduction to Non-Euclidean Geometry (3). Account of rise, development of non-Euclidean geometries. Intensive study of plane hyperbolic geometry. Prerequisite: 201.

372 Introduction to Topology (3). Topics from topology of Euclidean spaces, generalizations to metric spaces and topological spaces. Fundamentals of point set topology. Prerequisite: 201.

400 Problems (1-3).

401 Probability Theory (3) (same as Statistics 401).

404 Theory of Functions of Real Variables I (3). Properties of functions of one real variable. Lebesgue measure and integration on the line. Prerequisites: 310 & 311, or equivalent.

405 Theory of Functions of Real Variables II (3). Continuation of 404. L^p spaces, general measure and integration theory. Prerequisite: 404.

406 Measure Theory (3) (same as Statistics 406). Abstract measures, integration. Prerequisite: 404.

408 Partial Differential Equations (3). Sturm-Liouville problems and orthogonal functions. Solutions of partial differential equations by separation of variables and integral transforms. Properties of hyperbolic, elliptic and parabolic equations. Prerequisites: 304, & either 302 or 310.

409 Functional Analysis I (3). Linear topological spaces, Banach spaces, Hilbert spaces. Operator theory, including the Hahn-Banach, uniform boundedness and closed graph theorems. Prerequisite: 404.

410 Functional Analysis II (3). Continuation of 409. Topological vector spaces, duality theory, Banach algebras.

412 Calculus of Variations I (3). Develops necessary conditions and sufficient conditions for nonparametric and parametric problems. Hamilton's principle, related topics. Prerequisite: instructor's consent.

413 Complex Analysis I (3). Rigorous introduction to the theory of functions of a complex variable. Prerequisite: 311 or equivalent.

414 Complex Analysis II (3). Analytic continuation, Riemann surfaces, entire and meromorphic functions, selected topics. Prerequisite: 413.

418 Nonlinear Differential Equations (3). Existence theorems; criteria for periodic solutions; boundedness of solutions; perturbation theory. Emphasizes second order equations. Prerequisites: 304 & 302 or 310.

420 Topological Dynamics (3). Periodicity and its generalizations in dynamical systems. Prerequisite: 404.

423 Advanced Numerical Analysis (3). Elimination and iterative methods for solving linear systems of equations. Finite difference approximations to linear partial differential equations, integral equations, and boundary value problems for ordinary differential equations. Error analyses. Prerequisite: 310, 323 or equivalent, 331.

424 Theoretical Numerical Analysis (3). Theories of interpolation and approximation, iteration, and other aspects of numerical analysis. Prerequisites: 302 or 310, 331 or 324 & instructor's consent.

425 Special Functions (3). Representations and properties of the gamma, beta, Gauss hypergeometric, confluent hypergeometric, Legendre, elliptic, Bessel, Laguerre, Hermite, Jacobi, ultraspherical and related functions. Prerequisite: 305.

426 Advanced Ordinary Differential Equations I (3). Topics from existence and uniqueness theorems, plane autonomous systems, periodicity and boundedness of solutions of second order nonlinear equations, perturbation theory, Sturm-Liouville systems, behavior of solutions at singularities. Prerequisite: 310 or equivalent.

427 Advanced Ordinary Differential Equations II (3). Continuation of 426.

428 Topological Groups (3). Elementary properties of topological groups, invariant integration in compact groups, existence of a complete system of representations for a compact group.

429 Topics in Analysis (cr. arr.) Advanced topics in analysis. Prerequisite: instructor's consent.

430 Topics from Algebra (cr. arr.) Prerequisite: instructor's consent.

431 Linear Algebra and Matrices (3). Theory of vector spaces and linear transformations.

432 Theory of Groups I (3). Permutation groups, finite Abelian groups, Sylow theorems, and solvable groups. Prerequisite: 341.

433 Theory of Groups II (3). Extensions of groups, simple groups, free groups and selected topics.

434 Fields and Rings (3). Field extensions and Galois theory with introduction to structure of associative rings. Prerequisite: 341.

436 Nonassociative Algebras (3). Alternative and Jordan algebras with introduction to power-associative algebras.

440 Advanced Probability (3) (same as Statistics 440).

441 Stochastic Processes (3) (same as Statistics 441).

449 Topics in Applied Mathematics (cr. arr.) Selected topics in applied mathematics drawn from variety of areas: partial differential equations, tensor analysis, calculus of variations, asymptotic methods, integral equations, advanced theory of transforms and distributions, numerical analysis.

452 Lattice Theory (3). Fundamental properties of general and special lattices: modular, normed, complemented, distributive. Emphasizes distance theoretic aspect. Prerequisite: instructor's consent.

456 Differentiable Manifolds and Riemannian Geometry (3). Tensor product spaces and tensor fields on manifolds. Differentiation and integration of differential forms. Riemannian geometry and applications. Prerequisite: 310 or 372.

458 Differential Geometry I (3). Metric properties of restricted portions of curves and surfaces in three-dimensional Euclidean space. Prerequisite: 201.

460 Topics of Geometry (cr. arr.) Prerequisite: instructor's consent.

462 Distance Geometry I (3). Metric properties of metric spaces. Existence of segments and lines. Metric theory of curves.

463 Distance Geometry II (3). Metric characterization of classical spaces, related problems. Isometric imbedding.

466 Dimension Theory (3). Introduces Menger-Urysohn theory of dimension in separable metric spaces. Critical examination of curve concept.

468 General Topology I (3). Introduces axiomatic theory of general topology. Continuous functions and homeomorphisms. Convergence in abstract topological spaces. Compact and locally compact spaces. Connectedness. Metrizable spaces.

469 General Topology II (3). Continuation of 468. Product spaces and Tychonoff's Theorem. Introduction to homotopy theory. Fixed point theorems. Prerequisite: 468.

470 Introduction to Algebraic Topology (3). Development of singular homology theory; reference to other homology and cohomology theories. Introduction to homological algebra. Prerequisite: 468.

- 479 Topics in Topology** (cr. arr.) Advanced topics in topology or topological algebra.
- 480 Analysis Seminar** (cr. arr.)
- 482 Algebra Seminar** (cr. arr.)
- 484 Geometry Seminar** (cr. arr.)
- 486 Topology Seminar** (cr. arr.)
- 488 Applied Mathematics Seminar** (cr. arr.)
- 490 Research** (cr. arr.).

Mechanical & Aerospace Engineering

17 Experimental Course. For freshman-level students. Content and credit hours to be listed in *Schedule of Courses*.

20 Engineering Drawing (3). Lettering, drawing technique and use of instruments, orthographic, isometric, oblique, perspective and architectural drawing and sketching. Size description, object representation and drafting conventions. Design layout.

33 Social History of Engineering (3). Interaction between technology and society from the Industrial Revolution to the present. Meets Humanistics/Social Studies requirement.

117 Experimental Course. For sophomore-level students. Content and credit hours to be listed in *Schedule of Courses*.

120 Architectural Drawing and House Construction (3). Residential planning, construction. Architectural/construction elements, terminology, materials. Floor plans, room size, arrangement. Appliance selection/arrangement. Specifications/material standards, cost analysis. New materials, cost reduction techniques. Prerequisite: 20 or Engineering 30, or instructor's consent.

185 Introduction to Dynamics (3) (same as Civil Engineering 185). Basic fundamentals of particle and rigid body dynamics; energy and momentum methods. Prerequisite: Engineering 85.

199 Engineering Thermodynamics II (3) (same as Chemical Engineering 199).

210 Introduction to Biomechanics (3). Introduces engineering topics applicable to areas of physical therapy, physical medicine, orthopedics. Student must have had basic courses in physics, chemistry, biology, algebra and preferably trigonometry. May not be taken for credit by engineering students.

224 Engineering Materials I (3). Principles and concepts of the solid state and their relationship to behavior of solids. Structural dependency of properties. Prerequisites: Engineering 85, Engineering 99.

234 Engineering Materials II (3). Behavior of materials in engineering applications. Topics in fatigue, fracture mechanics, creep, forming processes and residual stresses. Prerequisites: 224, Engineering 195.

244 Mechanical Properties of Materials (2). Behavior of materials in engineering application. Topics in environmental effects, corrosion, fatigue, nuclear irradiation. Prerequisites: 224, 254 concurrently.

251 Fluid Mechanics (3) (same as Civil Engineering 251).

252 Instrumentation and Measurements Laboratory I (3). Static and dynamic errors; experiment design; instrumentation selection and calibration; measurement of voltage, resistance, amperage, duration, frequency, displacement, velocity, acceleration, strain, force, torque. Prerequisites: 185, Engineering 195, Math 304, & Engineering 124 or concurrently.

254 Properties of Materials Laboratory (1). Experimental investigation of physical, mechanical and thermodynamic properties of materials. Prerequisite: 224, 244 or 264 concurrently.

256 Design of Machine Elements (4). Methodology of engineering design. Design and selection of mechanical elements to meet functional, environmental and manufacturing requirements. Case studies, lab demonstrations, experiments. Prerequisites: 185, 234 & Engineering 30.

261 Thermodynamics of Compressible Flow (3). One dimensional compressible flow with and without friction and heat transfer. Isentropic flow and shock phenomenon in nozzles and diffusers. Topics from flow measurement and propulsion. Prerequisites: 251 & Math 304. cor.

262 Instrumentation and Measurements Laboratory II (3). Continuation of 252 with emphasis on instruments to measure temperature, pressure, fluid flow, fluid velocity, sound, spectral content and emissions. Prerequisites: 251, 252.

264 Physical/Thermodynamic Properties of Materials (2). Principles underlying relationships between physical and thermodynamic properties and structure in the solid state. Prerequisites: 224, 254 concurrently.

271 Aerodynamics (3). Presents fundamentals of wing and airfoil theory for incompressible flow, including fluid kinematics and dynamics, potential flow, flow about a body, thin-airfoil theory and finite wing. Prerequisites: 251 & Math 304.

276 Aerospace Structures I (3) (same as Civil Engineering 276).

280 Manufacturing Methods (3). Capabilities and limitations of engineering production methods. Economics of alternate methods, both conventional and innovative. Failure theories and material properties related to cutting and forming. Prerequisite: 224.

285 Systems Dynamics (3). Three-dimensional rigid body dynamics; mechanical vibration; response, control and stability of mechanical systems. Prerequisites: 185 & Math 304.

286 Aerospace Structures II (3). Analyzes statically determinate and indeterminate linearly elastic structures with applications. Prerequisite: 276.

295 Space Dynamics (3). Three-dimensional rigid body dynamics and orbit mechanics of flight vehicles. Prerequisites: 185 & Math 304.

286 Aerospace Structures II (3). Analyzes statically determinate and indeterminate linearly elastic structures with applications. Prerequisite: 276.

295 Space Dynamics (3). Three-dimensional rigid body dynamics and orbit mechanics of flight vehicles. Prerequisites: 185 & Math 304.

296 Design Synthesis (3). Synthesis procedures in mechanical and aerospace design; physical, economic and manufacturing constraints; modeling, optimization; design case studies from industry; design projects. Prerequisite: departmental senior standing.

299 Heat Transfer (3). Fundamentals of conduction, convection, radiation. Use of nondimensional parameters. Theory of heat exchangers. Prerequisites: 251 & Math 304.

300 Problems (cr. arr.) Special design, experimental and analytical problems in mechanical and aerospace engineering. Prerequisite: senior standing in Mechanical & Aerospace Engineering.

301 Topics in Mechanical and Aerospace Engineering (3). Current and new technical developments in mechanical and aerospace engineering. Prerequisite: instructor's consent.

304 Digital Computer Applications in Engineering (3) (same as Chemical Engineering 304, Electrical Engineering 304, Nuclear Engineering 304).

- 306 Design Analysis of Mechanisms (4).** Graphical, analytical and computer-assisted kinematic, dynamic bearing and shaking force, time response analysis of mechanisms including cams, gears and linkages. Cam design. Prerequisites: 185, Engineering 5.
- 310 Introduction to Bioengineering (3)** (same as Electrical Engineering 310).
- 313 Materials for Missiles and Spacecraft (3).** Analyzes material problems that confront designers of missiles and spacecraft. Prerequisite: 244 or concurrently.
- 314 Material Science for Advanced Applications (3).** The interaction of chemical, metallurgical and mechanical phenomena in advanced material applications. Prerequisite: 224.
- 315 Engineering Evaluation of Energy Systems and Resources (3)** (same as Electrical Engineering 315, Nuclear Engineering 315).
- 316 Life-Support Systems Design (3).** Environmental, ecological and human factors for life-support systems. Prerequisite: senior standing.
- 321 Creativity in Design (3).** Identification and strengthening of attitudes and talents essential in design. Creative aspects and value considerations in design. Prerequisite: senior or graduate standing in engineering.
- 324 Nonmetallic Engineering Materials (3).** Structures, properties and applications of ceramics, glasses, cermets, polymers and composite materials. Prerequisite: 224.
- 325 Engineering Kinetics (3)** (same as Civil Engineering 325).
- 326 Synthesis of Linkages (3).** Type, number and dimensional synthesis of linkages to produce a given input-output motion and/or force. Prerequisite: 306, Engineering 5 or equivalent.
- 331 Experimental Methods in Fluid Flow and Heat Transfer (3).** Lab experiments involving fundamental mechanisms and phenomena associated with fluid flow and heat transfer. Current experimental methods and techniques employed. Prerequisites: 262 & 299.
- 334 Introduction to X-Ray Diffraction (3).** Principles of X-ray production, instrumentation and diffraction. Applies diffraction techniques to problems of current interest. Prerequisite: instructor's consent.
- 335 Gas Dynamics I (3).** Multidimensional potential flow by use of small perturbations and method of characteristics. Considers wings in subsonic and supersonic flow. Oblique shocks, shock polars. Prerequisite: 261.
- 339 Solar Energy Utilization (3).** Thermal aspects of solar radiation applied to human and industrial needs. Solar energy availability: hourly, daily and seasonally. Space and water heating. Thermal storage. Passive and active solar design of buildings and homes. Prerequisite: 299.
- 340 Heating and Air Conditioning (3).** General principles. Conditioning air of buildings for comfort, ventilation, industrial purposes. Steam, water, hot air heating systems. Prerequisite: 299.
- 345 Mechanical Instrumentation (3).** Applications of dynamical systems, optics, thermodynamics, other energizing groups. Theory of errors and precision of design. Prerequisite: junior standing.
- 346 Introduction to Nuclear Reactor Engineering I (3)** (same as Nuclear Engineering 346). Nuclear reactions and radiations; neutron diffusion and slowing down; steady-state and time dependent theory; reactor control; energy removal. Prerequisite: Math 304 or instructor's consent.
- 350 Honors Research (cr. arr.)** Independent investigation to be presented as an undergraduate Honors thesis. Prerequisite: Honors student in Mechanical & Aerospace Engineering.
- 351 Power Plant Design (3).** Preliminary thermal design of a complete power plant. Pollution problems of the power industry are considered. Prerequisites: 199 & 299.
- 352 Advanced Mechanics of Materials (3)** (same as Civil Engineering 352).
- 353 Experimental Stress Analysis (3)** (same as Civil Engineering 353).
- 357 Automatic Control of Mechanical Systems (3).** Basic study of controller characteristics, feedback elements, process characteristics, analysis of complete systems. Prerequisites: 285 & Math 304 or equivalent.
- 359 Principles of direct Energy Conversion (3).** Principles and utilization of thermoelectric, thermionic, photovoltaic, magnetohydrodynamic generators and fuel cells. Prerequisites: 199 & 251 or equivalents.
- 360 Internal Combustion Engines (3).** Gas and oil engines. Thermodynamics of ideal and actual cycles, fuels and combustion, carburetor and injection systems, performance, construction. Prerequisite: 251.
- 361 Energy Considerations in Transportation System Design (3).** Energy factors influencing selection and design of transport systems; energy conservation and decision-making strategies; effects on future design concepts for prime movers, vehicles and transportation systems. Prerequisite: 251.
- 363 Aerospace Propulsion (3).** Analysis of air breathing and spacecraft propulsion systems. Prerequisite: 261.
- 365 Automotive Engineering (3).** Principles of design, construction, operating characteristics of automotive vehicles. Selected design problems, review of current developments. Prerequisite: 256 or concurrently.
- 367 Fluid Power Control Systems (3).** Pneumatic and hydraulic control systems. Fluid power supplies; analysis of control and power elements. Nonlinearities in fluid control systems. Fluid amplifiers and fluidics. Laboratory demonstrations. Prerequisites: 285 & Math 304 or equivalent.
- 368 Principles of Turbomachinery (3).** Thermodynamics and fluid dynamics involved in study of turbomachinery. Prerequisite: 251.
- 370 Refrigeration Systems (3).** General principles of basic methods of producing refrigeration. Special emphasis on vapor compression and absorption systems. Properties of refrigerants. Prerequisite: 199, 299 or concurrently.
- 375 Introduction to Plasmas (3)** (same as Nuclear Engineering 375, Electrical Engineering 375).
- 385 Vibration Analysis (3)** (same as Civil Engineering 385).
- 389 Advanced Thermodynamics (3)** Topics from availability, thermodynamic relationships, equations of state of pure substances and mixtures. Computation of properties. Chemical and phase equilibria. Prerequisites: 199; 304 or equivalent concurrently.
- 390 Control of Aerospace Vehicles (3).** Steady and unsteady flight of aerospace vehicles, aerodynamic loads, equations of motion, solution of equations, stability criteria, take-off and landing and controls. Prerequisite: 271, 295, or instructor's consent.
- 399 Intermediate Heat Transfer (3).** Industrial applications involving more than one mode of heat transfer. Numerical and graphical solution of transient heat flow. Heat transfer with change of phase heat exchangers. Heat transfer in high speed flow. Prerequisite: 299.
- 400 Problems (cr. arr.)** Supervised investigations in mechanical and aerospace engineering to be presented in the form of a report.
- 401 Advanced Topics in Mechanical and Aerospace Engineering (3).**
- 404 Advanced Metallurgy Principles (3).** Advanced treatment of physical metallurgy principles to provide a theoretical understanding of engineering materials. Prerequisite: 244 or equivalent.

406 Materials at Elevated Temperatures (3). Mechanical behavior of materials at elevated temperature; covers creep and stress rupture under combined stresses, variable conditions of stresses and temperatures. Effect of thermal shock and thermal fatigue. Prerequisite: 244.

407 Materials at Low Temperatures (3). Properties of structural materials in the refrigeration and cryogenic ranges; selected design applications. Materials covered include metals, alloys, plastics, glass. Prerequisite: 244.

408 State Variable Methods in Automatic Control (3) (same as Chemical Engineering 408, Electrical Engineering 408, Nuclear Engineering 408).

410 Seminar (1). Reviews recent investigations, projects of major importance in mechanical and aerospace engineering.

411 Continuum Mechanics (3) (same as Civil Engineering 411).

412 Theory of Elasticity (3) (same as Civil Engineering 412).

413 Theory of Plates and Shells (3) (same as Civil Engineering 413).

414 Theory of Elastic Stability (3) (same as Civil Engineering 414).

415 Aeroelasticity (3). Deformations of aerospace structures under static and dynamic loads, natural mode shapes and frequencies, aerodynamics and inertial loads, flutter analysis, dynamic response phenomena and critical speeds and frequencies. Prerequisites: 286 & 390.

416 Theory of Plasticity (3) (same as Civil Engineering 416).

418 Advanced Dynamics (3) (same as Civil Engineering 418).

419 Nonlinear Mechanical Analysis (3) (same as Civil Engineering 419).

426 Space Mechanics (3) (same as Civil Engineering 426).

427 Dynamics of Machinery (3). Dynamic balancing of rotating and reciprocating components of turbomachinery and internal combustion engines. Gas torque analysis, vibration stress analysis and equivalent systems. Numerical and graphical techniques. Prerequisite: 385.

428 Vibrations of Distributed Parameter Systems (3) (same as Civil Engineering 428).

430 Boundary Layer Theory (3). Fluid motion at high Reynolds Number. Derivation of Navier-Stokes equations and boundary layer equations. Methods of solution. Transition to turbulent flow. Completely developed turbulent flow. Prerequisite: instructor's consent.

431 Gas Dynamics II (3). Advanced study of selected topics in compressible flow. Prerequisite: 335.

433 Statistical Thermodynamics (3). Statistical methods of evaluating thermodynamic properties. Elements of quantum mechanics, statistical mechanics and kinetic theory applied to topics of engineering thermodynamics. Prerequisite: 199.

434 Fracture Mechanics I (3) (same as Nuclear Engineering 434). Mechanics of flawed structure. Concepts include Griffith theory, Barenblatt's theory, Irwin analysis, energy analysis of cracked bodies, fracture toughness testing, plane strain, plane stress, transition temperature concepts, subcritical flaw growth. Prerequisite: 224, 244 or instructor's consent.

435 Heat Transfer-Conduction (3). Distribution of temperature and temperature history within solids by the four essential methods of evaluation of these temperature fields. Prerequisite: 299.

436 Heat Transfer-Convection (3). Principles of heat transfer by convection, review of boundary layer theory, laminar and turbulent heat transfer, temperature-dependent fluid properties, high velocity heat transfer and an introduction to mass transfer. Prerequisites: 299 & 430.

437 Heat Transfer-Radiation (3). Advanced study of engineering radiation heat transfer. Concepts of electromagnetic theory. Development of thermal radiation laws from thermodynamic laws. Analysis of grey and non-grey systems with intervening gases. Study of recent literature. Prerequisites: 299, 304.

438 Introduction to Turbulence (3). Introduces the physical phenomena of turbulence, supported by mathematical and statistical descriptions. Especially appropriate for engineers involved in research aspects of momentum, heat and mass transport. Prerequisite: 430 or instructor's consent.

441 Physical Gas Dynamics (3). Study of the flow of chemically reacting gases of interest in mechanical and aerospace engineering. Prerequisites: 261 & 299.

444 Fracture and Fatigue Prevention in Engineering Practice (3) (same as Nuclear Engineering 444). Practical design problems. Introduces retrofit design, maintenance, product improvement and new design from a fatigue and fracture prevention philosophy. Fail safe and safe life designs presented. Prerequisite: 434.

445 Instrumentation Theory (3). Applied theory of dynamical and energizing systems for analyzing, computing, control devices. Prerequisite: 345.

447 Magnetogasdynamics (3) (same as Electrical Engineering 447).

458 Dynamical Theory (3) (same as Civil Engineering 458).

459 Dynamics of Structures (3) (same as Civil Engineering 459).

460 Combustion (3). Advanced topics in flames and combustion. Detonation and deflagrations, supersonic combustion, air pollution. Prerequisites: 199 & 261.

470 Refrigeration and Cryogenics (3). Advanced topics in refrigeration and cryogenics. Prerequisite: 370.

475 Random Vibration (3) (same as Civil Engineering 475).

490 Research (cr. arr.) Independent investigation in field of Mechanical and Aerospace Engineering to be presented as a thesis.

Medical Technology

Medical Technology:

30 Hours Credit

135 Teaching Practicum for Allied Health Sciences (3) (same as Curriculum & Instruction D135, Occupational Therapy 135, Physical Therapy 135, Radiologic Technology 135, Respiratory Therapy 135).

MT200 Hematology (7). Lectures/lab regarding diagnostic procedures for hematologic diseases: staining, counting, identifying blood and bone marrow cells; blood coagulation studies; experience with patients in the collection of specimens.

MT201 Immunohematology, Blood Banking and Tissue Typing (3). Principles and techniques related to transfusion practices are related through lectures and experience in the blood bank lab. Tissue typing deals with compatibility testing prior to organ transplant.

MT202 Clinical Microbiology (7). Diagnostic procedures related to the isolation and identification of infectious microorganisms: bacteria, fungi, parasites. Lecture and lab give special emphasis to human pathogens and their sensitivity patterns with commonly used antibiotics.

MT203 Diagnostic Immunology and Virology (3). Diagnostic immunology deals with antigen-antibody reactions and their role in the determination of infectious auto-allergic and inflammatory disease states. Virology deals with the isolation and identification of human pathogenic viruses.

MT204 Clinical Chemistry (9). Diagnosis of metabolic disease using application of principles employed in quantitation of biochemical substances. Lecture/lab cover hand methods and automated techniques for determination of proteins, carbohydrates, lipids, enzymes, electrolytes and toxic substances found in body fluids.

MT205 Morphological Techniques (1). Techniques used in histology and cytology for preparation of biological materials. Clinical microscopy covers diagnosis of disease from studies of urine; cytogenetics deals with preparation of tissue to be used in diagnosis of genetic disorders.

Medicine

Medicine, Third Year (10). Students are assigned to medical wards for 9 weeks of intensive instruction in basic internal medicine. Emphasis placed on developing the fundamental skills of history-taking, physical diagnosis and case presentation. Attention focused on learning the principles of clinical diagnosis and on developing a core knowledge of disordered physiology that constitutes representative diseases of the various organ systems. A thorough knowledge and understanding of all of the patient's problems are stressed. Third-year students participate in daily patient-teaching rounds and a series of weekly conferences.

Medicine, Fourth Year (10). During senior Medicine, students are assigned to either General Medicine or specialty experiences for a period of approximately 8-9 weeks. Experiences in General Medicine involve inpatient care. Experiences in the specialties involve both inpatient and outpatient activities. In selected situations, externships are available, as well as time in a research lab.

Elective Medicine (10). Opportunities exist for medical students at all levels after satisfactory completion of the first year. Elective and/or free time may be spent in any of several areas at the present time. They include: Cardiology; Dermatology; Endocrinology; Gastroenterology; Hematology and Oncology; Immunology and Rheumatology; Nephrology; Pulmonary Medicine. The director of the respective division should be contacted for details of opportunities available.

Postgraduate Instruction. A straight medicine internship, as well as a mixed medicine-pediatric internship offered. A three-year residency program is offered to qualified physicians.

School of Medicine —Interdisciplinary

205M Social and Behavioral Sciences I (3). Examines social, psychological and cultural aspects of physician-patient relationship, and the hospital as one of the institutional sites of patient care. Emphasizes interviewing skills and management of human crises.

206M Social and Behavioral Sciences II (2). Examines the delivery of health care; provides opportunities for student to explore in depth a selected area among a range of health care delivery problems.

207M Social and Behavioral Sciences III (2). Examines biological, psychological and social foundations of behavior; examines animal as well as human behavior, and the development of behavior and its relevance to clinical considerations.

220M Introduction to Clinical Medicine I (1). During the second semester of the first year, the goal is to introduce methods of physical examination.

221 Introduction to Clinical Medicine II (2). Goals include: (1) development of insight concerning physician-patient relationship, emphasis on interviewing skills; (2) developing skill in medical history-taking and physical diagnosis; (3) understanding of basic procedure in infectious disease epidemiology. f.

222M Introduction to Clinical Medicine III (3). Goals include: (1) refinement of the techniques of the medical history and physical diagnosis; (2) understanding of the pathophysiology of the patient's symptoms; (3) introduction to process of diagnosis and patient management. w.

Medieval & Renaissance Studies

405 Seminar in Medieval and Renaissance Studies (3). Interdisciplinary course. Advanced study/research in selected topics: European civilization during medieval, Renaissance, Reformation periods. May be repeated twice. Prerequisite: graduate status in departments having courses in medieval or Renaissance area (humanities/social sciences).

Microbiology

205 Fundamentals of Medical and Public Health Microbiology (4). Fundamental principles of infection, immunity and control of infectious disease agents. Designed primarily for students in nursing and other colleges and schools of the University. f.

301 Medical Microbiology (8). For graduate students and sophomore medical students. Fundamentals of microbiology and immunology; host-parasite relationships stressed. Pathogenic bacteria, fungi, rickettsia, viruses, animal parasites and diseases they produce studied. Prerequisite: organic chemistry; general bacteriology recommended. f.

302 Ecology and Epidemiology of Infectious Agents (cr. arr.) For advanced students. Current health problems and trends, health organizations and their function, and techniques used in epidemiological studies. Stress placed on infectious disease. Prerequisite: 301 or equivalent. w.

303 Medical Parasitology (cr. arr.) For advanced students, stressing parasites of medical importance. Prerequisite: 301 or equivalent. w.

304 Immunology (3). Lectures and lab demonstration covers antigens and their reactions; immediate and delayed hypersensitivities; blood grouping and typing, vaccines and immunity. Prerequisites: microbiology & organic chemistry or biochemistry. w.

305 Antibiotics (4). Lecture and lab study of antimicrobial substances isolated from microorganisms: methods of screening, isolating, assay, and a study of action on fungi, bacteria, rickettsia, viruses, animal parasites. Prerequisite: general bacteriology. Recommended: advanced microbiology.

306 History of Microbiology (1). Lecture and seminar-type course to acquaint students with historical background of important developments in microbiology. w.

307 Instrumental Methods in Medical Microbiology (2). Orients students toward techniques and application of instruments to research problems in medical microbiology. Primarily a lab/demonstration course: phase and fluorescent microscopy, density gradient centrifugation, Warburg methods, etc. Prerequisite: course in microbiology. w.

308 Microorganisms Indigenous to Man (3). Lecture and lab course includes quantitative and qualitative studies of the role of human indigenous microorganisms. Prerequisite: advanced course in microbiology. w.

309 Antisepsis, Disinfection and Sterilization (cr. arr.) Lecture, lab, demonstration and conference course covering basic principles and applied procedures in this field. Prerequisite: a course in microbiology. w.

310 Microbiology of the Environment (cr. arr.) Lecture, demonstration and conference course covering the ecology of microorganisms and methods for their qualitative and quantitative study in man's environment. Prerequisites: course in microbiology & in biochemistry. w.

314 Immunology Laboratory (1). Lab only in serology and immunotechniques. Ordinarily taken concurrently with 304. Prerequisite: course in microbiology. w.

315 Bacterial and Viral Genetics (4). Role of bacteria and viruses in study of molecular genetics, lecture and lab. Prerequisites: course in microbiology & in biochemistry. w.

400 Problems (cr. arr.) Students assigned individual problems in microbiology for library or lab investigation. Prerequisite: strong background in microbiology. f,w,s.

401 Advanced Medical Microbiology (cr. arr.) Similar to 301 but treats medical microbiology and immunology in more advanced manner. Methods of preparation and instruction stressed. Prerequisite: 301 or equivalent. f.

402 Virology (4). Comparative survey of viruses; emphasis on biochemical, biophysical and genetic nature. Interrelations of viruses with their host cells studied. Lecture & lab. Prerequisites: medical microbiology & biochemistry. w.

403 Advanced Microbiology (cr. arr.) Covers microorganisms in detail by lecture and assigned reading on origin, history, taxonomy, morphology, physical and chemical nature, growth and nutrition. Prerequisites: microbiology & chemistry. w.

404 Physiology of Pathogenic Organisms (cr. arr.) Covers by lecture and lab the physiologic functions of microorganisms in relation to their structure, growth, carbohydrate, protein, lipid and nucleic acid metabolism. Prerequisites: general bacteriology & biochemistry. w.

405 Advanced Virology (4). Lab and lecture. Acquaints students with methods of study of the biological, biochemical and biophysical properties of viruses. Prerequisite: 402 or equivalent. w.

406 Medical Mycology (3). Covers the superficial, subcutaneous and systematic fungi pathogenic to man. Isolation and identification of the pathogens and contaminant saprophytes stressed in lecture and lab. Prerequisite: medical microbiology. w.

407 Advanced Immunology (2). Discussions and conferences emphasizing theoretical aspects of immunology and detailed considerations of the more involved areas of this science. Prerequisite: 304. w.

410 Seminar (1). Presentation and critical discussion of student and staff research, current literature and guest lectures on subjects in various areas of microbiology. f,w.

490 Research (cr. arr.) Original investigations in various areas of microbiology related to bacteria, fungi, rickettsia, viruses, and animal parasites, or immunology relating to antigens and antibodies of infectious and noninfectious nature. Designed for graduate thesis research.

301 Topics (cr. arr.) Organized study of selected topics in music. May be repeated with departmental consent. Subjects and credit variable. Prerequisite: junior standing or instructor's consent.

400 Problems (cr. arr.) May repeat for credit.

401 Topics (cr. arr.) Organized study of selected topics in music. Subjects and credit variable. May be repeated with departmental consent. Prerequisite: instructor's consent.

421 Introduction to Graduate Study (2). Introduces library procedures, basic sources of information on music and techniques for research. Section A Comprehensive Research and Section B Musicology (or Music History).

490 Research (cr. arr.) Thesis course; may repeat for credit.

Music Theory

1 Fundamentals of Music I (2). No credit for music majors. Essentials of musicianship. Designed for elementary education majors.

2 Fundamentals of Music II (2). Continuation of Music 1. No credit for music majors. Prerequisite: 1 or instructor's consent.

3 Syntax, Structure and Style of Music I (2) (Lecture). Review of fundamentals. Study of rhythm, melody, harmony, structural organization of music. Similarities, differences of various style periods. Applications through original composition projects. Prerequisite: none for music majors; others: instructor's consent.

4 Syntax, Structure and Style of Music II (2) (Lecture). Study of smaller forms of basic counterpoint. Prerequisite: 3 or instructor's consent.

5 Aural Training and Sight Singing I (2) (Drill). Development of aural and vocal realization of materials and structure of music. Prerequisite: 3 (or concurrently).

6 Aural Training and Sight Singing II (2) (Drill). Continuation of 5. Prerequisite: 5; 4 (or concurrently).

103 Syntax, Structure and Style of Music III (2) (Lecture). Introduces chromatic harmony; studies contrapuntal genres; original composition. Prerequisite: 4.

104 Syntax, Structure and Style of Music IV (2) (Lecture). Study of advanced chromatic harmony and larger forms; original composition. Prerequisite: 103.

105 Aural Training and Sight Singing III (2) (Drill). Further development of aural and vocal skills; emphasis on late 19th-century and early 20th-century composition. Prerequisites: 6; 103 (or concurrently).

106 Aural Training and Sight Singing IV (2) (Drill). Continuation of 105. Prerequisites: 105; 104 (or concurrently).

115-116 Composition I (2) f; (2) w. Fundamentals of composition and writing of small forms. Prerequisite: 4 or instructor's consent.

150 Music Travel Course (1-4). Study tour designed to broaden perspective of persons interested in music. Stresses relationship of music to art and ideas in a variety of social and cultural contexts. Prerequisite: instructor's consent. Participant bears course cost. s.

203-204 Syntax, Structure and Style of Music V, VI (2) f; (2) w. V: study of 20th-century techniques and analysis of 20th-century music. VI: detailed analysis of selections from the 17th-20th centuries; individual projects and reports. Prerequisite: 104.

303-304 Eighteenth-Century Counterpoint I, II (2) f; (2) w. Analysis of contrapuntal procedures and representative works of 18th century; emphasis on style of J.S. Bach. Composition of canons, inventions, choral preludes and fugues. Prerequisite: 104.

Military Science (See R.O.T.C.)

Music

General

300 Special Problems (cr. arr.) Independent investigation leading to a paper or project. Prerequisite: instructor's consent.

305-306 Sixteenth-Century Counterpoint I, II (2) f; (2) w. Analysis of contrapuntal procedures and representative compositions of 16th century; emphasis on styles of Lassus, Palestrina, Byrd, and Vittoria. Composition of canons, motets, mass movements, madrigals, other secular and instrumental works. Prerequisite: 104.

307-308 Orchestration (2) f; (2) w. Capacities of orchestral instruments. Scoring for various orchestral combinations including full orchestra. Prerequisite: 104.

309 Band Arranging (2). Transcription, scoring of solo and ensemble literature for band instrument combinations of varying sizes up to and including concert band. Prerequisite: 104.

310 Choral Arranging (2). Transcription and arrangement of music suitable for performance by various vocal ensembles. Prerequisite: 104.

344 Analysis of Music (2). Analytical study of rhythmic, melodic, harmonic, and structural aspects of 18th-, 19th- and 20th-century music. Prerequisite: 104 or equivalent.

345 Introduction to Electronic Music (2). Techniques used in the creation of music with tape recorders, voltage-controlled synthesizers and electronics. Prerequisite: 203 or instructor's consent.

403-404 Analysis of Musical Styles I, II (3) f; (3) w. Analytical study of specific rhythmic, melodic, harmonic and structural factors which constitute the stylistic features of an era. I: Early Baroque through Early Romantic. II: Romantic to present. Prerequisite: 204.

407 Contemporary Analytical Techniques (2). Study and application of various analytical systems for 20th-century composition. Analysis of music employing contemporary theories (Hindemith, Hanson and Schoenberg).

411-412 Comparative Approaches to Music Theory I, II (2) f; (2) w. Techniques and materials for teaching music theory. I: basic theory courses for high school and college. II: organization and study of upperclass college courses in music theory. Prerequisite: graduate standing or instructor's consent.

215-216 Composition II (2) f; (2) w. Further development of proficiency in classical forms. Prerequisite: 116.

315-316 Composition III (2) f; (2) w. Writing of larger forms for solo instrument or chamber ensemble. May repeat for additional credit. Prerequisite: 216.

415-416 Composition IV (2) f; (2) w. Intensive work in larger forms. Seminar, private lessons. May repeat for additional credit.

429-430 Advanced Orchestration (2) f; (2) w. Transcription for full orchestra of large works from different periods. Scoring of original works for orchestra. Seminar, private lessons. Prerequisite: 308.

Music History & Literature

21 Introduction to Music Literature (3). Survey of music masterpieces from ca. 1740 to the present, with a concentration on instrumental idioms and forms.

30 Jazz, Pop and Rock (3). Historical survey of American jazz tracing its development and subsequent influences on pop and rock music since 1945. No credit for students who have taken Music 31.

31 History of Jazz (2). Historical survey of American jazz from its origins to the present. No credit for students who have taken Music 30. f, w, s.

121 Masterpieces of Music (2). For non-majors. Significant works of music studied in cross-disciplinary contexts such as theatre, literature and social history. May be repeated once for credit. Prerequisite: 21 recommended.

122 Music in the United States (2). The traditions and practice of music in the United States from colonial times to the present. Prerequisite: 21 recommended.

123 Symphony and Symphonic Poem (3). The symphony since Beethoven, with emphasis on program symphonies and symphonic poems of the later 19th century and early 20th century. Prerequisite: 21 recommended.

124 Nationalism in Music (2). Rise of national consciousness in music from the 19th through 20th centuries; masterpieces of present-day concert repertory. Recommended: 21.

125 Introduction to Opera (2). Masterpieces of opera; study of drama in music through selected scenes, acts and complete works. Recommended: 21.

187 History of Western Music I (2). Surveys music from ca. 600 A.D. to ca. 1750. Not open to freshmen. Prerequisite: 21 or equivalent.

188 History of Western Music II (2). Continuing survey of music history from ca. 1750 to present. Not open to freshmen. Prerequisite: 21 or equivalent.

223 Richard Wagner and the Music Drama (3). Wagner's life, his theories and writings on music and drama, and his relationship to the 19th-century world of politics and the arts. Prerequisite: 21 or 188 recommended.

321 Music to 1600 (3). Critical survey of the development of European music from Gregorian chant to the end of the Renaissance. Prerequisite: 187 or equivalent.

322 Music in the Seventeenth and Eighteenth Centuries (3). Critical survey of the development of European music from the Baroque through the Rococo and Classical periods. Prerequisite: 188 or equivalent.

323 The Romantic Period (2). Nineteenth-century music in relationship to Romantic Movement. Prerequisite: 188.

324 Modern Music (2). Music since 1900; emphasizes contemporary trends. Prerequisite: 188.

422 Studies in the History of American Music (2). Critical survey of the history of music in the Americas from the 16th century to the present. Prerequisites: 187 & 188 or equivalent.

423 Bach and His Time (2). Historical, critical investigation of works of Bach; influence on subsequent music.

424 Haydn, Mozart and Beethoven (2). Historical, critical investigation of composers' works. Special topics for original investigation.

426 History of Performance Practices (2). Performance practices; emphasizes Renaissance and Baroque periods.

427 Studies in the History of Opera (2). Significant operatic masterpieces from 1600 to present.

428 Studies in the History of Choral Music (2). Significant choral works from Renaissance to present.

450 Travel Seminar (1-4). Selected topics for directed study in music history undertaken in context of study tour. Emphasis on subjects with broad cross-disciplinary implications. Maximum of four hours credit. Prerequisite: instructor's consent. Participant bears cost of course. s.

Applied Music

The applied music group includes private instruction in piano, voice, string instruments, organ, wind instruments and percussion instruments. A amount of credit elected per semester is variable within indicated limits for each course and is determined by advisement. All music majors enrolled in applied music must participate as advised in a University ensemble or chamber group.

Fundamental Courses (e.g. 55) (1-2 hours credit per semester). Credit in Special Courses does not count toward a major in the subject. It is accepted, however, for music majors on B.S. in Education degree and as a secondary applied music subject on B.M. degree. Also acceptable for non-majors on A.B. degree.

Underclass Courses (e.g. 58) (1-5 hours credit per semester, 1-3 hours credit per summer session). Credit accepted toward a major in the subject on A.B. or B.M. degree. Also acceptable for B.S. in Education degree and for non-majors.

Upperclass Course (e.g. 255) (1-3 hours credit per semester). Accepted as upperclass credit on A.B. degree, and B.S. in Music Education, and for graduate credit on M.Ed. degree. Not used by B.M. degree candidates in their major instrument. Prerequisite: 8 hours Underclass Course or equivalent, plus audition by examining committee.

Advanced Upperclass Course (e.g. 355) (1-5 hours credit per semester). Required for upperclass major instrument credit on B.M. degree. Accepted as upperclass credit on A.B., B.S. in Ed., and B.M. degrees and for graduate credit on M.A. and M.Ed. degrees. Prerequisite: audition by examining committee.

Graduate Course (e.g. 455) (1-5 hours credit). Required for graduate credit as major instrument on M.M. degree. Accepted as graduate credit on M.A. and M.Ed. degrees. Prerequisite: audition by examining committee.

Sections 1 through 18 (below) indicate specific section content for courses 55, 58, 255, 355, and 455.

1. Flute
2. Oboe
3. Clarinet
4. Bassoon
5. Saxophone
6. Trumpet/Cornet
7. French Horn
8. Trombone
9. Euphonium
10. Tuba
11. Percussion
12. Piano
13. Organ
14. Violin
15. Viola
16. Violoncello
17. String Bass
18. Voice
19. Harpsichord
20. Accompanying

7 Recital/Lecture Assembly (0). Required course for all music majors (B.M. and B.S. in Music Education, except during student teaching semester) for each semester in residence, excluding the summer session. f.w.

55 Fundamental Individual Performance Study (1-2). Acceptable for non-majors. Material varies in accordance with credit elected and educational purpose. Prerequisite: instructor's consent.

58 Underclass Individual Performance Study (1-5). Credit accepted toward a major in the subject on B.M. degree, B.S. in Music Education and for non-majors. Prerequisite: instructor's consent.

255 Upperclass Individual Performance Study (1-3). Accepted as upperclass credit on B.S. in Music Education and for graduate credit on M.Ed. degree. Not used by B.M. degree candidates in their major instrument. Prerequisites: audition by examining committee & instructor's consent.

340 Individual Instruction in Instrumental and Vocal Techniques (1). For music teachers needing instruction in secondary instruments or voice. May repeat for credit.

355 Advanced Upperclass Individual Performance Study (1-5). Required for upperclass major instrument credit on B.M. degree. Accepted as upperclass credit on B.S. in Music Education degree, graduate credit on M.A. and M.Ed. degrees. Prerequisites: audition by examining committee & instructor's consent.

455 Graduate Individual Performance Study (1-5). Required for graduate credit as major instrument on M.M. degree. Accepted as graduate credit on M.A. and M.Ed. degrees. Prerequisites: audition by examining committee & instructor's consent.

Instrumental & Vocal Techniques

10 Piano Class (1). For beginning piano students. No prerequisite.

11 Piano Class (1). Continuation of 10.

12 Elementary Folk Guitar Class (1). Teaching correct hand position, strum patterns and chords needed for accompaniment of popular and folk songs.

13 Intermediate Folk Guitar Class (1). Expanded study of chords. Introduces finger picks, bass runs and coordination of bass runs with bar and picking patterns.

14 Advanced Folk Guitar Class (1). Develops solo techniques found in varying modern music styles. Prerequisite: 13 or equivalent.

15 Elementary Classical Guitar Class (1). Teaching correct hand position, notation, melodic study and two-part playing.

16 Intermediate Classical Guitar Class (1). Continuation of melodic studies, development of right hand articulation patterns and development of repertory. Prerequisite: 15 or equivalent.

137 Woodwinds I (1)

138 Woodwinds II (1)

139 Woodwinds III (1)

140 Strings I (1)

141 Strings II (1)

145 Brass I (1)

146 Brass II (1)

147 Brass III (1)

148 Percussion (1)

Practical work in orchestral instruments. Courses designed to give class instruction in playing various orchestral instruments. Given on a lab basis with two recitations weekly. Prerequisite: courses limited to majors in Music and Music Education.

149 Conducting (2). Technique of baton, factors of interpretation, score readings, rehearsal procedures for choral and instrumental organizations, program building, public appearances.

150 Conducting (2). Continuation of 149.

151 Voice Class (1). Fundamentals of singing: posture, breath support, control, vocalization, concepts of tone quality, placement, and resonance. Song literature selected for students with no previous training. Adapted to needs of drama and other interdisciplinary students.

152 Voice Class (1). Continuation of 151.

240 Undergraduate Seminar in Vocal Techniques (1). Discusses accepted techniques of singing, practical application to posture, breath support, tone placement, musicianship, diction, interpretation, stage deportment. Recognizing and solving specific vocal problems. Repeatable one time for credit. Prerequisite: instructor's consent.

241 Comparative Approaches to Keyboard Techniques and Materials (2). Different methods and ways piano is taught, including materials used. Prerequisite: instructor's consent.

242 Seminar in String Techniques (1). In-depth study of publications, philosophies, repertory, grading, specific problems for the string player. Repeatable once for credit. Prerequisites: 140 & 141, or instructor's consent.

243 Symposium in Wind and Percussion Instruments (1). Reviews strategies, techniques and literature requisites for heterogeneous wind and percussion instrumental class performance. Prerequisite: junior standing.

431-432 Principles of Singing (2) s; (2) s.

433 Advanced Choral Conducting (2). Baton technique, problems involved in direction of choral ensembles. Prerequisites: graduate standing & 149 & 150 or equivalent.

Instrumental & Vocal Repertory

302 Church Music (2). Concerned with music conventional or appropriate to church service. The repertory class concerned with study, analysis and performance of literature available for the instrument or instruments. Prerequisites: junior standing & instructor's consent.

353-354 Piano Literature (2) f; (2) w. Prerequisite: junior standing as a piano major or instructor's consent.

453-454 Piano Repertory (3) f; (3) w. Prerequisite: 355 or instructor's consent.

463-464 Vocal Repertory (3) f; (3) w. Prerequisite: 355 or instructor's consent.

473-474 String Instrument Repertory (1) f; (1) w. Prerequisite: 355 or instructor's consent.

493-494 Organ Repertory (1) f; (1) w. Prerequisite: 355 or instructor's consent.

Ensemble Courses

38 Opera Workshop (2). Open to all students with sufficient ability. Provides experience to vocal technique, repertoire.

40 Choral Ensemble. Open to University students by audition. Provides experience in vocal technique and repertoire.

Section 1: Women's Chorus

Section 2: Men's Chorus

Section 3: University Chorus (1)

Section 4: University Chorus (1)

Section 5: University Singers (2)

Section 6: Vocal Jazz Ensemble (2)

41 Instrumental Ensemble. Open to University students by audition. Provides experience in instrumental technique and repertoire.

Section 1: University Concert Band (1)

Section 2: University Symphonic Band (2)

Section 3: University Marching Band (2)

Section 4: University Orchestra (2)

Section 5: Studio Band (2)

Section 6: Stage Band (2)

44 Piano Ensemble (1). Progressive study of orchestra literature in the form of four-hand and eight-hand arrangements. Two classes weekly.

46 Chamber Music. Preparation for performance of material from recognized masterpieces of chamber music literature. Prerequisite: instructor's consent.

Section 1: String Instrument Ensemble (1)

Section 2: Wind Instrument Ensemble (1)

Section 3: Percussion Instrument Ensemble (1)

330 Collegium Musicum (1). Prerequisites: audition & instructor's consent.

346 Advanced Chamber Music (1). Section I: Strings; Section II: Winds. Prepares and performs chamber music works similar to course 46, but at the graduate level. Prerequisite: instructor's consent.

365 Opera Production (cr. arr.) Study, preparation and performance of selected operatic literature. Prerequisite: instructor's consent.

Naval Science (See R.O.T.C.)

Neurology

Neurology—Second Year. Students are taught the principles of neurologic diagnosis as part of the Introduction to Medicine course.

Neurology—Third and Fourth Years. Students participate in consultations rendered to other hospital services by Neurology and are presented a series of didactic lectures on diseases of the nervous system.

Neurology Elective—Third and Fourth Years. Students are assigned as clinical clerks to the service and participate in all clinical and teaching functions of the Department.

Nuclear Engineering Program

5 Digital Computer Computation (2). Primarily for freshman engineering students. Analysis and synthesis of digital computer programs for solving problems.

301 Topics in Nuclear Engineering (2-5). Current and new developments in nuclear engineering. Prerequisite: instructor's consent.

303 Radiation Safety (2). Types and origins of radiation; radiation detection and measurement; radiation interactions; shielding; dose calculations; federal, state and local regulations. Lab experiments in radiation measurements. Prerequisites: Physics 1, Chemistry 5.

304 Digital Computer Applications in Engineering (3) (same as Chemical Engineering 304, Electrical Engineering 304, Mechanical & Aerospace Engineering 304).

305 Survey of Nuclear Engineering (3). Introductory topics in nuclear engineering. Atomic and nuclear physics; nuclear reactor principles under steady-state and transient conditions; heat removal; shielding; instrumentation; power generation; fusion. Prerequisite: Physics 124. Concurrent with Math 304.

306 Engineering Analysis (3) (same as Chemical Engineering 306).

315 Engineering Evaluation of Energy Systems and Resources (3) (same as Electrical Engineering 315, Mechanical & Aerospace Engineering 315).

320 Natural Resources and Nuclear Energy (3). Not for engineering students. Lecture, demonstration; describes physical environment, energy, power plants, nuclear reactors; radioactivity, its biological effects; nuclear physics measures, rad-waste disposal; nuclear safeguards, nuclear explosives, societal implications. Prerequisite: high school algebra.

328 Introductory Radiation Biology (3) (same as Biological Sciences 328, Radiology 328, Veterinary Medicine & Surgery 328).

341 Nuclear Chemical Engineering (3). Principles and processes of importance in the field of nuclear technology.

346 Introduction to Nuclear Reactor Engineering I (3) (same as Mechanical & Aerospace Engineering 346).

347 Introduction to Nuclear Reactor Engineering II (3). Reactor fuel and other materials; safety; shielding; structural components; system design; economics. Prerequisite: 346.

348 Intermediate Nuclear Reactor Theory (3). Analysis of homogeneous and heterogeneous nuclear reactors using multigroup techniques; perturbation theory; control rod theory; introduces fast reactor concepts. Prerequisite: 347.

349 Nuclear Engineering Materials (3). Properties of materials for reactor components; radiation damage and corrosion; metallurgy of reactor materials. Prerequisite: upper division or graduate standing in physical sciences or engineering, or instructor's consent.

350 Nuclear Methods in Bioenvironmental Studies (3). Principles/applications of nuclear techniques in solution of bioenvironmental problems. Uses of nuclear methods in studies of water/air pollution, biology, medicine, pesticides, geochemistry, ecological transport. Lectures, lab. Prerequisite: senior standing or instructor's consent.

355 Nuclear Reactor Laboratory I (3). Experience with hands-on operation of nuclear reactors: start-up/shutdown, power level changes, control rod effects, temperature/fission product effects, instrumentation. Experiments measure flux distribution, control rod worth, reactivity coefficients, xenon transient. Prerequisite: instructor's consent.

365 Nuclear Power Engineering (3). Nuclear reactor heat generation and removal; nuclear reactor coolants; analysis of nuclear reactor power plants. Prerequisite: Engineering 99.

375 Introduction to Plasmas (3) (same as Electrical Engineering 375, Mechanical & Aerospace Engineering 375).

391 Nuclear Radiation Detection (3). Principles and application of radiation detectors and analyzers: ionization, Geiger-Muller, proportional, liquid and solid scintillation, semiconductor, pulse height analyzers, coincidence circuits, data reduction, tracer applications, activation analysis. Lectures, lab. Prerequisite: senior standing or instructor's consent.

395 Nuclear Engineering Design (3). Special problems in aspects of nuclear systems design; application of nuclear technology to industrial processes. Prerequisite: 347 or 365 or concurrently.

400 Problems (1-6). Supervised investigation in nuclear engineering to be presented in the form of a report.

401 Advanced Topics in Nuclear Engineering (3). Advanced developments in nuclear engineering. Prerequisite: instructor's consent.

405 Nuclear Reactor Laboratory II (3). Advanced experiments to measure diffusion length, Fermi age, material buckling, transfer function, neutron spectrum and other reactor characteristics. Reactor simulation with an analog computer. Prerequisite: 355, 411 or instructor's consent.

408 State Variable Methods in Automatic Control (3) (same as Chemical Engineering 408, Electrical Engineering 408, Mechanical & Aerospace Engineering 408).

409 Interaction of Radiation with Matter (3). Theory/applications of radiation interaction processes. Reviews nuclear physics concepts; radioactive decay; sources/spectra of ionizing radiation; collision mechanisms for charged particles, electromagnetic radiation, neutrons for interaction with matter. Prerequisite: instructor's consent.

410 Seminar (1). Reviews investigations and projects of importance in nuclear engineering.

411 Nuclear Reactor Theory I (3). Nuclear reactions; nuclear fission; introduces neutron transport; diffusion and slowing down of neutrons; steady-state homogeneous and heterogeneous reactor theory. Prerequisite: 347 or instructor's consent.

412 Nuclear Reactor Theory II (3). Linear and non-linear reactor kinetics; perturbation theory; temperature and fission product effects; control rod theory; transport theory. Prerequisite: 411 or 346 & 347.

421 Nuclear Pulse Analysis (3). Principles of radiation pulse analysis with emphasis on applications. Radiation detection devices; amplifying, shaping and discrimination circuits; nuclear pulse analysis; automated data analysis systems. Lectures and lab. Prerequisite: 346, 391 or instructor's consent.

422 Radiation Shielding (3). Fundamentals of radiation interactions stressing neutron and gamma radiation transport; ray theory, removal theory, multigroup transport shield design principles. Prerequisite: 409 or instructor's consent.

429 Radiation Dosimetry (3). Basis and applications of conventional and microscopic radiation dosimetry. Dose concepts and quantities; biological dose-response models; dose measurement principles; photon, charged particle, and neutron dosimetry. Prerequisite: 409 required. Recommended: 328.

432 Nuclear Reactor Engineering (3). Engineering topics from reactor heat transfer and thermal stresses, fuel cycle analysis, power plant thermodynamics, shielding and control rod analysis. Prerequisites: 411 or 347, & 365 or instructor's consent.

434 Fracture Mechanics I (3) (same as Mechanical & Aerospace Engineering 434).

444 Fracture and Fatigue Prevention in Engineering Practice (3) (same as Mechanical & Aerospace Engineering 444).

451 Computational Methods of Reactor Analysis (3). Applies numerical analysis and digital computation to topics from multigroup diffusion theory, transport theory, reactor kinetics, reactor thermal hydraulics, radiation shielding, reactor safety. Prerequisite: 304, 411, or Math 307 or Math 323.

455 Nuclear Reactor Kinetics and Control (3). Nuclear reactor kinetics equations; linear feedback systems; stability criteria; reactor transfer functions and nuclear systems analysis; analog simulation; non-linear reactor kinetics; statistical control theory and reactor noise. Prerequisite: 412.

461 Neutron Transport Theory (3). The Boltzmann equation; general properties and solution; numerical methods of solving the transport equation; neutron thermalization and neutron spectra. Prerequisite: 412; Math 305, Math 307 or instructor's consent.

470 Fast Reactor Analysis (3). Analytical methods for designing fast breeder reactor systems. Prerequisite: 412, 432, 451 or instructor's consent.

471 Radiation Protection (3). Theory and applications of radiation protection and health physics. Radiation dosimetry methods and calculations, shielding evaluations, equipment surveys and inspection, environmental monitoring, radiation standards and regulations and administration presented. Prerequisites: 303 & 328.

490 Research (cr. arr.) Independent investigation in nuclear engineering to be presented as a thesis.

Nursing

71 Concepts of Nursing (3). Examines nursing from perspective of self-care deficit theory; considers nursing as service to individuals, families and community; examines relationship of nursing to health care system and legal, ethical, professional concerns. Prerequisites: Sophomore standing and 2.5 GPA or instructor's consent. f.w.

75 Introduction to Nursing Methods (10). Develops knowledge of the nursing process and techniques used in practice. Guided experience in assessment, planning, implementation and evaluation of nursing care. Prerequisites: 71, anatomy, physiology, nutrition. Prerequisite or concurrent: microbiology, pharmacology. f.w.

77 Clinical Nursing (6). Application to nursing process of concepts derived from basic sciences. Guided experience in using the process with selected patients, applying psychosocial concepts and medical therapies pertinent to nursing. Prerequisites: departmental approval, R.N. students. s.

106 Pathophysiology and Therapeutics (4). Commonly occurring pathophysiologic states of adults and therapeutic interventions other than nursing utilized in their management. Considers causative factors, pathologic processes and prognosis. Prerequisites: 75 and an advanced sociology course which may be taken concurrently. f.w.

107 Nursing in Pathophysiologic States (6). Nursing theory and practice in care of hospitalized adults. Utilizes comprehension of pathophysiologic states, therapeutic interventions, psychosocio-cultural factors and nursing theory in the nursing process with selected patients. Prerequisite: 75. Corequisite: 106. f.w.

- 120 Basic Cardiac Dysrhythmias (1).** Functional cardiac anatomy and electrophysiology, characteristics of normal sinus rhythm, mechanisms of arrhythmia formation, atrial and ventricular dysrhythmias, atrioventricular blocks, cardiac pacemakers, cardiac drugs, and appropriate nursing interventions. Graded *S/U*. Prerequisites: 106 & 107.
- 136 Family Study I (2).** Designed to enable student to recognize universal self-care norms and demands of families. Prerequisites: junior standing, 107 & a growth and development course. f,w.
- 137 Family Nursing in the Maternity Cycle (4).** Differentiates self-care norms and deficits of the childbearing family; uses nursing process to assist childbearing families to meet universal self-care requirements. Prerequisites: 107 & a growth and development course. f,w.
- 138 Child Health Nursing (5).** Designed to enable students to effectively participate in nursing care of children and their families in a wholly compensatory, partly compensatory or supportive-educative system. Prerequisites: junior standing, 107 & a growth and development course. f,w.
- 140 Mental Health Nursing (7).** Theories and concepts relative to personality and behavior examined and incorporated into nursing process to assist individuals, groups and families in meeting therapeutic self-care demands within social and interpersonal systems. Prerequisites: 136, 137, 138. f,w.
- 158 Community Health Nursing: Family (4).** Nursing process used with families in various settings to promote, maintain, restore self-care which meets universal or health deviation requirements. Student may provide coordination, continuation of care. Prerequisites: 136, 137, 138. Corequisites: 140, 159, 160. f,w.
- 159 Community Health Nursing: Groups (3).** Stresses principles of health promotion, prevention, epidemiology and group dynamics. Nursing process used to assess, intervene in self-care systems of designated groups, communities. Prerequisites: 136, 137, 138. Corequisites: 140, 158, 160. f,w.
- 160 Community Health Nursing: Current Issues (1).** Seminar topics include nursing interests in community health issues, implications for change of nursing theories and practices, and need for involvement of nurses in future policy making at the community level. Prerequisites: 136, 137, 138. Corequisites: 140, 158, 159. f,w.
- 166 Leadership and Management in Nursing (5).** Theory and practice emphasize the role of the professional nurse as a leader. Experiences afforded in both primary and team nursing. Accountability stressed in management of patient care. Prerequisites: 140, 158, 159.
- 167 Seminar in Professional Nursing Issues (2).** Professional, legal and social influences relative to role performance discussed in the context of current practice and future trends in nursing research, education and practice. Prerequisite: 160.
- 168 Physical Assessment of the Adult (3).** Skills basic to the performance of physical assessment presented; their utilization in nursing practice emphasized. Normal and abnormal physical findings contrasted. Practicum sessions provided. Prerequisites: 140, 158, 159.
- 190 Individual Study (cr. arr.)** Independent study for qualified students in specific areas of interest in nursing under faculty guidance. Prerequisite: instructor's consent. f,w,s.
- 191 Pediatric Nursing Assessment Skills (3).** Prerequisites: instructor's consent, R.N. licensure, generic student may enroll for elective credit after 138.
- 199 Introduction to Home Nursing and Family Health (2).** Current trends in family health care; home nursing care with practice in the laboratory. f.
- 302 Health Appraisal (3).** Supervised clinical opportunity for repetitive practice of health history-taking and physical examination emphasizing discrimination of the client's significant self-care deficits and assets. Prerequisite: Physiology 208 or equivalent. w.
- 401 Topics in Advanced Clinical Nursing (3).** Specialized topics in advanced clinical nursing not available through regularly offered courses. Prerequisite: 410. f,w.
- 402 Research Methods in Nursing (3).** Rationale of scientific research; research methodology pertinent to nursing problems; hypothesis formulation, selection of appropriate design, instruments and analysis. Prerequisite: introductory course in statistics.
- 404 Teaching Nursing (3).** Principles and methods of teaching, evaluation and curriculum construction in undergraduate nursing education. Prerequisite: Educational Psychology A405 or equivalent, 411. f.
- 405 Teaching Practicum (3).** Participation in application of principles and methods of teaching, learning and evaluation to the education of undergraduate nursing students. Graded *S/U*. Prerequisite: 404. w.
- 406 Management of Clinical Nursing (3).** Investigates management process in relation to supervision of clinical nursing service. Prerequisite: Management 309 or equivalent; pre- or corequisite: 413, 423 or instructor's consent. f.
- 407 Management Practicum in Clinical Nursing (2).** Participation in the practical aspects of supervising a clinical nursing service. Arranged to meet individual student's needs and interests. Prerequisite: 406. f,w.
- 410 Advanced Nursing I (3).** Theories, concepts and principles essential to advanced nursing; basic mental and physical assessment skills, role of specialist. f.
- 411 Advanced Nursing II (3).** Continuation of 410. Prerequisite: 410. w.
- 412 Nursing in Physiological Processes I (3).** Physiological processes involved in health-illness continuum from birth to old age. Provides assessment basis for planning and implementing appropriate nursing interventions in concurrent clinical assignments. Prerequisite: Physiology 208 or equivalent.
- 413 Nursing in Physiological Processes II (3).** Continuation of 412. Prerequisite 412.
- 416 Gerontologic Nursing (3).** Concepts and principles of nursing care of aged derived from biological and behavioral sciences; nursing research on the aging process and care needs. Clinical experience with aged clients in their homes, residential and institutional settings. Prerequisite: 411.
- 418 Communication Processes and Intervention (3).** Dysfunctional communication in dyads, small groups and organizational structure. Clinical application in a variety of settings. Prerequisite: 411.
- 420 Theories of Development and Psychopathology (3).** Theories and empirical research related to psychosexual and psychosocial development, perception, cognition and moral development evaluated for ability to explain or predict behavior throughout the life cycle. Pre- or corequisite: 402. f.
- 422 Community Mental Health Nursing I (3).** Historical development and epidemiological foundations of community mental health; consultation and community assessment. Practicum in community mental health setting. Prerequisite: 410.
- 423 Community Mental Health Nursing II (3).** Nursing problems and issues, crisis intervention and consultation in community mental health. Practicum in a variety of community settings. Prerequisite: 422.
- 424 Family Dynamics and Intervention (3).** Theories of family function and dysfunction; techniques of assessment; models of family intervention. Practicum with selected families. Prerequisite: 420.

426 Child Health Nursing (0-6 Years) (3). Designed to assist students to develop a body of knowledge consistent with expertise in child health nursing practice with infants, toddlers, pre-schoolers and their families. Prerequisites: 410, 420, 424. f.

427 Child Health Nursing (6-18 years) (3). Designed to assist students to develop a body of knowledge consistent with expertise in child health nursing practice with school-agers, adolescents and their families. Prerequisites: 410, 420, 424. w.

428 Advanced Psychiatric Nursing of Children (3). Promotion of community mental health, means of preventing ill health. Considers short-term intervention, long-term relationship therapy. Clinical experience with child in community mental health setting. Prerequisite: 420. f.

430 Independent Study (2-3). Guided readings and/or a practicum either in an area of the student's interest or one which needs strengthening. Prerequisite: graduate standing. f,w,s.

431 Care of the Well Family (3). Emphasizes independence in the design, implementation and evaluation of nursing systems generally supportive and educative for well individuals and families in ambulatory care settings. Prerequisites: 302, 418, 424 and Physiology 208.

432 The Family with Long-Term Health Deviations (5). Emphasis on designing, implementing and evaluating nursing systems and participating in the medical management of individuals and families with long-term health deviations. Prerequisite: 431 or instructor's consent.

433 The Child-Bearing Family (3). Emphasis on designing, implementing and evaluating nursing systems, and participating in the medical management of individuals and families during the period of child bearing and early child rearing. Prerequisite: 431.

434 The Family with Short-Term Health Deviation (4). Emphasis on designing, implementing and evaluating nursing systems and participation in the medical management of individuals and families with short-term health deviations. Prerequisite: 431.

435 Family Nurse Practitioner Seminar I (1). Seminars focus on the development of the concept of a family nurse practitioner, the health care system, human resource management and the professional support system necessary for the family nurse practitioner to practice professional nursing. Concurrent with 431.

436 Family Nurse Practitioner Seminar II (1). Continuation of 435. Concurrent with 432.

437 Family Nurse Practitioner Seminar III (1). Continuation of 436. Concurrent with 433 and 434.

438 Family Nurse Practitioner Seminar IV (1). Continuation of 437. Concurrent with 439.

439 Family Practice Nursing Practicum (8). Intensive clinical practice focused on synthesis of previous clinical courses and development of an autonomous identity as a family nurse practitioner. Prerequisites: 432, 433, 434, 437.

450 Research (3-6). Independent research not leading to a thesis. Written report required. Prerequisite: 402 or equivalent.

460 Innovative Psychiatric Nursing (3). Guided individualized study in an area of student interest. Relevant to development of further expertise as a psychiatric nurse clinician. May be elected in last semester of second year. Prerequisite: 422 or instructor's consent. w.

490 Research (3-6). Investigates a special problem, or participates in ongoing research as a team member, followed by a written report of the study. Leads to a thesis. Prerequisite: 402 or instructor's consent. f,w,s.

Nutrition

300 Problems (1-6). f,w,s.

308 Poultry Feeding and Nutrition (3) (same as Poultry Husbandry 308).

335 Nutrition During the Life Cycle (3) (same as Human Nutrition, Foods & Food Systems Management 335).

339 Medical Dietetics (3 or 12) (same as Human Nutrition, Foods & Food Systems Management 339).

402 Animal Nutrition (3) (same as Animal Husbandry 402). w.

406 Comparative Nutrition and Metabolism (2) (same as Biochemistry 406). w.

410 Seminar (1). f.

432 Ruminant Nutrition (3) (same as Animal Husbandry 432).

440 Bioenergetics (3) (same as Dairy Husbandry 440).

450 Investigations in Experimental Nutrition (1-6). Written report required. f,w,s.

465 Advanced Metabolism: Amino Acids (2) (same as Biochemistry 465).

490 Research (cr. arr.) Investigation in any area of experimental nutrition. Thesis required. f,w,s.

Obstetrics & Gynecology

Obstetrics and Gynecology, Clinical Experience (10). Students are assigned to the clinical service in groups of varying size. Normal and complicated obstetrics and gynecology are taught by lecture, ward rounds, seminars and attendance in clinics, wards, delivery rooms and operating rooms. Weekly conferences with Radiotherapy and Pathology and seminars on maternal mortality, infertility and gynecologic endocrinology are held twice weekly.

Obstetrics and Gynecology Elective (10). Any student in the clinical elective period may make special arrangements with the department to do special work on a subject of interest.

Postgraduate Instruction. Advanced graduate and postgraduate instruction in Obstetrics and Gynecology (both short-term and long-term, varying from 1 to 4 years) and residencies are available to qualified physicians by special arrangement.

Occupational Therapy

Prerequisite for all Occupational Therapy courses: admission to program.

135 Teaching Practicum for Allied Health Sciences (3) (same as Curriculum & Instruction D135, Medical Technology 135, Physical Therapy 135, Radiological Technology 135, Respiratory Therapy 135).

200 Occupational Therapy Theory I (5). History and development of occupational therapy as a profession: theory and application of techniques in General Medicine, Surgery and Pediatrics. Study of perceptual motor dysfunctions.

201 Occupational Therapy Theory II (4). Theory and application of occupational therapy techniques with patients with physical disabilities.

202 Occupational Therapy Theory III (3). Theory and application of occupational therapy techniques with patients exhibiting psychiatric disorders.

205 Psychological Aspects of Physical Dysfunction (2). Introduces students to emotional reactions of illness and disability. Explores the roles of therapists and patients, death and dying, body image and self-concept, and adjustment problems met in developing a new life style.

210 Therapeutic Media (3). Therapeutic media used in occupational therapy for rehabilitating patients with physical or psycho-social disorders. Activities include adapted daily life tasks, fabrication of adaptive equipment, splinting, wheelchair modification, goal-directed use of craft media.

211 Group Process (2). To familiarize students with group dynamics through laboratory experience in which students encounter inter- and intrapersonal feelings through T (Training) Group and S (Sensitivity) Group techniques.

215 Organization and Administration of an Occupational Therapy Department (2). Organizational structure of occupational therapy departments in various types of institutions; inter- and intradepartmental relationships; ethics; community resources.

220 Human Anatomy (7). Gross structure and neuroanatomy of a human body, with dissection of extremities, back, head, neck, abdomen and thorax.

231 Basic Clinical Psychiatry (3). Lectures designed to give better understandings of etiology, symptomatology, prognosis and medical treatment of psychiatric disorders as necessary to the practice of occupational therapy.

240 Field Work Experience (cr. arr.) Assignment to an occupational therapy department in a physical or psychosocial setting or a community center.

250 Problems in Occupational Therapy (cr. arr.) Individualized course planned to meet specific needs of each student. Independent study in a variety of areas.

270 Clinical Kinesiology (3). Functional anatomy and biomechanics in normal and abnormal conditions of extremities, back, neck and thorax. Dynamics of human motion and motor skills.

Ophthalmology

Ophthalmology, Second Year. Students are taught the principles of ophthalmoscopy as a part of the Introduction to Medicine course.

Ophthalmology, Third and Fourth Years. The ocular signs of systemic disease are taught to students as they rotate through the services of Medicine, Child Health (Pediatrics) and Neurology.

Ophthalmology Elective—Senior Students—8 Weeks. Senior students who choose this elective are assigned to the service as junior residents, so that they may take part in all clinical and teaching functions of the Department.

Postgraduate Instruction. The department is approved for a formal three-year residency training program.

Pathology

193 Cytology Female Genital Tract (10). A definitive study of normal and abnormal cellular changes occurring within the organ system by means of light microscopy with histologic correlation. Instructor's consent required.

194 Respiratory Cytology (4). A definitive study of the normal and abnormal cellular changes occurring within the system by means of light microscopy, with histologic correlation. Instructor's consent required.

195 Cytology of Body Fluids (4). Normal and abnormal cellular changes within pleural, peritoneal, pericardial and cerebrospinal fluids by means of light microscopy, with histologic correlation. Instructor's consent required.

196 Gastrointestinal Cytology (4). A definitive study of the normal and abnormal cellular changes occurring within the system by means of light microscopy, with histologic correlation. Instructor's consent required.

197 Oral Cytology (2). Studies normal and abnormal cellular changes within the oral cavity and oropharynx by means of light microscopy, with histologic correlation. Instructor's consent required.

198 Urinary Cytology (4). Studies normal and abnormal cellular morphology from kidney, ureter and bladder samples, with histologic correlation. Instructor's consent required.

199 Special Problems in Cytology (2). Relating hematologic morphologic findings in conventional body fluid cytology; also review of techniques used in chromosome cultures and karyotyping, with emphasis on sex-related abnormalities.

200 Basic Pathology (2). Provides nonmedical students with a general understanding of the essential nature of disease, including mechanisms of its development and cause/effect relationships. Prerequisites: 5 hours biological science or equivalent and 5 hours chemistry. f.

210M General and Clinical Pathology, Second Year (8). Integrated study of fundamental pathological mechanisms of disease; effect on body organ systems. Clinical lab measurement of altered organ system function begun. Prerequisite: first year Medical School or equivalent. f.

212M Systemic and Clinical Pathology, Second Year (8). Integrated study of organ system diseases and their clinical lab manifestations. Emphasizes case study method. Open only to medical students. Prerequisite: 210M or equivalent. w.

303 Basic Pathology (2). Provides nonmedical students with a general understanding of the essential nature of disease, including mechanisms of its development, and cause/effect relationships. Prerequisites: 5 hours biological science or equivalent, & 5 hours chemistry. f.

310 General Pathology (5). Basic pathological mechanisms of human disease. Introductory principles of clinical lab measurements of altered organ system function studied. Prerequisites: Biochemistry 206, Physiology 250, Anatomy 301, 302, 304, 305, & instructor's consent. f.

311 General Pathology Laboratory (3). Gross and microscopic applied study of basic pathological disease mechanisms. Lab assessment of these basic disease mechanisms. Prerequisites: Biochemistry 206, Physiology 250, Anatomy 301, 302, 304, 305, or the equivalents, & instructor's consent. f.

312 Advanced Pathology (5). Lecture course presenting integrated systematic study of pathology of all major human organ systems. Lab manifestations of organ system pathology emphasized. Prerequisites: 310 & 311 or equivalent & instructor's consent. w.

313 Advanced Pathology Laboratory (3). Demonstration and simulation study of gross, microscopic and clinical laboratory pathology of major human organ systems. Prerequisites: 310 & 311 or equivalent & instructor's consent. w.

404 Advanced Pathology (cr. arr.) Graduate course in which amount and character of work depend upon needs, qualifications and interests of student. Prerequisite: instructor's consent.

430 Comparative Pathology (3) (same as Plant Pathology 430, Veterinary Pathology 430).

491 Research (cr. arr.) Open only to properly qualified graduate students. Background of advanced chemistry and mathematics required. Prerequisite: instructor's consent.

Pathology Elective (10). Any medical student in the elective period may make special arrangements with the department to do research on a subject of interest.

Postgraduate Instruction. Advanced graduate and postgraduate instruction in Pathology (both short term and long term, varying from 1 to 4 years), and residencies are available to qualified physicians by arrangement.

Peace Studies

- 50 Introduction to Peace Studies (3).** Introduces the study of peace; emphasizes underlying concepts and principles of conflict resolution, disarmament strategies, models of world order, aggression reduction and non-violent social change.
- 100 History of Modern Europe (3-4)** (same as History 100).
- 111 The World of the Middle Ages (3)** (same as History 111).
- 131 History of American Expansionism (3)** (same as History 131).
- 139 Russia in Modern Times (3)** (same as History 139).
- 141 Imperial China (3)** (same as History 141).
- 151 Politics and the Military (3)** (same as Political Science 151).
- 160 Social Bases of War and Peace (3)** (same as Sociology 160).
- 171 Group Communication (3)** (same as Speech & Dramatic Art 171).
- 180 Undergraduate Seminar I (3).** Psychobiological bases for conflict, aggression. Examines several species, with focus on biological determinations of aggression, nature of intraspecific aggression, methods by which aggression is contained and resolved.
- 181 Undergraduate Seminar II (3).** Sociological and cultural bases for conflict, aggression. Examines social causes of intrasocietal conflict, focuses on interpersonal aggression, conflict between social groups, mob action, riots, revolution.
- 182 Undergraduate Seminar III (3).** Intersocietal political and economic bases for conflict and aggression. Examines intersocietal causes of conflict, with focus on warfare arising out of political, economic, ideological conflicts between societies.
- 188 Senior Thesis I (3).** Prerequisite: consent of Peace Studies Committee.
- 189 Senior Thesis II (3).** Prerequisite: consent of Peace Studies Committee.
- 215 Collective Behavior (3)** (same as Sociology 215).
- 260 Economic Development (3)** (same as Economics 260).
- 261 The Third World: An Anthropological Perspective (3)** (same as Anthropology 260).
- 300 Mass Media and Society (2)** (same as Journalism 300). Requires approval of the Dean of the School of Journalism.
- 302 International Journalism (2)** (same as Journalism 303). Requires approval of the Dean of the School of Journalism.
- 303 Politics and War (3)** (same as Political Science 303).
- 318 Medieval Culture (3)** (same as History 318).
- 322 Philosophy of Behavioral and Social Sciences (3)** (same as Philosophy 322).
- 325 Political and Social Philosophy (3)** (same as Philosophy 325).
- 326 Political Anthropology (3)** (same as Anthropology 325).
- 341 Sino-Soviet Conflict (3)** (same as History 341).
- 354 Political Sociology (3)** (same as Sociology 354).
- 355 Western Europe's Foreign Policy (3)** (same as Political Science 355).
- 370 Political Development and Social Change (3)** (same as Political Science 370).
- 371 American Foreign Policy from Colonial Times to 1898 (3)** (same as History 370).
- 373 History of United States Foreign Relations, 1898 to the Present (3)** (same as History 373).

Pediatrics (See Child Health)

Pest Management

- 180 Principles of Pest Management (3)** (same as Agriculture 180). Basic concepts of integrated systems for the management of pest populations of insects, mites, plant pathogens, nematodes, weeds and vertebrates.
- 181 Pesticide Chemicals (3)** (same as Entomology 181, Agriculture 181).
- 198 Pesticide Application Equipment (3)** (same as Agriculture Engineering 198).
- 301 Introduction to Plant Pathology (3)** (same as Plant Pathology 301, Forestry, Fisheries and Wildlife 301).
- 391-392-393 Clinical Plant Pathology (2) s; (1) f; (1) w** (same as Plant Pathology 391, 392, 393).

Pharmacology

- 204 Elements of Pharmacology (2).** Introductory study of drugs commonly used in clinical medicine; particular reference to pharmacodynamics. Designed for medical science writers and nurses desiring a brief survey course. Prerequisite: Physiology 201 or equivalent. f.
- 305 Topics in Pharmacology (cr. arr.)** Selected topics not in regularly offered courses. Prerequisites specified by instructor each semester course is offered.
- 320 Pharmacology (8).** Basic pharmacology for graduate students and medical students. Special emphasis on actions, mechanisms of action and therapeutic uses of selected drugs from major groups of medicinal compounds. Prerequisites: 5 hours biochemistry & Physiology 305 or equivalent. w.
- 330 Lectures in Pharmacology (3).** Major principles of pharmacology and characteristics of different classes of drugs presented. Special emphasis on mechanisms of action, including interaction of chemicals with biological systems. Prerequisites: 10 hours physiology & 5 hours biochemistry. w.
- 332 Pharmacology Laboratory (2).** Classical pharmacological exercises and original student projects. Prerequisites: 10 hours physiology & 5 hours biochemistry & 330 (may be taken concurrently) or equivalent.
- 334 History of Pharmacology (1).** Historical background of contemporary pharmacology. Prerequisite: 320 or equivalent. w.
- 400 Problems (cr. arr.)** Individual projects in pharmacology.
- 410 Seminar (1).** Review of current literature of pharmacological topics. f,w.
- 420 Pharmacological Methods (2).** Objectives and approaches in pharmacological investigation. Prerequisite: 320 or equivalent. alt. f. even years.
- 427 Fate of Drugs in the Animal Body (2)** (same as Veterinary Anatomy-Physiology 427).
- 431 Effects of Drugs on Enzymes (1).** Presentation of selected agents which exert their pharmacological action by means of an effect on an enzyme. Prerequisite: 320 or equivalent. alt. f. odd yrs.
- 434 Pharmacodynamics of Autonomic Drugs (2).** Advanced study of autonomic drugs, primarily from current literature. Prerequisite: 320 or equivalent. alt. f. odd yrs.
- 436 Pharmacodynamics of Cardiovascular Drugs (1).** Advanced study of cardiovascular drugs. Prerequisite: 320 or equivalent. alt. f. odd yrs.
- 438 Pharmacodynamics of Behavior Drugs (2).** Advanced study of behavior drugs. Prerequisite: 320 or equivalent. alt. f. odd yrs.
- 450 Research (cr. arr.)** Opportunities for research in pharmacology, not leading to dissertation.
- 490 Research (cr. arr.)** Research in pharmacology, leading to dissertation.

Philosophy

1 General Introduction to Philosophy (3). Introduction to traditional philosophical problems and methods of philosophical enquiry. Consideration given to different philosophical theories on nature of reality, man, nature and God; knowledge and how it is acquired; values and social issues. cor.

5 Introduction to Ethics (3). Introduction to different philosophical theories regarding when acts are morally right rather than wrong; when things are good rather than bad; nature of the "good life." Theories regarding nature of ethical reasoning and justification considered.

10 Introduction to Logic (3). Introduction to the principles of deductive and inductive reasoning, the critical analysis of arguments and the detection of fallacies.

50 Philosophical Classics (3). Introduces selected philosophical classics, dealing primarily, but not exclusively, with problems of metaphysics and epistemology. Prerequisite: none, but both 5 & 50 may not be taken for credit.

110 Comparative Philosophy (3). Compares the interpretation and role of philosophical concepts such as experience, reason, permanence, change, immortality, soul, God, etc., in Indian, Chinese and European traditions.

120 Philosophical and Religious Themes (3). Considers basis for and nature of religious beliefs. Philosophical approaches to religion, cultural implications of religion, psychoanalysis and religion, mysticism and myth.

125 Contemporary Issues in Social Thought (3). Introduces political and social philosophy. Views of individual, group, class and their relations to society as seen through works of contemporary philosophers and related thinkers and writers.

130 Philosophy and Human Nature (3). Human existence, its nature, condition, foundations and significance, according to contemporary philosophies such as existentialism, pragmatism, Marxism, positivism, Thomism, process philosophy, religious personalism, etc. Students asked to formulate their own self-conceptions.

198 Honors I (3). Special work for Honors candidates.

199 Honors II (3). Special work for Honors candidates.

204 Ancient Western Philosophy (3). Philosophic thought from Thales through Plotinus; emphasizes Plato and Aristotle.

205 Early Modern Philosophy (3). Surveys critical and speculative thinking of modern period, up to and including Kant. Its relation to scientific, religious, political, general social movements.

301 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon consent of department. Prerequisites: junior standing & instructor's consent.

308 Greek Philosophers (3) (same as Classical Studies [Greek] 308).

310 American Philosophy (3). Philosophic, religious, political thought from Edwards to Emerson.

311 Recent American Philosophy (2-3). Leading philosophers, philosophic movements in American thought since 1890; emphasizes Dewey, James, Peirce, Royce.

312 Plato (3). Ethics, methods, metaphysics, epistemology in the major works of Plato.

313 Aristotle (3). Aristotle's work on metaphysics, psychology, ethics.

314 Symbolic Logic (3) (same as Linguistics 314). Fundamental operations in a variety of recent systems of logic using symbolic techniques.

315 Philosophical Ideas in Literature (3). Metaphysical, ethical, religious ideas embodied in literary classics from Plato and Lucretius to Dostoevsky and Eliot.

316 Intermediate Logic (3). Critical examination of so-called "alternative logics"; their uses to solve philosophical problems. Prerequisite: 314.

317 Aesthetics (3). Typical components of art; theories of art as representation, form, expression; relation of art to value.

318 Advanced Symbolic Logic (3). Analyzes formal systems with respect to such properties as consistency and completeness. Prerequisite: 314.

319 Inductive Logic (3). Critical examination of non-deductive inference, its uses and its limits.

320 Philosophy of Science (3). Critical analysis of methods and presuppositions of science. Prerequisites: junior standing & 10 hours science.

322 Philosophy of Behavioral and Social Sciences (3) (same as Peace Studies 322). Nature of the social sciences; their relation to natural science; problems of value and social control. Prerequisites: junior standing & 10 hours social science.

323 Philosophy of History (3). Reads from classic and contemporary philosophers of history. Problems about nature and limits of historical knowledge; relation between history and other disciplines; the existence, nature and kinds of historical laws.

324 Medieval Philosophy (3). Major thinkers from St. Augustine through 14th century Ockhamists.

325 Political and Social Philosophy (3) (same as Peace Studies 325). Examination through classical texts of man's relationship to the state and his relationship to both state and society in terms of such concepts as contract theory, general will, alienation, individualism and collectivism.

327 Ethical Theory (3). Critical study of some of the main types of ethical theory.

328 Philosophy of Mind (3). Examines problems and issues in the philosophy of mind, focusing on the works of such recent philosophers as Ryle, Strawson, Hampshire and Wittgenstein.

330 Logical Theory (3). Critical examination of subject matter and task of logic as seen from the traditional point of view and from that of symbolic logic, inductive logic, idealism, pragmatism, realism. Prerequisites: junior standing & course in logic.

332 Philosophy of Law (3). What is law? Are there pre- or translegal rights? Is punishment justifiable? How can judicial decisions be justified? What are the relations between law and morality?

335 Philosophy and Language (3) (same as Linguistics 335). Classical, contemporary views of effect of language on man's experience and beliefs about reality, knowledge, moral values. Construction of improved languages. Prerequisite: junior standing.

337 Contemporary Ethical Theory (3). Problems stemming from "naturalistic fallacy" debate, "ought-is" debate, and later developments; existentialist ethics; phenomenological ethics.

340 Latin American Philosophy (3). Examines philosophical and related ideas in Latin America. Prerequisite: course in philosophy or junior standing.

341 Marxism (3). A philosophical examination of (a) the notion of critique as seen in Marx's early and middle writings, and (b) specific topics by such authors as Lenin, Lukacs and Plekhanov.

345 Nineteenth-Century Philosophy (3). Empiricism of Comte, Mill, Spencer; rationalistic and voluntaristic idealisms of Fichte, Hegel, Schopenhauer, Nietzsche; existentialism of Kierkegaard. Prerequisites: junior standing & 5 or course in history of philosophy.

346 Contemporary Philosophy (3). Philosophies of Russell, Wittgenstein, Whitehead, Bergson, Dewey, Santayana, contemporary existentialism. Prerequisites: junior standing & 5 or course in history of philosophy.

350 Special Readings (1-3).

360 Asian Philosophy (3) (same as South Asia Studies 360). Survey of philosophical ideas in India, China and other centers.

362 Philosophy of India (3) (same as South Asia Studies 362). General development of Indian philosophy.

364 Contemporary Indian Philosophy (3) (same as South Asia Studies 364). Indian philosophical traditions as represented in backgrounds of Gandhi, Tagore, Ramakrishna and philosophical systems of Radhakrishnan, Aurobindo, etc.

365 Analytic Philosophy (3) (same as Linguistics 364). Writings of Russell, Moore, Ayer, Carnap, Ryle, Austin and Wittgenstein.

370 Existentialism (3). Existential ideas in Kierkegaard, Nietzsche, Heidegger, Jaspers, Sartre, Tillich.

405 Problems in the Teaching of Philosophy (2). Discusses presentation of material, plans courses, selects texts. Supervised practice teaching.

410 Seminar (1-3). Offered in a wide variety of topics. May be repeated for credit.

412 Seminar in Plato (1-3). Advanced studies in Plato; emphasis on recent scholarship.

413 Seminar in Aristotle (1-3). Advanced studies in Aristotle; emphasis on recent scholarship.

415 Problems in Metaphysics (1-6). Different topics studied alternate years. May be taken twice for credit.

417 History of Aesthetics (1-3). Works of Plato, Aristotle, Kant and Croce on art and beauty.

420 Problems in Theory of Knowledge (1-6). Critical analysis and evaluation of (1) ways of knowing; (2) problem of perception. Topics (1) and (2) studied in alternate years. May be taken twice for credit.

423 Problems in Asian Philosophy (1-6). Different topics studied in alternate years: (1) Buddhist philosophy; (2) Vedanta philosophy. May be taken twice for credit.

427 History of Ethics (1-3). Ethical works of Plato, Aristotle, Aquinas, Spinoza, Kant, Mill and Nietzsche.

430 Continental Rationalism (3). Philosophies of Descartes, Spinoza, Leibnitz.

435 British Empiricism (1-3). Philosophies of Locke, Berkeley, Hume.

436 Kant (1-3). Kant's *Critique of Pure Reason*; his contribution to ethical theory.

438 Problems in Social and Political Philosophy (1-6). Selected topics in social and political philosophy.

440 Seminar in Logic (1-6). Critical examination of selected topics from the history and theory of logic.

445 Schopenhauer and Nietzsche (1-3). Comparative study of criticism of reason; role of will in nature, man, art; pessimism, creativity in life, art.

446 Whitehead and Bergson (1-3). Comparative study of intuition and other methods, temporal and nontemporal reality, natural religion.

447 Sartre (2-3). Existentialism and phenomenology; emphasis on *Being and Nothingness*. Analysis of consciousness, the world, social relations, values, freedom, anguish and related concepts.

448 Heidegger (3). Close analysis of *Being and Time* and later essays.

450 Research (cr. arr.) Research not leading to thesis.

451 Problems in the Philosophy of Science (1-6). Selected topics in alternate years from (1) the epistemology and methodology of science, and (2) philosophical implications of substantive scientific concepts.

453 Problems in Philosophy of Social Science (1-3). Foundations of the social sciences and their implications for the philosophy of man.

455 The Philosophical Aspects of Personality Theory (3). Philosophical theories of self compared with contemporary psychological theories; emphasizes metaphysical assumptions behind each, and methodological principles governing theory construction and weight of evidence.

465 Russell and Wittgenstein (1-3). Philosophy of logical atomism; views of these men in epistemology, philosophy of language, other topics.

470 Seminar in Phenomenology (1-3). The phenomenological program, methods and investigations into specific topics by such authors as Husserl, Merleau-Ponty, Ricoeur and Schutz. May be taken twice for a maximum of 6 hours.

490 Research (cr. arr.) Work toward preparation of thesis or dissertation.

Physical Education (See Health & Physical Education)

Physical Medicine & Rehabilitation

210-211 Fundamentals of Applied Clinical Pathophysiology (3 hrs. each). Courses use self-instruction techniques, lectures, small group discussions. Fundamentals of pathophysiology and clinical medicine of different body systems. For physical and occupational therapy students.

Physical Medicine and Rehabilitation (5). Each medical student is provided a four-week clinical clerkship to develop an overall concept of restorative care and principles of rehabilitation. Experience gained working with allied health professions in the delivery of comprehensive health care.

Research in Physical Medicine and Rehabilitation (1). Original research requiring formal research report.

Clinical Fellowship in Physical Medicine and Rehabilitation (10). Eight-week experience in the clinical practice of Rehabilitation Medicine for selected students. Prerequisite: clinical clerkship in Physical Medicine & Rehabilitation.

Medical Aspects of Vocational Rehabilitation (2).

Physical Therapy

To be admitted to these courses the student must be majoring in physical therapy or have the consent of the director.

135 Teaching Practicum for Allied Health Sciences (3) (same as Curriculum & Instruction D135, Medical Technology 135, Occupational Therapy 135, Radiologic Technology 135, Respiratory Therapy 135).

180 Clinical Education I (1). Supervised treatment of patients, addressing the scope of future clinical practice.

181 Clinical Education II (2). Continuation of 180.

182 Clinical Education III (3). Continuation of 181. Supervised treatment of patients covering scope of future clinical practice. Patient-therapist relationships and teaching methods emphasized.

195 Organization and Administration (3). Administrative procedure of hospitals, rehabilitation centers and physical therapy departments: ethics, personnel, records, schedules, budgets. f.

P220 Human Anatomy (7). Gross structure and neuroanatomy of human body; dissection of extremities, back, head, neck, abdomen, thorax. s.

P237 Applied Neurophysiology for Allied Health Students (3). Principles of basic neurophysiology, emphasizing correlation of structure and function of the nervous system.

P250 Theory and Technique of Physical Therapy I (3). Principles and procedures of physical therapy; emphasis on basic evaluation techniques. Major topics: transfers, range of motion measurement, muscle testing, massage, mobility, activities of daily living, splinting and taping, s.

P251 Theory and Technique of Physical Therapy II (3). Principles, indications, methods of application, physiological effects of hydrotherapy and electrotherapy in diagnosis and treatment of diseases, disabilities; topics in biophysics and concepts of physics underlying use of electricity. f.

P260 Problems in Physical Therapy (3). Content geared to individual needs and interests of students in broad scope of Physical Medicine and Rehabilitation. Self-instruction and participatory learning stressed; descriptive thesis required. w.

P265 Seminar (2). Presentation and discussion of special professional techniques: cardiac and pulmonary rehabilitation, manipulation, pre-partum and post-partum programs. s.

P270 Clinical Kinesiology (3). Functional anatomy and biomechanics in normal and abnormal conditions of extremities, back, neck, thorax. Dynamics of human motion and motor skills. w.

P280 Therapeutic Exercise I (4). Principles, methods and physiological effects of therapeutic exercises. Evaluation and treatment of acute injuries, principles of orthotics, prosthetics and assistive devices included. w.

P281 Therapeutic Exercise II (4). Emphasis of facilitatory approaches to therapeutic exercises based upon neuro-muscular physiology and normal growth and development. s.

P290 Clinical Externship I (5). Full-time student assignment to Physical Therapy departments providing educational experience in hospitals, special schools, rehabilitation centers. Students supervised by experienced physical therapists and guided in developing skills necessary to fulfill their professional role. w.

P291 Clinical Externship II (5). Continuation of 290. w.

P292 Clinical Externship III (3). Continuation of 291. Independent study for those who qualify.

Physics

Basic Courses

Physics 1, 123, 124, 215 form a calculus-based sequence for science and engineering majors. Physics 11 and 12 are a non-calculus sequence of courses. Physics 11, 12, 130 may substitute for 1, 123, 124 as prerequisites for more advanced courses.

3 Physical Science (5) (same as Chemistry 3). Surveys aspects of physics and chemistry relevant to energy use by society. Many lecture demonstrations. Discussion mainly qualitative. Includes a lab. Recommended for non-science or non-engineering majors.

11 Elementary College Physics (5). Covers in an introductory manner nearly all areas of physics: mechanics, sound, magnetism, electricity, atomic physics, light. Four lectures, one lab weekly. Prerequisites: high school algebra & plane geometry.

12 Elementary College Physics (3). Continuance of 11. Introduces heat and properties of matter; additional topics in mechanics, electricity, modern physics. Two lectures, one lab weekly. Prerequisite: C in 11.

80 University Physics I (3). Physical quantities, standards and units, vectors, Newton's Laws of Motion, kinematics, statics, work and energy, rotational dynamics. Includes a lab. Corequisite: Math 80.

123 University Physics II (3). Oscillatory motion, gravitation, thermodynamics, electrostatics, elementary circuits. Includes a lab. Prerequisite: 80. Corequisite: Math 175.

124 University Physics III (3). Magnetism, electromagnetic phenomena, optics, matter waves and particles. Includes a lab. Prerequisite: 123. Corequisite: Math 201.

130 Intermediate College Physics (3). Continuation of 11 and 12 sequence. Key topics in mechanics and in electricity and magnetism are treated, using calculus. Prerequisites: a year of college physics & Math 201 concurrently.

Advanced Courses

A year of college physics with grade of C or better is prerequisite for all advanced courses.

180 Undergraduate Seminar (cr. arr.) Individual study, paper, presentation.

190 Honors Seminar (cr. arr.) Presentation of topics of current interest in physics by staff and students at junior-senior level.

196 Honors Problems in Physics (cr. arr.)

201 Introduction to Modern Astrophysics (3) (same as Astronomy 201).

202 Astronomical Observations and Measurements (2) (same as Astronomy 202).

205 Environmental Physics (2-3). Evaluates electromagnetic, acoustic and nuclear radiations and the characteristics of matter of environmental interest. Includes spectral distributions, light and sound levels, radiation hazards, particulate characteristics, atomic structures. Surveys campus instrumental resources. Laboratory variable.

215 Intermediate Modern Physics (3). Introduces quantum mechanics; atomic and molecular physics; electronic structure; spectra; electrical, thermal and magnetic properties of solids; imperfections; nuclear physics. Prerequisite: 124 or 130. Includes 4 or 5 lab experiments.

220 Space Physics (3) (same as Astronomy 220).

225 Fundamentals of Physics for High School Teachers I (2). Surveys mechanics, heat, sound for the high school teacher. Special reference to fundamental concepts, demonstrations, use of equipment, problems.

226 Fundamentals of Physics for High School Teachers II (2). Similar to 225 but covers magnetism and electricity, light, certain features of modern physics. May be taken before 225.

310 Electricity and Magnetism I (3). Mathematical preliminaries. Properties of charge distributions at rest and in motion, the field concept, introduces electromagnetic radiation. Prerequisites: 314 & Math 201 or concurrently.

311 Light and Modern Optics (4). Principles of geometrical and physical optics. Coherent radiation, lasers. Three classes weekly, six 3-hour labs during semester. Prerequisite: Math 175 or concurrently.

312 Introduction to Thermodynamics (3). Development of the concepts of temperature, heat, work, entropy, enthalpy and free energy. Applications to gases, liquids and solids. Statistical methods. Prerequisite: 215.

313 Electricity and Magnetism II (3). Application of Maxwell's Equations. Prerequisite: 310.

314 Mechanics (3). Development of fundamental concepts, principles of mechanics using mathematical methods. Many problems used. Prerequisite: Math 201 or concurrently.

315 Solar System Astrophysics (3) (same as Astronomy 315).

325 Stellar Astrophysics (3) (same as Astronomy 325).

335 Galactic Astronomy (3) (same as Astronomy 335).

370 Topics in Introductory Theoretical Physics (3). Introduces theories and mathematical methods of physics; emphasis on continuous media, wave phenomena. Prerequisites: 310 & 314 & Math 304 or instructor's consent.

375 Computational Methods in Physics (3). Use of modern computational techniques in solving a wide variety of problems in solid state, nuclear, quantum and statistical physics. Prerequisite: 215.

380 Modern Physics I (3). Special relativity and elementary wave mechanics. Schrödinger equation for harmonic oscillators and hydrogen-like atoms discussed in detail. Prerequisite: instructor's consent. Recommended: Math 304.

381 Modern Physics II (3). Applications of wave mechanics to atoms, nuclei and solids. Prerequisite: 380 or instructor's consent.

385 Introduction to Quantum Mechanics (3). Perturbation theory, applications to atomic physics, semiclassical radiation theory, elementary scattering theory. Prerequisite: instructor's consent.

Advanced Laboratory Courses

A year of college physics with a grade of C or better prerequisite for all advanced courses. Math 175 must precede. Math 201 must accompany any course in the following group.

300 Problems (cr. arr.) Special studies for advanced undergraduate students in physics covering subjects not included in courses regularly offered.

304 Principles of Physical Measurements (3). Analyzes direct/alternating current circuits. Measures solid/liquid properties of materials of current research interest. Uses computer to analyze data. One class, two labs weekly. Prerequisites: Math 175; Math 201 or concurrently.

305 Applied Electronics Circuits (3). Acquaints student with construction, use, maintenance of electronic circuits commonly used in physical research. Two classes, one lab weekly. Prerequisite: 304 or instructor's consent.

306 Advanced Physics Laboratory I (3). Experiments in atomic, nuclear and solid state physics including x-ray and neutron diffraction, NMR and Mossbauer effect measurements. Experiments familiarize students with modern equipment found in most physics laboratories. Two 3-hour labs weekly. Prerequisites: 215, 304.

307 Advanced Physics Laboratory II (3). Experiments include: super-conductivity, resistivity, specific heat, optical, and computer-related measurements. Two 3-hour labs weekly. Prerequisite: 215, 304.

Graduate Courses

Prerequisite: differential equations; 2 years college physics or equivalent for all courses numbered 400 or higher.

404 Study of Techniques of Teaching College Physics (1-3). Objectives, methods and problems related to teaching college physics. Some credit in this course is required for all students teaching physics. May repeat for 3 hours maximum.

410 Seminar (1). Colloquium for departmental staff and for students of sufficient attainments. May be elected repeatedly. Some credit in seminar required for all graduate degrees in physics.

411 Seminar in Solid State Physics (1). Topics of current interest selected for discussion. May be elected repeatedly. Prerequisite: 415.

412 Seminar in Nuclear Physics (1). Topics of current interest selected for discussion. May be elected repeatedly. Prerequisite: 420.

413 Seminar in Resonance Spectroscopy (1). Topics of current interest selected for discussion. May be elected repeatedly.

414 Seminar in Theoretical Physics (1). Topics of current interest selected for discussion. May be elected repeatedly.

415 Electronic Structure of Solids I (3). Theoretical, experimental aspects of electronic properties of solids; metals, semi-conductors, insulators.

416 Electronic Structure of Solids II (3). Continuation of 415. Mechanical, thermal, optical and magnetic properties of solids.

418 X-Rays and Neutron Diffraction (3). Theory and application of X-rays; absorption, scattering, refraction, X-ray spectra and defraction. Introduces neutron diffraction methods; interprets results. Prerequisite: 380 or equivalent.

419 X-Ray Laboratory (2-4). Technique of X-ray measurements acquired through repetition of classical experiments on absorption, scattering, polarization, diffraction of X-rays. Prerequisite: instructor's consent.

420 Nuclear Physics I (3). Properties of nuclei and nuclear radiations, detection methods, high-energy nuclear phenomena. Prerequisite: 380.

421 Nuclear Physics II (3). Selected topics in nuclear physics: angular momentum and the nuclear shell model, rearrangement collision theory and the coupled channel optical mode. May be elected twice. Prerequisite: 420.

425 Small-Angle Scattering of X-Rays (1-3). Lectures, discussion of theory, apparatus and applications of small-angle X-ray scattering including determination of particle size and shape. Relation of small-angle X-ray scattering to light scattering reviewed. Prerequisite: 418 or instructor's consent.

430 Theory of Nuclear Structure (3). Two, three and n-particle formal scattering theories; Faddeev's equations, separable potentials, off-shell scattering and analyticity methods are treated.

432 Theoretical Astrophysics (3) (same as Astronomy 432).

435 Radio Frequency Spectroscopy (3). Microwave absorption in gases, atomic and molecular beams, electronic and nuclear paramagnetic resonance. Prerequisite: 471 or 471 concurrently.

440 Low Energy Neutron Scattering (3). Theory, application of low energy neutron scattering to investigation of structure and dynamics of aggregate matter: lattice vibrations, ordered spin systems, spin waves, diffusive motions in liquids; experimental techniques discussed. Prerequisite: 415.

445 Plasma Physics (3). Orbit theory, kinetic theory, magnetohydrodynamics, multi-fluid formulations, wave propagation, instabilities and plasma flow.

452 Stellar Interiors (3) (same as Astronomy 452).

455 Stellar Atmospheres (3) (same as Astronomy 455).

461 Dynamics (3). Hamilton's principle and Weiss' principle; interplay of dynamics and symmetry. Lagrangian, Hamiltonian, Hamilton-Jacobi formulations applied to point particles, rigid bodies, small oscillations, nonlinear oscillations, fields (continuous systems). Prerequisite: instructor's consent.

462 Electromagnetic Theory (3). Electrostatics/magnetostatics, Cartesian, cylindrical/spherical coordinates. Separation of variables, eigenfunction expansions, Green's functions. Maxwell's equations, plane waves, time varying fields. Causality, Kramers-Kronig relations, dispersive media, Fresnel relations, dipole radiation, Kirchoff integral method for diffraction. Prerequisite: 461.

464 Electrodynamics (3). Tensor analysis, special theory of relativity, the Lorentz group. Classical theory of fields: variational principle, Noether's theorem, invariance principle. Microscopic Maxwell's equation, electromagnetic conservation laws and applications to radiation. Prerequisite: 462 or instructor's consent.

466 Topics in Mathematics of Modern Physics (3). Concentrates on mathematical techniques used in modern physics. Linear vector spaces: function spaces, operators, spectral theory, integral equations, applications of complex variables, Green's functions, group theory.

468 Thermodynamics and Statistical Mechanics (3). Thermodynamics as applied in physics, chemistry; laws of distribution; statistical methods of study matter, radiation. Prerequisite: 471 or concurrently.

471 Quantum Mechanics I (3). Basic definitions, axioms, exact solutions to the non-relativistic Schrodinger's equation, angular momentum and perturbation theory. Prerequisite: 461.

472 Quantum Mechanics II (3). Approximation methods, semi-classical treatment of radiation, identical particle systems, scattering theory, relativistic quantum mechanics and introduction to quantum field theory. Prerequisite: 471. f.

473 Quantum Mechanics III (3). Quantum theory of fields; discussions on quantization of the Klein, Gordon, Dirac and Maxwell fields. Reduction of S-matrix, Feynman diagrams, renormalization; applications to quantum electrodynamics. Prerequisite: 472. w.

475 Theory of Spectra (3). Atomic and molecular spectra; emphasis on use of spectral data to determine atomic and molecular structure. Prerequisite: 471 or instructor's consent.

478 Topics in Solid State Theory (3). Selected topics in solid state theory, including various elementary excitations in solids and their interactions. May be elected twice.

480 Application of Quantum Field Theory in Statistical Physics (3). Recent developments in the theory of many-particle systems. Applications to low temperature behavior, normal and superfluid, of condensed systems. Prerequisites: 468 & 472.

486 Theory of Elementary Particles (3). Invariance principles; parity, charge conjugation, time reversal, isotopic spin, g-parity, SUR, etc. Dynamic relationships: statistical model, field theoretical methods, dispersion relations. Prerequisite: 473 or instructor's consent.

Research & Reading Courses

400 Problems (cr. arr.) Lab work involving study of literature of special experiments in physics. Introduces research methods.

450 Research (cr. arr.) Selected experiments in advanced physics or selected topics in advanced reading. Report required. Does not lead to dissertation.

490 Research (cr. arr.) Work for preparation of dissertation for master's or doctor's degree.

Astronomy

1 Introduction to Astronomy (5). Surveys research methods used in astronomy; description of solar system; stellar astronomy, emphasizing physical condition; structure of galaxy and universe. No lab. Prerequisite: elementary knowledge of algebra & plane geometry.

2 Introduction to Experimental Astronomy (5). Emphasizes observational and practical astronomy including telescope experience. Students selected from Astronomy 1 enrollees. Lectures common with Astronomy 1 satisfy physical science lab requirements. Prerequisite: elementary knowledge of algebra and plane geometry.

201 Introduction to Modern Astrophysics (3) (same as Physics 201). Elements of solar system, stellar, and galactic astrophysics. Emphasizes interpretation of observations and physical conditions of various astronomical objects: planets, stars, gaseous nebulae, galaxies. Prerequisites: Physics 123 or equivalent, Math 80 or equivalent.

202 Astronomical Observations and Measurements (2) (same as Physics 202). Elements of modern astronomical instruments, observations and analysis. Prerequisite: 201 or concurrently.

220 Space Physics (3) (same as Physics 220). Reviews solar system astronomy. Detailed study of solar electromagnetic and particulate radiations; geomagnetic effects; solar, planetary and interplanetary magnetic fields; the near-earth space environment. Prerequisites: 1 year college physics & a working knowledge of calculus.

300 Problems (cr. arr.) Special studies in astronomy; covers subjects not included in courses regularly offered. Prerequisite: instructor's consent.

315 Solar System Astrophysics (3) (same as Physics 315). Investigates physical states of various members of solar system—planets, satellites, comets, sun. Emphasizes orbital mechanics, planetary interiors, structure and evolutionary state of sun, cosmogony. Prerequisite: Physics 314 or concurrently or instructor's consent.

325 Stellar Astrophysics (3) (same as Physics 325). Basic astrophysics of stable and unusual stars, stellar systems. Investigates stellar dimensions, radiation, spectra, energy, evolution, populations; interstellar medium; stellar motions and aggregations. Prerequisite: 201, Physics 314 or concurrently or instructor's consent.

335 Galactic Astronomy (3) (same as Physics 335). Reviews physical properties of stars. Investigates distribution and motion of stars in space, structure of our galaxy, galactic and star cluster dynamics. Prerequisite: 201, Physics 314 or instructor's consent.

432 Theoretical Astrophysics (3) (same as Physics 432). Selected topics from solar system, stellar, galactic and extragalactic astronomy and astrophysics. May be elected twice. Prerequisite: instructor's consent.

452 Stellar Interiors (3) (same as Physics 452). Investigates physical phenomena in stars: quantum thermodynamics, energy transport, mechanisms; stellar structure, evolution and nucleosynthesis.

455 Stellar Atmospheres (3) (same as Physics 455). Reviews atomic and molecular spectra. Investigates quantum radiation law, emission and absorption processes, radiation transfer theory, continuous and discrete line spectra of stars, stellar composition. Prerequisite: 325, Physics 380, or instructor's consent.

Physiology

201 Elements of Physiology (5). Beginning course for upperclassmen and graduate students designed to cover the basic functional aspects of all systems of the body. Prerequisite: 5 hours general zoology or equivalent.

208 Human Physiology (4). Specialized course providing in-depth training in principles of basic, applied physiology. Lab illustrates basic principles. Course primarily for nurses. Prerequisites: 201 & Anatomy 201 or equivalents & department chairperson's consent.

250 Medical Physiology (8). Functional survey of the organ system of man; special emphasis on the physiological basis of medical practice. Lab illustrates basic principles of physiology with emphasis on experimental design and data interpretation. Medical students only. w.

303 Physiology of Environmental Stress (2). Formulation of the stress hypothesis applicable to life in health and disease. Literature survey of environmental factors on physiological functions. Prerequisites: 201, 5 hours chemistry & 5 hours physics or equivalents. w.

305 Mammalian Physiology (6-10). Graduate-level course on the physiology of major organ systems of mammals; strong emphasis on physiological principles. Lab illustrates basic physiological concepts and design and interpretation of physiological experiments. Prerequisite: instructor's consent. w.

325 Medical Neurophysiology (3). Aspects of central nervous system function; emphasis on human pathophysiology. Prerequisites: 201 or 250 or Veterinary Anatomy-Physiology 420, & instructor's consent. f.

335 Systems Analysis of Physiological Processes (3). Develops a steady state control system approach to the analysis of several physiological mechanisms; emphasizes the application of steady state analysis to physiological research. Prerequisite: 201 or an equivalent college-level biology course.

400 Problems (cr. arr.) Individual problems in physiology assigned to expand previous work or an introduction to research.

410 Seminar (1). Reviews current literature on physiological topics. f,w.

418 Advanced Mammalian Physiology (3). Critical study of current status of various topics in mammalian physiology. Prerequisite: instructor's consent. w.

421 Animal Cryophysiology (2). Reviews aspects of low temperature biology: cellular and systemic. Comparative aspects of poikilothermy and evolution of homeothermy, acclimatization, hibernation, hypothermia. Prerequisites: courses in biophysics, physiology, & zoology.

422 Comparative Vertebrate Physiology (2). Seminar-type course in advanced physiology. Topics: organ systems in representative vertebrates, including role of evolution, adaptation, environment. Prerequisite: one course in physiology, organic chemistry, physics, comparative anatomy. alt. f. even yrs.

430 Cardiovascular Physiology (2). Covers important aspects of the cardiovascular system; emphasis on recent developments. Prerequisite: 305 or Veterinary Anatomy-Physiology 220V & Veterinary Anatomy-Physiology 221V or equivalent. alt. f. odd yrs.

439 Renal Physiology (2). Mechanisms in mammalian renal physiology presented; particular emphasis on micropuncture analysis of intrarenal function. Prerequisites: 305, Veterinary Anatomy-Physiology 220V & Veterinary Anatomy-Physiology 221V or equivalent. alt. f. even yrs.

445 Microcirculatory Control Mechanisms (2). Critical review of tissue control of microcirculation; emphasis on changes in perfusion for tissues with relatively high metabolic rates (skeletal muscle). Prerequisite: 305 or Veterinary Anatomy-Physiology 420, or Biological Sciences 270. alt. w. even yrs.

450 Research (cr. arr.) Opportunities for research in physiology not leading to dissertation.

490 Research (cr. arr.) Research in physiology, leading to dissertation. f,w,s.

Plant Pathology

301 Introduction to Plant Pathology (3) (same as Forestry, Fisheries & Wildlife 301, Pest Management 301). Provides basic understanding of biotic and abiotic agents which cause plant disease, and current approaches to disease control.

307 Mycology (4) (same as Biological Sciences 307).

361 Insects in Relation to Plant Diseases (3) (same as Entomology 361). Principles of insect transmission and dissemination of plant pathogens. Lectures, laboratory, greenhouse. Prerequisites: 301 & Entomology 101 or Entomology 201 or instructor's consent. alt. w. odd yrs.

369 Genetics of Plant Disease Development (3) (same as Biological Sciences 369).

391-392-393 Clinical Plant Pathology (2) s; (1) f; (1) w. Procedures for isolating and identifying diseases as they occur throughout the year on woody and herbaceous plants; determines causal agents and predisposing factors; discusses control measures.

400 Problems (cr. arr.) Advanced individual studies; minor research problems. f,w,s.

403 Diseases of Field Crops (3). Detailed study of diseases illustrating basic principles of plant pathology. Prerequisite: 301 or 307. alt. w. even yrs.

405 Diseases of Plants (Viral) (2). First 7 weeks f.

406 Diseases of Plants (Bacterial) (2). Second 8 weeks f.

407 Diseases of Plants (Fungal) (3). First 9 weeks w.

408 Diseases of Plants (Nematode) (2). Second 6 weeks w.

This sequence is a study of infectious diseases of plants caused by virus, fungus, bacteria and nematode pathogens. Entire sequence (405, 406, 407, 408) is an integrated two-semester, 9-credit-hour study of plant pathology, required in sequence of candidates for advanced degrees in plant pathology. Graduate students from other departments may elect any one or more of the four half-semester units. Prerequisite: 301.

410 Seminar (1). Presentation, discussion of extension studies, literature. f,w.

411 Biochemistry and Physiology of Plant Diseases (3). Physiology of infectious plant diseases; physical/chemical plant surface interactions between host/pathogen in rhizosphere, metabolic alterations within host/pathogen. Prerequisites: 301, Biological Sciences 313 & Chemistry 210. alt. f. odd yrs.

426 Fungus Physiology (4). Discussion of fungal metabolic systems; emphasis on lab procedures for studying selected metabolites. Prerequisites: bacteriology or microbiology, 8 hours organic chemistry & a course in biochemistry or instructor's consent. alt. w. odd yrs.

430 Comparative Pathology (3) (same as Veterinary Pathology 430, Pathology 430).

450 Research (cr. arr.) Research not expected to terminate in dissertation.

451 Electron Microscopy (1). Basic principles of electron microscopy; emphasis on biological applications. Prerequisites: graduate status & instructor's consent. s.

452 Electron Microscopy Laboratory (4). Provides extensive experience with current techniques and instrumentation employed in ultrastructural research. Prerequisites: graduate status, 451 & instructor's consent. s.

490 Research (cr. arr.) Independent investigation in field of plant pathology to be presented as a thesis.

Political Science

1 American Government (5 or 3). Theory, politics and constitutional development of American democracy at national and state levels; examines contemporary issues in foreign, military and economic affairs; meets state law requirement.

11 Introduction to Political Science (3). Introduces scope and content of politics: theory and operation of democratic and nondemocratic governments. Meets state law constitutional requirement. Students taking this course may not take 1, and vice versa. cor.

55 International Relations (3). Contemporary international affairs: family of nations, control of national foreign policies, competition and cooperation in legal, political, economic, social fields.

101 Topics (1-3). Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable upon departmental consent.

102 State Government (3). Government and politics at the state level, with emphasis on Missouri.

120 The Judicial Process (3). Analysis of role played by American judges and courts in democratic policy formation.

150 Comparative Political Systems (3). Analysis of major political systems selected from Europe, Asia, Africa and Latin America, emphasizing basic concepts of comparative political study. Prerequisite: 1 or 11.

151 Politics and the Military (3) (same as Peace Studies 151). Dynamics of contemporary civil-military relations, the military-industrial complex, the military regime. Also deals with military as an interest group and as a modern socializing agent.

155 World Politics (3). Introduces principles of international politics. Enrollment restricted to Honors students. Students taking this course may not take 55 or vice versa. Prerequisite: 1 or 11.

160 Introduction to Political Thought (3). Surveys political ideas from Plato to present; emphasis on Hobbes, Locke, Rousseau and the modern theories of Liberalism, Conservatism, Socialism, Fascism. Prerequisite: 1 or 11.

170 Internship in Local, State or National Government (3). Regularized work experience with government agency at local, state or national level; readings and guidance by faculty coordinator. *S/U* grade only. Prerequisites: 101, 306, or 310, or equivalent, & instructor's consent.

181 Asian Civilizations (3) (same as South Asia Studies 181, History 181).

182 Legislative Internship (3). Weekly work experience with an assigned individual legislator in Jefferson City during regular session of state legislature; guidance and readings supplied by faculty coordinator. *S/U* grade only. Prerequisite: 101, 305, 316, or 325, or equivalent.

183 Fieldwork in Practical Politics (3). Participates in political campaigns and interest group activities under guidance of faculty coordinator. *S/U* grade. Prerequisite: 305, 307, 325, 328, or equivalent. Can be taken more than once to a total of 6 hours.

190 Proseminar in Political Science (1-3). For Political Science Honors candidates. Analyzes content, methods and problems of the discipline using classical and contemporary writing. Normally taken in junior or senior year.

198 Honors (1-6). Special readings, reports in the several fields of political science. For Political Science Honors candidates.

210 Current Issues in American Politics (3). Investigation primarily through reading and discussion of contemporary issues in American politics. Content varies. Prerequisite: 1 or 11.

211 Internship in Local, State or National Government (3). Regularized work experience with government agency at local, state or national level, with readings. Guidance by faculty coordinator. Prerequisites: 1 or 11, & instructor's consent.

216 Legislative Internship (3). Weekly work experience with an assigned individual legislator in Jefferson City during regular session of state legislature; guidance and readings supplied by faculty coordinator. Prerequisite: sophomore standing or above.

224 Fieldwork in Practical Politics (3). Direct participation in activities of candidates' campaigns, political parties, interest groups, citizen's organizations and the like with readings and guidance by faculty coordinator. Prerequisite: 1 or 11.

260 Themes in Political Theory (3). Selected themes and issues in political theory. Specific subject matter varies each semester.

300 Special Problems (cr. arr.) Independent investigation to meet needs of the individual student. Prerequisite: instructor's consent.

301 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit vary from semester to semester. Repeatable with departmental consent. Prerequisites: junior standing & instructor's consent.

303 Politics and War (3) (same as Peace Studies 303). Why do wars occur? The functions of force and uses of a threat of force. Problems of national security strategy and arms control.

304 Inter-American Relations (3). Surveys recent problems in relations of United States with Latin American powers. Prerequisites: junior standing & 1 or 11.

305 Political Parties (3). Development, organization, functions, activities of major and minor political parties; pressure groups; election administration, especially in United States. Prerequisites: junior standing; 1 or 11.

306 Municipal Government (3). Political organization of urban communities; place of municipal corporation in American governmental system. Prerequisites: junior standing; 1 or 11.

307 Voter Behavior and Attitudes (3). Consideration of studies of voting behavior and political opinion formation, role of voters in a democracy.

308 Comparative Urban Politics (3). Compares political processes in metropolitan areas of United States with those in other cultural settings. Includes an examination of political conflict, influence and relationships of political and social organization in urban areas.

309 International Law (3). Legal system which defines rights of states in the international community. Illustrated by court decisions and state practice. Prerequisites: junior standing; 1 or 11.

310 Introduction to Public Administration (3). Surveys recurring themes, conceptual problems and substantive findings in the literature of public administration with particular attention to U.S. public bureaucracies.

311 Administrative Regulation of Business (3). Role of administrative agencies in development of regulatory policy in the U.S.

312 Issues in Public Bureaucracy (3). Investigates selected political and administrative problems affecting public bureaucratic units. Context varies.

313 Comparative Public Administration (3). Analytical comparison of administrative systems of various countries in different stages of national development. Prerequisite: junior standing.

314 American Foreign Policies (3). Bases, formulation, evaluation of current American foreign policies. Prerequisites: junior standing; 55 or 155; History 20.

316 Legislation (3). American national and state legislative systems.

317 Public Policy (3). Introduction to the study of public policy in the United States. Analyzes public policy choices of national, state and local governments and the variety of forces which serve to shape policy decisions.

318 Comparative State Politics (3). Analyzes similarities and differences of state politics and the ways in which such politics are shaped by political and socioeconomic environments of the states.

320 The American Constitution (3). Leading American constitutional principles as they have evolved through important decisions of the United States Supreme Court. Prerequisites: junior standing; 1 or 11.

321 The Constitution and Civil Rights (3). Civil rights in American constitutional context emphasizing freedom of religion, freedom of expression, minority discrimination, loyalty, rights of defendants. Prerequisites: junior standing; 1 or 11.

322 The United States Supreme Court (3). Role of Supreme Court in American system of government; particular attention given to reading biographies and writings of the justices. Prerequisite: 320.

323 Law and the Political Process (3). Political uses of courts and legal bureaucracies; development of legal issues, recruitment, internal dynamics and decision making, policy outcomes and public opinion.

324 Survey Research Methods (3). Selection of survey research topics, questionnaire development, sampling, interviewing, coding and preparation of data for computer analysis. Emphasis on practical participation.

- 325 Politics of Pressure Groups (3).** Internal politics of special interest groups—business, labor, agriculture, etc.; techniques of influencing public policy in American political system. Prerequisites: junior standing; 1 or 11.
- 326 Data Analysis in Political Research (3).** Introduces methods and techniques of data collection and analysis. Prerequisites: 1 or 11; junior standing.
- 328 Political Behavior (3).** Economic, psychological and social dimensions of political behavior; participation, leadership and elites; political attitudes; voting behavior and decision-making processes. Prerequisites: junior standing; 1 or 11.
- 330 Government Budgeting (3).** Role of the budget in resource allocation, operations control and intergovernmental relations. Emphasis on politics of budgeting, planning-programming-budgeting system (PPBS), and financial problems of urban governments. Prerequisite: 310 or equivalent.
- 331 Planning, Budgeting and Systems Analysis (3).** Planning, budgeting and systems analysis as a means for coordination, control, evaluation and optimizing resources of organization; recent innovations in information handling and their significance for government organizations examined.
- 340 The American Presidency (3).** Evolution of the presidency; particular emphasis on constitutional and political roles played by chief executive in shaping public policy. Prerequisites: junior standing; 1 or 11.
- 350 Special Readings (cr. arr.)** Independent readings selected in consultation with supervisory faculty member. Prerequisite: instructor's consent.
- 351 Latin American Governments (3).** Development, present status of political institutions in South America; emphasizes current political problems. Prerequisites: junior standing; 1 or 11.
- 354 Western European Political Systems (3).** Comparison of the political cultures, institutions and processes of Britain, France, West Germany, Italy and selected smaller countries in Western Europe.
- 355 Western Europe's Foreign Policy (3)** (same as Peace Studies 355). Comparison of foreign policies of the major Western European countries; their roles within the European Community. Study of institutions and functioning of the European Community and its potential as an emerging world power.
- 356 Comparative Communist Systems (3).** Dynamics of communist revolutions; methods of consolidation, development-mobilization techniques, domestic problems, attempted solutions. Emphasis predominantly on Asian and Eastern European with some reference to Soviet communist states and Cuba.
- 358 Soviet Foreign Policy (3).** Principles, problems and evolution of Soviet foreign policy toward Western powers, developing nations and other members of Soviet bloc. Prerequisite: junior standing.
- 360 American Political Thought (3).** Development of political thought in America from colonial period to World War II. Prerequisite: junior standing.
- 361 Recent American Political Thought (3).** Analysis of leading political ideas in America: primary emphasis on development since World War II: reformulation of liberal and conservative traditions and emergence of radical ideas. Prerequisites: junior standing or instructor's consent; 360.
- 362 Political Theory I—Classical to Early Modern (3).** Development of political ideas in the Classical, Roman, Medieval and Renaissance periods. Major thinkers considered: Plato, Aristotle, Cicero, Augustine, Thomas Aquinas, Machiavelli. Prerequisite: junior standing.
- 363 Political Theory II—Modern (3).** Development of political ideas from the Renaissance through 19th century. Major thinkers considered: Hobbes, Locke, Rousseau, Burke, Hegel, Mill, Marx. Prerequisite: junior standing.
- 364 Political Theory III—Contemporary (3).** Development of political ideas from late 19th century to present. Major thinkers considered: Nietzsche, Dewey, Lenin, Mao, Fromm, Sartre, Niebuhr, Spengler, Gentile. Prerequisite: junior standing.
- 370 Political Development and Social Change (3)** (same as Peace Studies 370). Interdisciplinary analysis of the dynamics of political and socioeconomic change based on an examination of theories of development and case studies from Asia, Africa, Latin America and/or the Middle East.
- 371 Government and Politics in Southeast Asia (3).** Comparative analysis of the politics of selected Southeast Asian states, such as Indonesia, Vietnam, Malaysia, Thailand, and the Philippines. Special attention given to problems of political and socioeconomic development.
- 372 International Relations in Asia (3).** Survey of recent problems in relations among Asian nations and of United States policy in the region. Prerequisite: junior standing.
- 373 The Political Cultures of South Asia (3)** (same as South Asia Studies 373). Impact of political thought, social and cultural setting, foreign intrusions (e.g., colonialism), and nationalism upon politics and government of India, Pakistan, Ceylon, Bangladesh and Nepal. Prerequisite: junior standing or instructor's consent.
- 374 Contemporary South Asian Political Systems (3)** (same as South Asia Studies 374). Contemporary political and governmental patterns of India, Pakistan, Sri Lanka, Nepal and Bangladesh.
- 375 The Politics of Modernization: East Asia (3).** Comparative study of the evolution of national governments and policies, primarily in Japan and Korea.
- 376 Contemporary Chinese Politics (3).** Comparative study of the evolution of national governments and policies in China and Taiwan.
- 385 International Organization (3).** Forms, functions of international organizations; special reference to United Nations and International Court of Justice. Prerequisites: junior standing; 1 or 11.
- 400 Problems (cr. arr.)** For graduate students with necessary prerequisite courses. Topics in one of the fields of political science for individual study.
- 401 Topics (cr. arr.)** Organized study of selected topics. Subjects and earnable credit vary from semester to semester. Repeatable with departmental consent. Prerequisite: instructor's consent.
- 402 Readings in International Relations (3).** Analysis, evaluation of some basic theories which attempt to explain international affairs.
- 403 Public Administration and Policy Development (3).** Intensive study of role of administrators in determination and development of public policy. Prerequisite: 310.
- 404 Seminar in International Politics (3).** Intensive study of foreign policy formulation and implementation; special emphasis on American foreign policies. Prerequisite: graduate standing or instructor's consent.
- 405 Readings in American Political Parties (3).** Critical examination of literature in American party system.
- 406 Research in American Politics and Legislation (3).** Directed research into one or more specific aspects of American party system, pressure groups, presidency, legislation, public opinion and the like.
- 407 Problems in Public Opinion (3).** Intensive study of public opinion theory and analysis. Prerequisite: instructor's consent.

410 Readings in Public Administration (3). Critical examination of literature relating to selected topics in public bureaucracies.

411 Studies in Public Administration (3). Directed research involving selected topics in public bureaucracies.

412 Comparative Administrative Systems and Cultures (3). Intensive comparative analysis of selected aspects of the public administration systems of various countries in different stages of national development.

415 The Urban Community (3). Directed research into selected problems of the urban setting.

418 Federalism and Intergovernmental Relations (3). Analyzes relationships among American governmental units emphasizing national-state relations and metropolitan area problems. Prerequisite: instructor's consent.

419 Logic of Political Inquiry (3). Examines some assumptions underlying empirical social science. Critical analysis and comparison of some important conceptual frameworks which are also general enough to be applied to many kinds of polity.

420 Judicial Behavior (3). Critical examination, both conceptual and methodological, and behavioral literature in public law. Emphasizes impact of judicial decisions and relations of judiciaries to their environing systems.

421 Research Design and Measurement (3). Research design, social measurement and techniques for study of political phenomena. Prerequisite: 419 or instructor's consent.

425 Seminar in Constitutional Law (3). Reading and critical examination of significant writings in American constitutional and legal theory.

430 Seminar in Public Policy (3). Covers the basic theory, approaches, problems and issues relating to the scope, development and implementation of public policy.

431 Policy Evaluation Methods (3). Methods of evaluating public policies and legislative impacts. Emphasis on applied designs and information analysis such as sampling design, experimental design, statistical regression and operations research. Prerequisite: 326 or equivalent.

433 Theories of Decision Making (3). Intensive examination of decision-making theories applied to political institutions and behavior.

434 The Individual and the Work Group (3). Analyzes the work group as an arena of political participation and mobilization. Cross-national comparison of contemporary models of worker control and self-management.

450 Research (cr. arr.) Independent research not leading to thesis.

451 Latin American Problems (3). Intensive study of internal and external politics of selected Latin American countries. Reading knowledge of Spanish desirable, but not essential. Prerequisites: graduate standing, instructor's consent.

452 Comparative Parliamentary Democracies (3). Readings and/or research in selected topics emphasizing comparison of party systems, legislative bodies, etc., in parliamentary countries. Research use of foreign language encouraged.

456 Seminar in Comparative Politics (3). Comparative study of selected aspects of political systems. Variable content. May be repeated for credit.

459 Problems in Comparative Politics (3) (same as South Asia Studies 459). Study of comparative approach to politics in Europe, Asia and/or Latin America. Prerequisite: instructor's consent.

460 Early Political Thought (3). Readings in the classics of politics, ancient and medieval. Original works read in full and analyzed; emphasis on critical evaluation of reports.

461 Modern Political Thought (3). Readings in the classics of early modern and modern political thought. Original works read in full and analyzed; emphasis on critical evaluation of reports.

462 Contemporary Political Thought (3). Readings in major works of 20th-century political thought. Original works read in full and analyzed; emphasis on critical evaluation of reports.

463 Studies in Political Thought (3). Intensive analysis of an individual political philosopher. Recommended for students with a special interest in political theory. Prerequisite: 361 or 362 or 460 or 461 or instructor's consent.

465 Normative Political Theory (3). Intensive analysis of basic concepts of political theories; political system, justice, obligation, liberty, authority, responsibility, equality and community. Problems selected vary from term to term. Prerequisite: instructor's consent.

471 Seminar in Southeast Asian Politics (3). Comparative analysis of political institutions and processes of one or more Southeast Asian states. Special attention given to historical, social and economic environments which condition political processes of these countries.

474 Problems of South Asia (3) (same as South Asia Studies 474). Intensive study of and research in selected political problems in India, Pakistan, Ceylon, Bangladesh and the Himalayan states. Prerequisite: instructor's consent.

475 Seminar in East Asian Politics (3). Intensive study of selected topics in the internal and external politics of China, Japan and Korea. Prerequisites: graduate standing & instructor's consent.

480 Independent Readings for Ph.D. Comprehensive Examinations (1-6).

490 Research (cr. arr.) Independent research leading to thesis.

Portuguese (See Romance Languages)

Poultry Husbandry

12 Animal Science (5) (same as Agriculture 12, Animal Husbandry 12, Dairy Husbandry 12).

101 Poultry Science (3). Basic information on the industry: reproduction, feeding and management of poultry. Introductory course for poultry science majors, and others desiring information on poultry production and related fields. Prerequisite: 12 or instructor's consent. w. cor.

202 Selection, Grading and Judging Poultry and Poultry Products (2). Includes breeds and varieties of poultry, production judging, flock selection and testing, and grading of live and dressed poultry and eggs. Prerequisite: 101 or equivalent or instructor's consent. f.w.

292 Marketing Farm Commodities: Poultry Products (1) (same as Agricultural Economics 292).

300 Problems (cr. arr.) For senior & graduate students. Problems in poultry breeding, incubation, management, marketing, nutrition, physiology and turkey production. f.w.s.

302 Poultry Farm Management (3). Poultry farm methods, practices; factors affecting costs and returns with poultry. Prerequisites: 101 or 101 concurrently, & Agricultural Economics 50 or instructor's consent. w.

303 Poultry Breeding and Incubation (3). Course designed to provide a basic understanding of poultry breeding and incubation. Prerequisite: 101 or instructor's consent. w.

304 Turkey Production and Management (3). Principles, practices in turkey raising. w.

307 Egg Technology (3) (same as Food Science & Nutrition 307).

308 Poultry Feeding and Nutrition (3) (same as Nutrition 308). Principles of nutrition, feed formulation and recent research in poultry feeding. Prerequisite: Animal Husbandry 202. Recommended: Biochemistry 193. w.

309 Avian Physiology (3). Anatomy, physiology of domestic fowl. Applies principles of physiology, recent research to growth, reproduction and environmental problems of poultry. Prerequisites: Biological Sciences 1 & 2. alt. f. odd yrs.

390 Field Training in Poultry Husbandry (cr. arr.) Study, observation, employment in selected fields. Planned study program, written reports, final exam required. Enrollment by permission only. Prerequisite: 101 or one or more of following—302, 304, 307, 309. s.

391 Field Instruction in Animal Science (1-3) (same as Animal Husbandry 391, Dairy Husbandry 391).

400 Problems (cr. arr.) Advanced study on a selected research problem. f,w,s.

410 Seminar (1). Scientific literature, problems in poultry science reviewed, discussed. w.

423 Genetics of Populations (4) (same as Animal Husbandry 423, Biological Sciences 423). Genetic composition of populations and conditions influencing their rate of change. Relative effectiveness of various breeding plans. Prerequisites: 3 hours genetics & 3 hours statistics.

450 Research (cr. arr.) Independent research not leading to a thesis. f,w,s.

490 Research (cr. arr.). Graduate research investigations. Presented as thesis. f,w,s.

Practical Arts & Vocational-Technical Education

F190 Programs and Issues in Practical Arts and Vocational-Technical Education (1). Examines programs, legislation and administrative framework at federal, state, local levels; issues contemporary teachers face working in areas of practical arts and vocational-technical education. Prerequisite: junior standing.

F300 Problems (cr. arr.) Studies professional programs and issues or technical problems related to field of practical arts and vocational education.

F308 Coordination of Cooperative Occupational Education (1-4). Problems and procedures in the operation of cooperative occupational education programs. Especially designed for those who can qualify as coordinators of occupational education programs of a cooperative nature.

F321 Vocational Guidance (2-3). Problems, methods, procedures involved in assisting individuals in choosing, preparing for, entering upon, progressing in their vocation. For teachers, counselors, school administrators.

F325 Field Study in Occupational Education (1-4). Directed observation in a cross-section of business and industry combined with reports, weekly seminars and/or conferences. May repeat until four semester hours accumulated.

F360 Topics in Practical Arts and Vocational-Technical Education (cr. arr.)

F365 Occupational Analysis (2). Techniques, procedures of analyzing occupations into their basic elements. Required of trade teachers, coordinators.

F400 Problems (cr. arr.)

F406 Foundations and Program Development for Adult Vocational Education (3). The adult vocational education movement; characteristics of and learning principles applied to adult vocational students; instructional materials, methods and procedures in organizing and operating adult vocational education programs.

F410 Seminar in Practical Arts and Vocational-Technical Education (½-2).

F411 Philosophy of the Practical Arts and Vocational Education (3). Nature, purpose of practical arts and vocational education in modern school. For teachers of agriculture, business, home economics, industrial subjects, administrators.

F415 Occupational Surveys (3). Problems, methods, procedures in planning and conducting community occupational surveys. For counselors, teachers, supervisors of vocational education, school administrators, employment service personnel.

F451 Measurement and Evaluation in Vocational Education (2-4). Develops evaluation procedures and the construction of evaluation devices for vocational education. Emphasizes evaluation of student progress, improvement of instruction, and program evaluation. Prerequisite: course in curriculum construction or instructor's consent.

F459 Administration and Supervision of Vocational and Technical Education (2-3). Types of organization, approved administrative and supervisory practices of vocational, technical and practical arts programs in secondary and post-secondary institutions.

F460 Topics (cr. arr.)

F490 Research (cr. arr.)

Agricultural Education

F100 Foundations of Agricultural Education (2). Introduces education in agriculture; reviews developments leading to vocational education in agriculture; overview of teaching as a career.

F199 Student Teaching in Agriculture (cr. arr.) Supervised observations of agriculture teaching and actual participation in teaching activities together with conferences as provided. Normally preceded by F303 & F306.

F303 The Teaching of Agriculture (3). Developing instructional units, supervising individual occupational experience programs, and guidance of student organizations. Prerequisites: Educational Psychology A102 & Educational Psychology A140 or instructor's consent.

F304 Programs for Out-of-School Groups in Agriculture (2). Programs in agriculture for out-of-school groups; particular emphasis on young farmer and adult farmer classes. Prerequisite: F100 or instructor's consent.

F305 Programs and Instructional Materials in Agriculture (2). Plans programs, prepares teaching materials and evaluates programs in agriculture in public schools. Prerequisite: Educational Psychology A140 or instructor's consent.

F306 Teaching Agricultural Mechanics (3). Organizing course content; conduct and management of an agricultural mechanics shop. Prerequisite: F100 or instructor's consent.

F307 Teaching of Agricultural Management (2). Organizing course content, developing instructional materials and preparing to teach agricultural management in high school and young/adult farmer programs of vocational agriculture. Prerequisites: Agricultural Economics 260 & 312; F100 or instructor's consent.

F310 Agriculture in the Community Schools (2-4). Organization of instructional program and of instruction in agriculture in the community school. Prerequisites: baccalaureate degree & instructor's consent.

F320 Adult Education in Agriculture (2-4). Objectives, organization, procedures for conducting classes in agriculture for out-of-school groups. Prerequisites: baccalaureate degree & instructor's consent.

F408 Seminar in Agricultural Education (1-3).

F420 Advanced Methods of Teaching Agricultural Mechanics (2-4). Determines needs, plans and administers programs, evaluates outcomes. Prerequisite: F306 or instructor's consent.

F440 Planning Programs of Supervised Experience in Agricultural Occupations (2-4). Surveys agricultural situations. Develops activities which lead to establishment. Evaluates programs with different groups.

F450 Methods of Teaching Agricultural Management (2-4). Determines needs, selects and organizes course content, and evaluates instructional program in farm management. Prerequisite: baccalaureate degree in agriculture or instructor's consent.

F470 In-Service Course in Agricultural Education (cr. arr.)

Business Education

F33 Intermediate Typewriting (2). Instruction in preparing various styles of business letters, office forms, reports, duplicating masters, etc.; development of typing speed, accuracy.

F34 Advanced Typewriting (3). Prepares various personal, business, professional papers and forms, intensive practice in developing high standards of speed and accuracy. Prerequisite: F33.

F35 Office Machines (2). Typewriting problems representative of various procedures in business offices; training in use of office machines: transcribing machines, power typewriter, composer, offset duplicator, adding-calculating machines, etc. Prerequisite: F34.

F36 Elementary Stenography (3). Not open to students with previous training in shorthand. Studies theory of Gregg shorthand; develops shorthand reading, writing and transcription techniques.

F37 Intermediate Stenography (3). Review of Gregg shorthand theory; dictation and transcription practice. Prerequisite: grade of C or equivalent in F36.

F38 Advanced Stenography (3). Review of Gregg shorthand theory; intensive practice in speed dictation and transcription. Prerequisite: grade of C or better in F37.

F138 Touch Shorthand for Teachers (3). Theory of touch shorthand; develops proper techniques and minimal skill in the operation of the shorthand machine; studies effective instructional methods; observes and evaluates instructional materials. Prerequisites: F34, F38, & junior standing or instructor's consent.

F139 Secretarial Practice (2). Study of dual role of secretary—the procedural and the administrative—emphasizing the application of knowledge and skills and the exercise of critical judgment. Prerequisites: F34 and grade of C or better in F38.

F142 Filing Systems and Records Management (2). Comprehensive study of basic filing rules, procedures, equipment, management.

F150 Special Readings in Business Education (1-3).

F251 Teaching Basic Business Subjects (2). Methods, techniques and measurement of achievement in teaching basic business subjects. Prerequisite: Educational Psychology A102.

F252 Teaching Business Skills Subjects (2). Instructional objectives, materials, media, methodologies and measurement of achievement. Prerequisite: Educational Psychology A102.

F409 Principles of Business Education (3). Organization, curriculum, problems and trends of business education in secondary schools and colleges.

F414 Seminar in Business Education (1-3).

F421 Improvement of Instruction in Basic Business Subjects (3). Recent developments in methods, techniques and materials of instruction in the teaching of basic business subjects.

F422 Improvement of Instruction in Business Skills Subjects (3). Developments and trends in the instructional program of business skills courses.

F474 In-Service Course in Business Education (cr. arr.)

Distributive Education

F25 Principles of Salesmanship (3). Role of selling in distribution, and methods and techniques involved in selling. Emphasizes student demonstration, through simulation and role playing, of effective sales procedures.

F75 Principles of Retailing (3). Examines problems, opportunities and trends in retailing. Problems and cases deal with store organization, budgeting, control, personnel and operation.

F125 Merchandising (3). Develops basic competencies essential to successful merchandising. Studies skills essential in merchandising; analyzes merchandising functions and activities.

F175 Directed Occupational Experience (1-4). Reports based on employment experience in selected occupations combined with related conferences and/or seminars. May repeat until four semester hours accumulated.

F195 Practicum in Vocational Education (1-3). Supervised field experience in a school setting.

F397 Curriculum Construction for Cooperative and Distributive Education (3). Derivation of objectives, selection and arrangement of instruction units and materials for cooperative classes. Construction and use of evaluative devices.

F398 Principles of Teaching Distributive Education (3). Development of distributive education, organization of distributive education, cooperative and project experiences, instructional materials, and the program of Distributive Education Clubs of America.

F475 In-Service Course in Distributive Education (cr. arr.)

Home Economics Education

F235 Organization of Vocational Home Economics (2). Organizing and administering curriculum and instruction, homemaking and home economics for gainful employment.

F275 Occupational Home Economics Programs (2). Problems, methods, procedures in planning and conducting occupational home economics programs. For prospective elementary and secondary teachers. Prerequisites: F235 & Educational Psychology A102.

F280 Methods of Teaching Vocational Consumer-Homemaking (3). Methods of teaching vocational consumer-homemaking programs, kindergarten-adult. Prerequisites: F235 & Educational Psychology A102.

F315 Current Developments in Home Economics Education (3). Analysis of current concerns which affect home economics programs. Prerequisite: F235.

F376 Homemaking Education for Adults (2-3). Problems in organization, presentation of programs in homemaking education for adults, homemaking and gainful employment. Includes laboratory experiences. Prerequisite: F280 or instructor's consent.

F413 Seminar in Home Economics Education (1-3).

F430 Supervision of Student Teaching of Vocational Home Economics (2-3). For those preparing to become supervisors in vocational home economics education. Prerequisites: F280 & Curriculum & Instruction D199.

F446 Curriculum Construction in Home Economics (2-3). For home economics teachers engaged in curriculum development or revision. Individual research study and development of curriculum materials.

F472 In-Service Course in Home Economics Education (cr. arr.) Individual and group study of problems related to teaching, supervising and administering home economics education at secondary and post-secondary levels.

F473 Trends in Home Economics Education (3). Provides opportunities for experienced teachers to study selected topics and recent developments in home economics education. Conferences and guidance relative to individual research studies.

F482 Review and Synthesis of Research in Home Economics Education (3). Review and analysis of historical and current developments in home economics and home economics education research with implications for classroom teachers.

Industrial Education

F9 Industrial Materials (3). Classifying materials; their characteristics, properties and testing, extraction methods, selection, application.

F10 Fundamentals of Woodwork (3). Hand tool processes, machine operation, wood and wood products, assembling and fastening, simple finishing.

F14 Applied Electricity (3). Projects, related studies involving principles of electricity, electrical construction, repair, maintenance.

F101 Industrial Arts for Elementary Teachers (3). Design, construction and finish of simple, inexpensive projects in wood, metal, leather and other crafts appropriate for use with elementary and special education students. Prerequisite: junior standing or instructor's consent.

F112 Introduction to Metals Processing (3). Basic methods of bench layout, measurement and inspection, basic machining and foundry practices, welding, forging, sheet metal work. Prerequisite: F9.

F221 Machine Woodworking (2-3). Operation of wood-working machines, mass production methods, lumbering, cabinetmaking, upholstery and finishing. Prerequisite: F10.

F331 Technology of Woodworking (2-3). Design and construction of advanced-level products of wood; study of technological developments relating to wood products, processes and related materials; laminating and bending; mass producing with jigs; experiments in woodworking. Prerequisite: F221.

F341 Metals Processing Technology (2-3). Principles of manufacturing cost, design and analysis, dimensional quality control, theory and technology of metal cutting, welding and foundry processes. Prerequisite: F112.

F350 Industrial Design (3). Principles of structural design, contour, surface enrichment applied to three-dimensional objects; sketches, details, working drawings of shop projects.

F355 Applied Electronics (3). Alternating currents and circuits; vacuum tube design, characteristics and circuits; measurements in the electronics laboratory. Prerequisites: F14; 5 hours physics.

F356 Radio and Television Circuits (3). Audio amplifiers, transformers and transistors, modulation, superheterodyne receivers, transmitter circuits, antennas, basic television, repair methods and procedures. Prerequisite: F355.

F361 Architectural Drawing and Home Design (3). Problems, procedures in planning and constructing a home. Students draw and write specifications for complete set of house plans. Prerequisite: F350.

F375 Selection and Organization of Subject Matter (3). Objectives, content selection and arrangements, preparation of job and informational assignments, course making. For shop teachers, coordinators.

F385 Manufacturing Processes (2-3). Processes involved in manufacture of ferrous and non-ferrous metal products, textiles and wood products: paper, plastics and other synthetics, rubber, glass and chinaware, leather, lubricants, fuel, cement and clay products. Prerequisite: 9 hours in technical subjects.

F390 Principles of Teaching Industrial Subjects (2-3). Shop teacher's job; learning in the school shop; discipline and shop management; teaching devices and procedures; measurements of achievement; interschool, community relations. Prerequisite: Curriculum & Instruction D110.

F404 History of Industrial Education (2). Development of industrial education in America; special attention to European influences, philosophical concepts, issues, motivating factors, leaders, movements, current trends.

F412 Seminar in Industrial Education (1-3).

F471 In-Service Course in Industrial Education (cr. arr.)

Psychiatry

Psychiatry, Third and Fourth Years (clinical clerkship) (10). Experience in the clinical study and care of psychiatrically disordered adults and children. Under supervision, students participate with increasing responsibility in selected activities of the psychiatric inpatient, outpatient and liaison and consultative services, including work in other departments of the hospital and in affiliated public mental hospitals and community mental health agencies. Students have the opportunity to plan a portion of the clerkship core program in accordance with their own interests. Eight weeks full time during the third or fourth year; required of all medical students.

Psychiatry, Elective (Third and Fourth Years) (10). Special work in Department of Psychiatry on a subject of the student's choice, during the elective and free periods in the junior or senior year. Such work may include experience in additional clinical clerkship service, or preceptorship under practicing psychiatrists in psychiatric hospitals or clinics or community mental health services, or laboratory or clinical research, or a combination of these. Joint programs with other clinical or basic science departments can be arranged. Open to all students in third and fourth years. Subject to approval of department chairman and staff members who will supervise student's work.

Postgraduate Instruction. A fully approved residency program in general and child psychiatry is offered to qualified physicians, with the University of Missouri-Columbia Medical Center and the Mid-Missouri Mental Health Center providing facilities for academic and clinical training in all requisite phases of psychiatry. A Master of Science program in community mental health and behavioral science is offered on an optional basis, and special third, fourth and fifth year academic fellowships are available in child psychiatry, community psychiatry, research and other sub-specialty areas. Individualized training permits flexible starting dates.

Psychology

Basic Courses

1 General Psychology (3). Survey of facts, principles, methods in study of human behavior. cor.

2 General Experimental Psychology (5). Scientific study of human behavior, emphasis on biological foundations. Lectures & lab.

3 Experimental Psychology (2). Consists entirely of lab work similar to that in 2. Prerequisite: 1 or equivalent. w.

Intermediate Courses

20 Psychology of Personal Adjustment (3). Dynamic principles of human behavior; emphasizes motivation, frustration, defense against anxiety, personality organization. Prerequisite: 1 or 2.

30 Applied Psychology (3). Applied psychology to business; emphasizes advertising, personnel selection, efficiency, Brief reference to professional and social applications. Prerequisite: 1 or 2, w.s. cor.

101 Topics (cr. arr.) Organized study of selected topics in psychology. Particular topics and earnable credit may vary from semester to semester. Repeatable upon departmental consent. Prerequisite: 1 or 2.

120 Human Sexuality (3). Surveys information on heterosexual behavior, sex norms, childbirth, venereal disease, homosexuality and legal aspects of sexual behavior. Guest lecturers. Attendance at small group discussions required. Prerequisite: 1 or 2.

170 Child Psychology (3). Origins and development of child behavior, with emphasis on basic processes, theory and research rather than on application or guidance. Prerequisite: 1 or 2. cor.

180 Fundamentals of Abnormal Psychology (3). Basic survey of maladaptive human behavior and experience: character disorder, alcohol and drug abuse, neurosis, psychosis. Prerequisite: 1 or 2.

200 Special Problems (cr. arr.) Research apprenticeship with a faculty member, assisting a faculty member in the development and execution of research. May be repeated to 6 hours maximum. Prerequisite: instructor's consent.

211 Theories of Learning (3). Considers viewpoints in learning; emphasizes classical issues and theories; considers these in contemporary form. Prerequisite: 6 hours psychology.

212 Human Learning (3). Factors affecting human learning, retention; basic principles of learning, forgetting. Prerequisite: 1 or 2. f.

215 Research Methods in Psychology (3). Rationale of scientific research; role of the experiment and other forms of information gathering in psychology; surveys research methods. Prerequisite: 1 or 2 & Statistics 31 or Statistics 31 concurrently.

216 Advanced Experimental Psychology (3). Individualized supervision in planning, conducting and communicating of original research. Recommended for majors desiring opportunity to work in research areas of their interest. Prerequisite: 215.

220 Psychology of Music (3). Attributes of sound, characteristics of musical performances, aptitudes for listening and performance, expressiveness of music, uses of music, modern instruments. Prerequisite: 3 hours psychology or music theory. w.

230 Individual Differences (2). Surveys individual, group differences. Contributions of various factors to variations in behavior. Prerequisite: 2 or Statistics 31. f, w.

260 Social Psychology (3) (same as Sociology 260). Social bases of behavior and behavior of individuals in social situations. Prerequisite: 1 or 2 and/or Sociology 1. cor.

Honors Courses

191 Honors Proseminar (3). Individual research on assigned topics; class discussions of research strategies and problems. Prerequisites: senior standing, overall and psychology GPA 3.0, & instructor's consent.

194 Honors Proseminar (3). In consultation with instructor, student works on Honors thesis. Successful completion of thesis leads to degree with Honors in psychology. Prerequisite: 191

Advanced Lecture Courses

280 Psychology of Personality (3). Introduction to study of human personality. Prerequisite: 1 or 2. f, w.

300 Special Problems (cr. arr.) Independent investigation leading to a project or paper. Repeatable upon consent of department. Prerequisite: instructor's consent.

301 Topics (cr. arr.) Organized study of selected topics in psychology. Particular topic and earnable credit may vary from semester to semester. Repeatable upon consent of department. Prerequisites: junior standing & instructor's consent.

302 Theories of Personality (3). Readings in human personality theories. Prerequisite: 1 or 2. f, w.

304 Industrial Psychology (3). Training, efficiency, supervision, morale, group dynamics, consumer research in business and industry. Projects, field study. Prerequisite: Statistics 31. w.

313 Physiological Psychology (3). Survey of response systems and biological events as independent variables in behavior. Prerequisite: 8 hours psychology, or psychology & biology. f.

314 Demonstration Laboratory in Physiological Psychology (2). Guided study of programmed and graphic materials in neuropsychology and techniques of physiological psychology. Prerequisite: may be taken concurrently or following 313.

316 Experimental Approaches to Personality (3). Surveys current research in personality; emphasizes experimental evidence from human and animal studies. Prerequisite: 215 or instructor's consent.

330 Animal Behavior (3). Comparative study of animal behavior. Relation of behavior to bodily structure, environment. Prerequisites: 1 or 2 & 8 hours psychology or biological science. w.

340 Social Psychology of Illness (3). Survey of social and social-psychological factors in development and treatment of physical and mental illness. Prerequisite: 260 or bachelor's degree. w.

342 Social Motivation (3). Study of social determinants of individual behavior: affiliation, achievement, aggression, social exchange and social comparison processes. Emphasis on theoretical integration of recent finds. Prerequisite: 260. w.

343 Advanced Social Psychology (3) (same as Sociology 343). Major theoretical fields and their application to human problems. Prerequisite: 260 or instructor's consent. f.

344 Group Dynamics and Role Theory (3) (same as Sociology 344). Detailed investigation of one or more theoretical and experimental areas in social psychology. Prerequisite: 343 or instructor's consent.

345 Advanced Abnormal Psychology (3). Intensive survey and evaluation of the psychological literature on abnormal behavior; emphasizes experimental and explanatory approaches. Prerequisite: 14 hours psychology or graduate standing.

347 Emotional Disorders in Infancy and Childhood (3). Discusses behavioral development in childhood factors which produce disorders of development. Prerequisites: 170 & 280 or equivalent.

350 Special Readings (cr. arr.) Independent readings selected in consultation with supervisory faculty member. Repeatable upon consent of department. Prerequisite: instructor's consent.

359 Contemporary Social Issues and Psychology (3). Seminar devoted to exploring ways of applying knowledge from psychology to current social and political issues; discusses data and theories from psychology that have created sociopolitical controversy. Prerequisite: junior or senior standing.

360 Systematic Psychology (3). Critical evaluation of major theoretical systems of psychology. Introduces methodological problems of theory construction, system-making. Emphasizes integration of recent trends. Prerequisites: senior standing & 9 hours psychology. f.w.

361 The History of Psychology (3). Historical foundations of contemporary psychology. Prerequisites: senior standing & 9 hours psychology.

365 Introduction to Clinical Psychology (3). Role of clinical psychology in mental health rehabilitation and social welfare work. Prerequisite: senior psychology major or graduate standing in related fields. w.

369 Advanced Physiological Psychology (3). The psychobiology of learning, memory, motivation, attention and emotion. Prerequisite: 313.

371 Attitude Change (3) (same as Sociology 371). Methods, theories, experimental findings in social attitude research. Prerequisite: 260.

376 Psychological Tests and Measurements (3). Theory, practice of testing, measurements in psychology. Prerequisite: Statistics 31. f.s.

386 Methods in Developmental Psychology (3). Experimental studies of human and animal behavior, development and growth. Role of early experience, cognitive and social development, and other selected topics. Prerequisites: 170 & 215. f.

387 Psychology of Aging (3). Surveys psychological processes in aging during middle/late adulthood. Emphasizes sensory, perceptual, physiological, memory, cognitive processes and methodological issues in gerontological research. Prerequisites: 1 or 2; course in developmental psychology (e.g., child psychology) or instructor's consent.

391 Animal Learning (3). Study of experimental literature concerning habituation, classical conditioning, operant conditioning, extinction, schedules of reinforcement. Prerequisite: 378 or equivalent; undergraduates require instructor's consent.

392 Advanced Animal Learning (3). Study of experimental literature concerning discrimination, escape, avoidance, punishment. Prerequisite: 391.

393 Perception (3). Data and contemporary theories in visual perception (primarily) and auditory perception. Prerequisite: 6 hours psychology.

394 Cognitive Psychology (3). Thinking and language processes examined from the perspective of classical learning theory and information processing theory. Prerequisite: 212 or equivalent.

399 Motivation (3). Survey of historical and contemporary theory; research on motivation. Major emphasis on motivation from the perspective of learning theory. Topics: drive theory, incentive motivation, anxiety, activation-arousal theory, stimulus sampling theory. Prerequisite: 211 or equivalent.

Advanced Laboratory Courses

378 Animal Learning Laboratory (3-4). Survey of principles of classical and instrumental conditioning; special reference to data from animal studies. Introduces learning theories. Prerequisite: 6 hours psychology. w.

379 Human Learning Laboratory (3). Rote learning, concept learning and organization, transfer, and retention, with special reference to verbal behavior. Prerequisite: senior standing; not available to students having taken 212 except by instructor's consent.

380 The Human Senses (3). Psychophysical data, sense organs, psychological attributes and theories for vision, hearing and the vestibular (motion) senses. Elementary aspects of psychophysics. Prerequisite: 6 hours psychology.

382 Biopsychology of Response (3). Reflex and voluntary action, motor skills, mental and physical work, fatigue, efficiency, motor theory of behavior. Prerequisite: 313. w.

385 Experimental Social Psychology (3). Experimental studies of attitudes, social interaction, person perception and other topics of contemporary social psychology. Prerequisite: 260.

Graduate Courses

400 Problems (cr. arr.) Advanced studies to meet needs of individual student. Repeatable upon departmental consent. Prerequisite: instructor's consent.

401 Topics (cr. arr.) Organized study of selected topics in psychology. Particular topic and earnable credit may vary from semester to semester. Repeatable upon consent of department. Prerequisite: instructor's consent.

404 Normal and Altered Psychological States (3). States of awareness and behavior: dreaming, meditation, hypnosis, states associated with drugs, direct brain stimulation, biofeedback. Prerequisites: courses in psychopathology, learning, & physiological psychology, or instructor's consent. w.s.

405 Survey of Social Psychology (3). Survey of historical and contemporary theory and research in affiliation, attribution, social comparison, attitude change and group dynamics. Prerequisite: graduate standing.

406 Psychology of Development (3). Principles, theories, research in normal human development.

407 Psychopathology of Childhood (3). Problems of etiology, diagnosis and treatment of maladjustment in infancy and childhood. Prerequisite: 347 or equivalent.

408 Behavior Disorders (3). Problems of etiology, diagnosis, treatment in psychopathology. Considers theory, research, case histories. Prerequisite: 345. w,s.

409 Experimental Psychopathology (3). Critical examination of current theories; special emphasis on empirical studies in psychopathology: alcoholism, enuresis, sexual deviancy, drug addictions, mental retardation.

410 Seminar (1). Presentation of psychological problem-investigations by staff, students. f,w.

411 Studies in Professional Problems (3). Sources for psychological literature research, techniques of scientific reporting, problems of professionalization. f.

412 Methods in Clinical Assessment I (3). Introduction to clinical use of tests of intelligence, and both projective and objective methods of personality study. Emphasis on integrated use of assessment methods. Lectures and lab. Prerequisite: graduate standing in psychology. f,w.

414 Methods in Clinical Assessment II (3). Advanced training in the integrated use of clinical methods for appraisal of intelligence, personality, organic impairment, etc. Lectures and lab. Prerequisites: 412 & instructor's consent. f,w.

415 Test Theory and Development (3). Theory of psychological measurement. Construction of one or more psychological tests. Prerequisites: 376 & 420 or instructor's consent. alt. w. even yrs.

416 Studies in Personality (cr. arr.) Contemporary research and theory in personality. Repeatable upon consent of department. Prerequisite: 280 or equivalent.

417 Objective Personality Appraisal (3). Construction, interpretation and use of such objective instruments as the Minnesota Multiphasic Personality Inventory, Edwards Personal Preference Schedule, Guilford-Zimmerman, etc. Prerequisites: second-year graduate standing & an introductory testing course or equivalent. w.

- 418 Studies in Clinical Psychology (cr. arr.)** Contemporary research and theory for advanced graduate students in clinical psychology. Repeatable upon consent of department. w.
- 419 Advanced Psychological Statistics I (3).** Theory of testing statistical hypotheses, estimation techniques, non-parametric statistics. Prerequisite: undergraduate course in statistics. f.
- 420 Advanced Psychological Statistics II (3).** Complex analysis of variance; experimental design. Prerequisite: 419 or equivalent. w.
- 421 Advanced Techniques in Psychological Statistics (3).** Multiple regression, covariance analysis, multivariate analysis of variance, factor analysis as applied to problems in psychology. Prerequisite: 420 or equivalent. f.
- 422 Studies in Learning (cr. arr.)** Critical consideration of selected experimental work in psychology of learning and memory. Repeatable upon consent of department. Prerequisite: 378 or 379. w.
- 423 Studies in Audition (cr. arr.)** Reports, discussion of contemporary research in audition; emphasis on attributes of auditory experience; their physical and physiological correlates. Repeatable upon consent of department. Prerequisite: 380. alt. w. even yrs.
- 424 Studies in Physiological Psychology (cr. arr.)** Critical consideration of recent experimental, theoretical work. Repeatable upon consent of department. Prerequisite: 313. w.
- 425 Orientations in Psychotherapy (3).** Broad survey of orientation to psychological treatment, emphasizing integration of personality theory, techniques of personality and behavior change, and research findings in the area. Prerequisite: instructor's consent. f.
- 426 Studies in Comparative Psychology (cr. arr.)** Critical consideration of selected experimental work in animal behavior. Repeatable upon consent of department. Prerequisite: 330. f.
- 427 Studies in Visual Perception (cr. arr.)** Critical evaluation of current theories, contemporary research in visual perception. Repeatable upon consent of department. Prerequisite: 380.
- 428 Studies in Psycholinguistics (3)** (same as Linguistics 428). Selected topics in psycholinguistics; emphasizes language competence versus performance, effects of syntax on memory, developmental linguistics, etc. Prerequisite: graduate standing in psychology or instructor's consent.
- 429 Advanced Theories of Learning (3).** Intensive coverage of major theories of learning and evaluation of them in the context of the contemporary field of psychology.
- 430 Studies in Contemporary Psychological Theory (cr. arr.)** Logic of modern psychology; emphasis on recent major methodological trends in theory construction. Repeatable upon consent of department. Prerequisite: 360. w.
- 431 Psychoanalytic Theory (2).** Critical evaluation of concepts, origin, social significance of psychoanalytic theory. Prerequisite: instructor's consent. f.
- 432 Medical Orientation for Clinical Psychologists (2).** Considers relationships between psychological and medical problems. Prerequisite: M.A. in Psychology. w.
- 433 Seminar in Social Psychology I (3)** (same as Sociology 433). Intensive review of concepts and theories of social psychology; emphasizes reading from primary sources. Ph.D. candidates only. Required for all Ph.D. candidates in social psychology program. Prerequisite: instructor's consent. f.
- 434 Seminar in Social Psychology II (3)** (same as Sociology 434). Continuance of 433. Required for all Ph.D. candidates in social psychology program. Prerequisite: 433 or instructor's consent. w.
- 435 Structure of Interpersonal Behavior (3)** (same as Sociology 435). Organization of interpersonal behavior aimed at integrating development, pathological, institutional aspects by relating personality to culture and cognitive structure to behavior. Prerequisite: advanced graduate standing in psychology or sociology, or instructor's consent.
- 436 Introduction to Mathematical Learning Theory (2).** Mathematical theories of single and complex learning with related formal methods such as stochastic processes. Prerequisite: 420.
- 437 Studies in Developmental Psychology (cr. arr.)** Principles, theories, research in normal human development. Repeatable upon consent of department. Prerequisite: 406. f.
- 438 Trance Behavior (3).** Integrative study of hypnotic and related behavior. Prerequisites: 345 & advanced graduate standing in psychology or instructor's consent. f.
- 439 Human Sexuality for Psychotherapists (3).** Background information for and methods and techniques of dealing with a variety of sexual problems that clients bring to therapists. Sexual dysfunction, homosexuality, sexual aberrations and sex crimes covered. Prerequisite: graduate standing.
- 440 Use of Computers in Psychology (3).** Surveys uses of digital computing systems in psychology and other behavioral sciences. Topics: structuring data bases, language processing, simulation of mental/social processes, online facilities in research. Prerequisite: Computer Science 104 or instructor's consent.
- 441 Behavior Modifications (3).** Surveys principles and research finds relative to treatment of abnormal behavior through the utilization of learning principles. Prerequisites: advanced graduate standing in psychology & instructor's consent. w.
- 442 Community Psychology (2).** Lectures, discussion, readings and field-observation to acquaint student with the philosophy, technique and theory of community mental health. Prerequisite: M.A. in psychology. w.
- 443 Studies in Social Psychology (cr. arr.)** Critical coverage of selected research and theory in social psychology. Repeatable upon consent of department. Prerequisite: instructor's consent.
- 444 Clinical Research Practicum (3).** Problems and methods in experimental design with respect to applied research topics and applied settings; experimental experience with such designs.
- 445 Clinical Practicum (cr. arr.)** Intensive supervised training in use and interpretation of psychological techniques and in psychotherapy. Prerequisites: 412, 414, & instructor's consent. f,w,s.
- 448 Counseling Practicum (cr. arr.)** Supervised practice of counseling in approved counseling agency. Offered only on S/U basis. Prerequisites: 376 & Counseling & Personnel Services G397 & Counseling & Personnel Services G407. f,w.
- 450 Research (cr. arr.)** Experimental investigations not leading to thesis.
- 456 Conceptual Approaches to Personality (3).** Evaluation of major traditional and contemporary systems of personality theory and their relationships to normal and, especially, abnormal behavior. Prerequisites: 280 & 345 or equivalent.
- 458 Social Learning: Theory and Research (3).** Covers recent theoretical and research developments concerning role of social learning in personality development, functioning. Theories of Rotter, Bandura and Walters, those having to do with operant human behavior presented. Prerequisite: instructor's consent.

460 Verbal Learning (3). Introduces psychological literature concerning learning and use of verbal materials in experimental settings; considers methods used in such studies, along with parameters influencing learning. Transfer and forgetting not emphasized.

462 Family and Group Process (3). Conceptual approaches to family and group interaction considered; contemporary research and treatment. Prerequisite: 425, graduate standing in psychology, or instructor's consent.

465 Research Methods in Physiological Psychology (cr. arr.) Techniques and instrumentation for specialized research. Emphasis on human and lower animal work in alternate years. Repeatable upon consent of department. Prerequisite: 313, 369, or 382.

470 Social Interaction Research (3) (same as Sociology 470). Experimental designs, research techniques, theories, research findings in social interaction. Prerequisites: 343 & instructor's consent. w.

485 Social Psychology Methodology (3). Advanced study of experimental methods in social psychological research. Prerequisites: 343 & instructor's consent. w.

490 Research (cr. arr.) Investigations in psychology; leads to thesis.

Public Administration

Open only to MSPA candidates and to other graduate students by consent of the Director, Master of Science in Public Administration Program.

400 Problems (cr. arr.) Intensive study of an area of public administration related to the student's special interest.

401 Scope and Theory of Public Administration (3). History, premises, theories and structure of public administration; professional norms and standards, ethical and public interest implications of public service.

402 Research Methods in Public Affairs (3). General principles of research in the social sciences; research methods most commonly used in public administration; information resources and efficient use thereof.

451 Administrative Organization Theory (3). Examines major theories of how organizations behave, as well as how individuals behave within organizations; applications of such theories to problems of public organization design, maintenance and development.

452 National and Subnational Policy Processes (3). Processes through which public demands are generated, converted into formal policy and implemented. Focuses on role of administrator and institutional-organizational contexts in which administrator functions.

453 Public Policy Analysis (3). Systematic approaches in policy making. Application of systems analysis, operations analysis and other analytic techniques to selected policy decisions of state, local and national governments.

454 Public Budgeting and Taxation (3). Intensive study of the institutions, processes, politics and social and economic impact of public taxation and expenditures.

455 Public Financial Administration (3). Nature and environment of public financial administration. Principles of accountability for management of public funds; management and investment of cash balances; special problems related to long- and short-term debt.

456 Program Review and Evaluation (3). Applies systematic, objective methods for evaluating effectiveness of public programs; means for determining extent to which program administration facilitates achievement of program objectives. To be taken during student's last semester in the Program.

457 Public Personnel Administration (3). Basic functions, processes and problems of personnel administration in the public service.

460 Planning for Manpower Programs (3). Information requirements and sources of information for manpower planning. Examines the manpower planning process in terms of the interaction of manpower, education and welfare institutions. Prerequisite: Economics 312.

461 Application of Manpower Planning Methods (3). Research relating to information needs of the state and local manpower planning process and the resultant allocation of manpower funds. Evaluates public manpower programs, policies, plans. Prerequisite: Economics 460.

Radiologic Technology

135 Teaching Practicum for Allied Health Sciences (3) (same as Curriculum & Instruction D135, Medical Technology 135, Occupational Therapy 135, Physical Therapy 135, Respiratory Therapy 135).

153 Clinical Education in Radiation Therapy I (3). Principles involved in the delivery of a prescribed treatment plan: positioning, immobilization, shielding, the use of other treatment techniques and aids such as wedges, cone and bolus.

154 Radium Therapy (2). Introduction to radioactive sources used in brachytherapy; particular emphasis on radium and cesium. Dose calculations, source types, standard applicators and their preparation and handling are covered.

155 Radiation Therapy Pathology (2). Basic cell construction: growth, function, mitosis, division. Tumors to include types, growth and spread.

156 Clinical Education in Radiation Therapy II (3). Refinement of principles involved in 153. Fundamentals of nursing procedures; emphasizes problems related to cancer patients. Prerequisite: 153.

157 Treatment Planning I (3). Principles involved in the selection of modality; treatment techniques, time dose relationship, therapy aids.

158 Treatment Planning II (2). Continuation of 157.

160NM Clinical Nuclear Medicine I (2). Orientation, history and administrative procedures in a nuclear medicine service. Some of specific *in vitro* procedures in nuclear medicine discussed in detail. Prerequisite: instructor's consent.

161NM Clinical Nuclear Medicine II (2). Patient handling, nursing and emergency procedures. Many specific radionuclide imaging procedures discussed in detail. Prerequisite: 160NM.

162NM Clinical Nuclear Medicine III (2). In-depth review of clinical nuclear medicine studies and detailed instruction on specific uses of computers in these studies. Prerequisite: 161NM.

180 Radiologic Anatomy and Physiology (5). Normal structure and function of human body; emphasizes topographic and radiographic anatomy. w.

182 Radiation Biology for Radiologic Technology Students (3). Interaction of ionizing radiations with matter. Their effects on cells, molecules, organisms, man.

183 Radiologic Physics I (3). Fundamentals of physics of electricity and radiant energy; principles of generation of electromagnetic radiations and applicable equipment. w.

184 Radiologic Physics II (3). Basic nuclear physics includes introduction to instrumentation and clinical application of radionuclides, as well as various types of radiation therapy devices, their application to disease. f.

185 Radiation Hazards and Protection (2). Principles involved in biologic effects of radiation; hazards and protection for ionizing radiations; D.O.E. regulations; state regulations; recommendations of National Council on Radiologic Protection and Measurement. w.

186 Radiation Therapy Physics (5). Radiation physics, therapy equipment and circuits, calibration, quantity and quality of radiation, radiation units, essentials of dose calculations. Prerequisite: 183 or equivalent.

187 Principles of Radiographic Exposure I (3). Theory and principles of X-ray technique; correlation of factors with application. s.

188 Principles of Radiographic Exposure II (3). Continuation of the theory of principles of X-ray technique, plus the principles behind and the experiments for establishing a complete quality assurance program. Prerequisite: 187.

190 Radiographic Positioning I (2). Instruction in radiographic positioning of and for all structures and organs of the body. w.

191 Radiographic Positioning II (2). Advanced positioning techniques; emphasizes pediatrics; cineradiography; neuroradiography; cardiovascular radiography; other special procedures. w.

193 Clinical Education I (2). Includes orientation, history, ethics, office procedures, darkroom processing and chemistry. f,w,s.

194 Clinical Education II (2). Includes medical terminology, film critique; nursing procedures pertinent to radiology. f,w,s.

195 Clinical Education III (2). Includes intraoral radiography; film critique; administrative procedures. f,w,s.

196 Clinical Education IV (2). Includes medical and surgery diseases; film critique. f,w,s.

197 Clinical Education V (2). Full-time student assignment to radiology department. f,w,s.

198 Clinical Education VI (2). Continuation of 197. f,w,s.

260 Techniques of Radioreceptor Analysis in Nuclear Medicine (2). Prerequisite: Radiology 227 or equivalent or concurrent with Radiology 227 & senior standing.

263NM Morphological Correlations in Nuclear Medicine (3). Anatomy, physiology and pathology of human body pertinent to studies performed in nuclear medicine. Prerequisites: a course in anatomy or physiology, & instructor's consent.

265NM Clinical Education in Nuclear Medicine, In Vivo (5). Practical experience in clinical setting with imaging procedures performed in nuclear medicine. Ultrasound and CAT instrumentation also discussed. Prerequisites: Radiology 227, senior standing, & instructor's consent.

266NM Clinical Education in Nuclear Medicine, In Vitro (6). Practical experience in clinical setting with all routine radioassay procedures performed in nuclear medicine. Includes lectures describing clinical application. Prerequisites: 260, Radiology 227 or equivalent, & instructor's consent.

300 Problems in Nuclear Medicine Technology (1-3). Supervised investigation in an aspect of nuclear medicine. Technology usually culminating in a written report. Prerequisite: instructor's consent.

327 Nuclear Medicine Instrumentation (2). Prerequisites: Radiology 227 or equivalent, & instructor's consent.

329 Radiopharmaceuticals in Nuclear Medicine (2). Introduces concepts of radiopharmacy, generator systems, labelling of materials, quality control procedures and FDA regulations concerning radiopharmaceuticals. Prerequisites: Chemistry 361 or Radiology 227, & instructor's consent. f.

201M Radiology (1). Correlative radiologic pathology for second-year medical students. Radiographic perspective of diseases of organ systems. Demonstrations with comparable material in basic pathology. Six lectures related to cellular, tissue, organ effects of radiation, effects of whole body radiation.

227 Radioisotopes in Medicine and Biology (4). Survey of radiotracer applications in nuclear medicine: basic principles of radioactive decay and radiation detection equipment used in nuclear medicine. Prerequisites: Chemistry 11 & Physics 11 & instructor's consent. f.

328 Introductory Radiation Biology (3) (same as Biological Sciences 328, Nuclear Engineering 328, Veterinary Medicine & Surgery 328). Concepts of ionizing radiations, their actions on matter through effects on simple chemical systems, biological molecules, cell, organisms, man. Prerequisite: junior standing sciences/engineering; one course in biological sciences & physics/chemistry; or instructor's consent.

400 Problems in Radiological Science (1-3). Supervised investigation in an aspect of radiological science usually culminating in a written report.

410 Seminar (1). Reports and discussion of recent investigations pertinent to radiological science.

Radiology Block. One-week assignment to department for practical experience on radiotherapy ward and in clinical radiotherapy practice, with optional time in diagnostic radiology.

Radiology Elective (10). A nine-week elective assignment to the Diagnostic Section of the Department of Radiology to provide a clinical experience in the principles of radiographic examination and interpretation. Elective experiences are also provided in radiation therapy and nuclear medicine.

Postgraduate Instruction. Advanced graduate instruction of three years duration (with an elective fourth year) in radiology is available to qualified physicians. Instruction includes diagnostic, nuclear medicine and therapeutic radiology; radiopathology; and radiation physics. Special experience is provided for those interested in pursuing careers in teaching and research. Research Training Fellowships in academic radiology and its basic sciences also offered.

Recreation & Park Administration

10 Introduction to Recreations (3). Implications of, attitudes toward and development of recreation and leisure. f,w,s. cor.

11 Career Orientation in Recreation (1). Orientation to the field of recreation. Analysis self-related to career opportunities in recreation. Academic planning leading to B.S. in Recreation in Park Administration. Graded S/U. Prerequisite: 10 or concurrent with instructor's consent.

107 Organization of Aquatic Programs (2). History; evaluation of leadership training methods, facilities, pool and beach control and management procedures. Prerequisite: sophomore standing. w.

111 Introduction to Planning and Evaluating Recreation Environments (3). Process, principles and procedures commonly applied to planning physical developments for recreation environments. Emphasis on evaluating existing areas and facilities for purposes of specifying design requirements.

112 Planning Recreation Areas and Facilities (3). History, basic principles, approaches of planning recreation areas, facilities. Consideration of physical, socioeconomic factors. Introduction to layout of various park and recreation areas. Prerequisite: 10; Recreation & Park major; or instructor's consent.

Radiology

152 Treatment Planning (5). Principles involved in the selection of modality; treatment techniques, time dose relationship, therapy aids.

131 Principles of Interpretive Outdoor Recreation (3). Interpretive principles and techniques employed to communicate values, natural history and cultural features to the recreation user. Prerequisites: 10 & sophomore standing or instructor's consent. cor.

140 Camp Leadership (2). Camp history, standards, trends, programs, behavior problems. Practical application of outdoor cookery, camp craft.

142 Leadership of Social Recreation (2). Study and practice in techniques of leading social activities suitable for various social settings.

144 Organization and Conduct of Recreation Centers (2). Problems of operation, management of playgrounds, recreation centers.

151 Community Recreation (3). Introduction to public recreation in local government. Prerequisite: 10. f,w. cor.

215 Senior Seminar (2). Review of principles of parks and recreation, independent study resulting in seminar presentation and paper. Prerequisite: open only to Recreation & Park Administration majors with 90 credits or more.

289 Recreation and Park Administration Field Experience (12). Supervised experience in an approved organization concurrent with seminars related to individual field assignments. Prerequisites: upperclass standing, 10, 11, 305, 306, & instructor's consent.

300 Problems (3). cor.

305 Theory and Practice of Group Leadership (3). Considers theories pertaining to individual and group dynamics, group processes and methods of leadership; application through analysis of case studies. Prerequisites: upper division standing & instructor's consent. f.

306 An Analysis of Leisure Time Recreation Services (3). Analyzes and evaluates theories and principles for planning recreation services. Prerequisites: upperclass standing. 10, 11, 151, & 305, or instructor's consent.

316 Introduction to Administration in Recreation and Parks (3). Introduction to finance, personnel management, legal implications and office management as applied to municipal park and recreation departments. Prerequisites: 10 & 151. f,w.

326 Introduction to Therapeutic Recreation (3). Objectives, concepts and settings of recreation for the ill and handicapped. Overview of current administrative structures and funding. Prerequisites: 10, 11, & 305, or instructor's consent.

327 Operation of Therapeutic Recreation Services (3). Theories and principles of leadership and programming as they apply to recreation services for the ill, handicapped and aged. Prerequisites: 326 & instructor's consent. w.

328 Leisure and Aging (3). Basic understanding of problems/needs of later maturity in relation to recreation. Characteristics/capabilities of aged, program settings, financial support, planning guidelines emphasized. Objectives: provide fundamentals for recreation planning with aged individuals/groups. Prerequisite: instructor's consent.

331 Outdoor Recreation—Education (3). Philosophies, essential principles, methods, techniques, resources, administrative and program practices for outdoor recreation and education. Prerequisites: 140 or equivalent & instructor's consent. f.

333 Park Management (3). Basic principles, practices and problems involved in managing public park systems. Consideration given to local, district, county, state, federal and foreign park systems. Prerequisite: instructor's consent. w.

340 Recreation Land Management and Planning (3) (same as Forestry, Fisheries & Wildlife 340).

342 Principles and Practices of Fund Raising/Evaluation for Human Service Organizations (3) (same as Regional & Community Affairs 382).

355 Private and Commercial Recreation Principles and Practice (3). Considers principles, practices, influences in public/private leisure services; influence of tourism/travel on public/private recreation services. Prerequisites: upper division or graduate standing & 306 & 316, or instructor's consent.

391 Topics in Leisure Studies (1-3). Specialized topics in leisure and leisure delivery systems. Subjects and earnable credit vary semester to semester. Specific content varied depending upon available faculty resources and student needs. Course content announced in advance. Prerequisite: instructor's consent.

400 Problems (1-6). Independent research on special projects. Prerequisites: adviser's consent; open to recreation majors and minors only.

401 Foundations of Recreation (3). Basic theories and philosophies of recreation and leisure time as they apply to the recreation movement in modern society. Prerequisites: 10 & 11 or equivalent or instructor's consent. f.

402 Organization of Recreation Programs within the Community and Region (3). Assesses recreation needs within community through study of organization and structure of organized recreation as related to public agency programs, leadership, facilities, services. Prerequisite: instructor's consent. f,s.

403 Research Methods in Recreation and Park Administration (3). Review, analysis of research completed in recreation field. Prerequisite: graduate standing in department & elementary course in statistics or test and measurements approved by instructor. f.

404 Readings in the Field of Recreation (1-3). Selected readings based on student's needs. Emphasis may be placed on a student's area of interest. Prerequisites: adviser's consent; open to students majoring in field of recreation. cor.

410 Seminar (2). Contemporary problems in field of recreation. Prerequisite: graduate majoring in recreation field.

416 Administration of Public Parks and Recreation (3). Study in depth of the basic principles in administration of parks and recreation as governmental services. Prerequisites: 316 or equivalent & instructor's consent. w.

481 Field Instruction (1-6). Supervised student practice in recreation, park or related settings under qualified instructor. Prerequisites: 289 or equivalent & graduate departmental standing.

490 Thesis Research (1-6). Research leading to thesis in field of recreation. Prerequisites: graduate standing & 481 or equivalent.

Regional & Community Affairs

The Department of Regional and Community Affairs offers academic work primarily for graduate students. Four courses—190, 192, 193 and 194—are offered specifically for undergraduate students. Undergraduate students are also permitted to enroll in 300, 310, 320, 360, 362, 364 and 376.

190 Individual Participation in Our Changing American Communities (3). Citizen participation; consideration given to community development philosophy, practice, structures and obstacles to the encouragement of effective citizen involvement in public decision making.

192 The Field of Community Development (3). General survey of community development (domestic and international): origins, current status, basic values and practices associated with citizen participation in community change.

193 Community Development Approaches to Youth Work (3). Focuses on implications and applications of community development concepts, principles and practices for youth program development and maintenance.

194 Planning and the Community (3). Acquaints undergraduates with the basic philosophy of planning, roles of citizens, private interests and planners, and with basic principles and processes of planning in urban and rural communities, and at the regional level.

300 Introduction to Community Development (3). Historical, philosophical perspectives of community development form the base for this course. Examines concepts, values, principles of community development as an introduction to community development theory, practice.

310 Community Development Theory (3). Relevant social science theory reviewed as it applies to conscious, deliberate efforts to affect human, social, economic, political development. Relation of theory to action, specific methodologies, programming from professional services presented as aspects of practice theory.

320 Group and Interpersonal Competence (3). Opportunity for extensive participation in group process; emphasizes interpersonal competence; use of group techniques in community development work. Selected readings in social psychology related to aspects of group principles and practices.

330 Professional Practice of Community Development (3). Introduces professional practice methods through selection of field methods appropriate to specific situations and consistent with community development theory.

350 Special Readings (1-3). Extensive reading in selected area or intensive reading in special field.

360 Principles and Practices of Planning (3). Examines planning process as conceived and practiced at local level of United States today. Consideration given to scope and purpose, governmental framework, concepts of form and structure, research methods, development of alternatives, implementation.

362 The Implementation of the Local Planning Process (3). Implementation of planning process analyzed within context of contemporary scene in United States. Consideration given to advantages and limitations of various devices and to emergence of new approaches to planning implementation.

364 Area and Regional Planning (3). Concepts, techniques, procedures of community/regional planning. Methods of collection, analysis, integration of pertinent economic, social, political, physical data. Future needs estimated; space for planning future growth allocated; area development.

370 Seminar in International Development (3). Interdisciplinary seminar on international development. Development theories and problems including social, political and administrative aspects explored; sectoral areas such as population, rural development, education and health analyzed. Roles of various development agencies discussed.

372 Community Development in Lesser Developed Countries (3). Analyzes economic/social/political/administrative implications of community development in lesser developed countries. Investigation of organization/implementation/operation of programs; particular attention to programming and practice.

376 Cultural Factors in Community Development (3). Applies theories and methods of cultural change to the solution of practical problems in the modern world.

382 Principles and Practices of Fund Raising/Evaluation for Human Service Organizations (3) (same as Recreation & Park Administration 342). A basic understanding of program evaluation and its relationship to the fund raising process, emphasizing youth-oriented programs. Focuses on developing fund raising campaigns and grantsmanship.

384 Elderly Consumer-Participants in Human Service Delivery (3). Elderly as consumers of services/participants in service delivery systems: services offered, special participation problems, social dynamics of service delivery systems and intervention points, community strategies to effect and improve service delivery.

400 Problems (cr. arr.) Intensive study of an area of community development related to student's special interest.

410 Community Development Process (3). Establishment, implementation, development and institutionalization of community development process in traditional and transitional societies. Attention given to interrelated social, economic, political, institutional and cultural factors pertaining to establishment and operation of the process.

412 The Theory of Planning (3). Engagement of basic philosophical and theoretical frameworks and constructs of planning, including the evolution through both the social and physical sciences and their impacts on planning theory. Prerequisite: upper division status.

417 Government Social Policy and Institutional Resources (3). Examines historical and contemporary developments of social policies and institutional arrangements implementing them.

420 Field Experience (3-12). Field practice in selected community setting under faculty or other competent supervision.

425 Community Development Research Methods and Techniques (3). Introduction to social science research methods and techniques; considers a variety of research approaches and techniques. Particular application of these approaches to community development research and evaluation stressed.

430 Community Development Seminar (3). Integration of theoretical knowledge and current practice problems in community development. Students and faculty in the seminar decide issues and topics to be the focus.

438 Community Development in Urban Areas (3). Considers barriers to effective use of community development process in meeting needs in urban areas; critique of present structures and approaches; examines goals and organizational structures for applying process to urban needs.

440 Specialized Topics in Community Development (1-3). Specialized topics and developments in related fields of special pertinence to community development.

442 Community Development Practice in Urban Areas (3). Introduces variables to be considered in creating the community development process in urban areas. Courses of action to take in response to these variables and problems which arise around them. Prerequisite: instructor's consent.

450 Research (1-6). Student expected to demonstrate graduate ability in designing and carrying out a research project not leading to thesis.

490 Research (3). Student demonstrates theoretical knowledge and skills in research leading to thesis.

Religion

Courses in religion offered by Missouri School of Religion and the Baptist Chair of Bible may be taken for credit toward degrees in the University. All courses accredited in College of Arts and Science. Students may elect as many as 14 semester hours toward A.B. degree. Students working toward other degrees may elect courses in religion by consent of deans of respective schools.

1 Modern Hebrew I (3). Acquisition of vocabulary and familiarity with grammatical structures through simple readings, oral-aural drill and written exercises.

2 Modern Hebrew II (3). Continuation of 1. Prerequisite: 1 or equivalent.

3 Modern Hebrew III (3). Readings from both Biblical and contemporary literature with class discussion primarily in Hebrew; beginning composition. Prerequisite: 2 or equivalent.

25 Introduction to Religion (2). Engages students in reflection on religious questions which human existence poses; introduces them to conceptual tools for understanding and evaluating answers which have emerged in human history.

102 Greek: Readings in Biblical Greek (3). Second year of study for those with one year in either Classical or New Testament Greek. Selected passages analyzed for vocabulary, grammar, style and content. Prerequisite: one year Greek.

103 Modern Hebrew Reading (3). Continuation of 3. Prerequisite: 3 or equivalent.

106 Readings in Biblical Hebrew I (3). Advanced course. Knowledge of forms presupposed. Introduction to syntax. Selections from the prophets, Hagiographa. Prerequisite: instructor's consent.

107 Readings in Biblical Hebrew II (3). Continuation of 106. Prerequisite: 106 or equivalent. w.

108 Rabbinic Hebrew I (2). Lectures on history of post-Biblical literature. Representative selections from Talmudic, Midrashic literature. Prerequisite: instructor's consent.

109 Rabbinic Hebrew II (2). Continuation of 108. Prerequisite: 108 or equivalent.

110 Introduction to the Old Testament (3). Introduces the literature, history and thought of the Old Testament and scholarly theories necessary for academic study of the Bible. Covers the traditions of creation, election, covenant, monarchy, prophecy, post-exilic Judaism. cor.

121 Introduction to the New Testament (3). Central documents of Christian religion to determine origin, authorship, literary structure, nature, permanent value. f,w. cor.

122 Life and Teachings of Jesus (3). Brief historical introduction; principal events in life of Jesus. His teachings with application to life today. f,w. cor.

124 Life and Letters of Paul (3). Brief historical introduction; principal events in the life of Paul. His teachings with application to life today. f,w.

130 Living Religions of the World (3). A study of the differing ways in which the great world religions interpret life and reality. A survey of the basic ideas in Confucianism, Taoism, Shintoism; Hinduism, Jainism, Buddhism; Judaism, Islam, Christianity, and others. cor.

131 Comparative Religion (2). Cross-cultural comparative study of ideas of major world religions; considers unique and common elements. f,w.

133 Magic and the Occult (2). Examines religious and philosophical presuppositions of a selection of what is called magic and the occult. Topics: alchemy, astrology, cartomancy, witchcraft, satanism, spiritualism.

135 The Religions of India (3). In-depth survey of Hinduism, Buddhism, Jainism, Sikhism and other religions in India, concentrating on the way they understand religion, man, world and salvation.

136 Religions of China-Japan (3). Surveys Scriptures, beliefs, history of religions of China-Japan from ancient origins to modern times. Chinese and Japanese understanding of religion, man and the world through various systems and popular cults of each tradition.

141 The Early History of Israel (3). History of Israel from settlement in Palestine to end of Maccabean period. Evaluation of government, law, religion, prophecy, interaction with neighboring countries.

150 Themes of Christian History (3). Chronological survey of Christian history from origins to present, by focusing on the evolution of selected themes: persecution, authority, doctrine, worship, monasticism, reform, celibacy, dissent, divisions and ecumenism.

152 Early and Medieval Church History (3). Surveys outstanding developments in life of church from apostolic age to present. History of church in light of political, economic, social movements.

153 Reformation and Modern Church History (3). Emphasis on sources and development of Protestant and Catholic reformations. Both traced into modern Christianity in Europe. Treatment of development of Puritanism, Pietism, Rationalism, Empiricism and Existentialism.

154 History of Religion in America (2). Historical analysis of the development of American Protestantism, Catholicism and Judaism from their colonial origins to present. Emphasizes changes within these traditions resulting from contact with the shifting American environment.

156 The Bible in the American Tradition (3). Study of primary documents, both academic and popular, in the history of American Biblical interpretation; the relation of Biblical interpretation to theological issues and broader cultural phenomena.

158 History of Ecumenism (2). History of divisions within Christianity and efforts to remedy them. Elaboration of theological and sociological developments in Christian denominationalism. Assessment of modern Ecumenical Movement and its efforts to transcend Christian divisions.

161 Psychology of Religion (3). Definition and historical survey of psychology of religion. Attention focused on perceptual, intellectual and emotional processes; thought organization; the motor system; relations to persons, things, ideas and self in religion.

171 Philosophy of Religion (3). Philosophy inquiring into origin, nature, function of religion; examines source and validity of claims religion makes; clarifies fundamental religious concepts. f,w.

181 Religious Themes in Modern Literature (3). Literary study of religious views and themes expressed in 20th-century poetry, fiction and drama: Eliot, Camus, Kazantzakis, O'Conner, Wiesel, Updike and others.

182 Contemporary Religious Thought (3). Survey of currents of religious thought that have cut across denominational lines in the 20th century: existentialism, personalism, social gospel, "death of God," phenomenology, fundamentalism, theology of hope, etc.

183 Parables (3). Comparative investigation of parables of rabbinic authors, Jesus of Nazareth and selected modern authors; delineating parables as a linguistic genre as an instance of "figurative" language in contrast to analytic "positivistic" use.

184 Uses of Religion in Afro-American Literature (3). Examination of Afro-American fiction, poetry and drama which present significant racial attitudes toward the Christian religion.

185 The Modern Short Story and the Crisis of Belief (2). An in-depth study of selections of short fiction concerned with the question of faith in the modern world.

191 Religion and Contemporary Social Issues (3). Study of basic problems in social ethics: violence and war, racial and ethnic exclusion, economic inequality, technology, government and law, personal morality. Understanding and possible modes of resolution through resources of Western religious tradition.

201 Topics in Religion (cr. arr.) Topics announced at time of registration. Prerequisite: sophomore standing.

205 Masterpieces of Sacred Literature (3). Selected texts in world religious literature. Selections in Egyptian, Babylonian, Persian, Old and New Testaments, Koran, Chinese, Hindu sacred writings. Historical background of selections studied. Prerequisites: junior standing & 6 hours literature.

211 The Pentateuch (2). In-depth study of first five books of the Bible from viewpoint of the origin, structure and theology of basic traditions of the Yahwist, Elohist, the priestly writer and Deuteronomy. Prerequisite: 110 or equivalent.

212 The Israelite Monarchy and Prophetism (2). In-depth study of the religious and political development of Judah and Israel from Saul to the Babylonian exile. Prerequisite: 110 or equivalent.

213 Post-Exilic Judaism (2). In-depth study of the religious and political development of Judaism from the Babylonian exile to the destruction of Jerusalem. Prerequisite: 110, f.w.

214 Dynamics and Tensions of Modern Judaism (3). Examines intellectual, social-economic forces which shaped Judaism history from 1790-present. Attention focused on emancipation, religious reform, Jewish socialism, anti-Semitism, Zionism and the Holocaust as formative events and ideas.

221 Synoptic Gospels (3). Origin, sources and interrelationships of Mark, Luke and Matthew. In-depth study of some passages to determine use of tradition in the early church and to study the life of Jesus. Prerequisite: 122 or equivalent.

222 The Gospel of John (3). Origin, structure and theology of fourth gospel. In-depth study of some passages, including those that allow a comparison with synoptic passages on same material. Prerequisite: 122.

Reserve Officers Training Corps (R.O.T.C.)

Aerospace Studies

General Military Courses

11 The Air Force Today I (1). Deals with Air Force in the contemporary world. Introduces the doctrine, mission and organization of U.S. Air Force. Familiarizes students with functions of U.S. strategic offensive and defensive forces. Leadership lab. f.

12 The Air Force Today II (1). Introduction and familiarization with systems used in missile defense. Functions of U.S. general purpose forces, including Army and Navy forces, and Aerospace Support Forces. Leadership lab. w.

21 History of Air Power I (1). Deals with development of air power from balloons through World War II. Early flying operations and uses of aircraft in wartime and peacetime are covered. Early technological aircraft developments are studied. Leadership lab. f.

22 History of Air Power II (1). Includes development of air power after World War II, the peaceful employment of air power in relief missions and civic action programs, and use of air power in Vietnam. Leadership lab. w.

Professional Officers Courses

131 Management (3). An integrated management course emphasizing the individual as a manager in an Air Force environment. Individual motivational and behavioral processes, leadership, and group dynamics are covered. Emphasis on communicative skills as junior officer attributes. Lab. f.

132 Concepts of Leadership (3). Basic managerial processes involving decision making, organizing and controlling are covered. Military justice and administrative law are discussed within the context of the military organization. Student participation in speaking and writing is required. Lab. w.

141 American Defense Policy I (3). Emphasizes civil-military relations, including society's attitudes, the role of the professional officer, and the interaction of U.S. defense policy with the military. Stresses the development of individual and group communicative skills. Lab. f.

142 American Defense Policy II (3). Focuses on the Armed Forces as an integral part of society. Emphasizes society's constraints on national defense; requisites for maintaining security forces; and variables involved in formulating and implementing security policy and strategy. Lab. w.

Military Science

Basic Courses (Freshmen & Sophomore Years)

10 The U.S. Army Officer—Careers and Specialities (0-1). Role, life style, utilization of academic major and professional challenges of reserve and regular Army officers. Branches of Army. Reserve components structure. Mission of the Army in total defense picture. w.

11 The Military and Society (0-1). Theories of conflict, nature, origins, conduct of warfare; nature of military power. Military and American society, changing military role and impact on U.S. political, social, economic institutions. Practical leadership emphasis on self-discipline. f.

50 American Military History (0-2). Changes in U.S. military operations from colonial times to present as influenced by economic, technological, sociological, international environment. Importance of leadership in determining outcome of conflict. Practical leadership of squad and platoon. f.

51 Land Navigation (0-2). Study and application of map and aerial photography. Fundamentals of military use of compass, map and nature in cross-country navigation. Introduction to orienteering. w.

Advanced Courses (Junior & Senior Years)

Prerequisites for Advanced Courses are satisfactory completion of Basic Courses or permission of the Department; prior active service; successful completion of summer basic camp; or 3 years of junior ROTC.

100 Leadership (3). Theories, models and behavioral patterns involved in interaction between individuals, groups, leaders. Organization and situational interactions. Topical problems in light of contemporary behavioral theory. Practical leadership of squad and platoon. Methods of instruction. f.

101 Command Operations (3). Leadership, tactical theory of small-unit operations. Orientation in Army branch organization. Direction of combined military teams. Methods of military instruction: practical leadership at squad/platoon level; preparation for summer camp. w.

150 Staff Organization and Management (3). Military staff organization, functions, procedures. Staff estimates, problem-solving techniques. Study of combat, intelligence, logistics and administration. Special problems of airmobile operations. Planning, organization for field exercise. Practical leadership at staff level. f.

151 Administration (3). Study of military law, personnel evaluation and management systems. Organizational administration systems. Analysis of social, political, economic changes and implications concerning military policy. Practical leadership at officer levels. w.

Naval Science

All midshipmen enrolled in Naval Science courses are required to attend a two-hour laboratory period weekly. All non-NROTC students enrolled in Naval Science courses are exempted from attending laboratory periods.

1 Introduction to Naval Science (2). Navy's history, the total concept of seapower, the Navy's organization and an introduction to each of the major components. f.

2 Naval Ship Systems I (2). Ship construction, stability and damage control, basic thermodynamics, the steam cycle and the engineering plant. w.

25 Naval Ship Systems II (2). Naval weapons systems, their employment and control, including the basic fire control problem, with emphasis on new systems. f.

26 Seapower and Maritime Affairs (2). Seminars examine the application of seapower as an instrument of foreign policy by major nations of the world. Emphasis placed on role of the Navy. w.

100 Navigation (3). Theoretical and practical application of the principles of marine navigation. Includes fundamentals of dead reckoning, piloting, tides and current, celestial navigation, electronic navigation. f.

101 Naval Operations (3). Principles and concepts of naval operations: Rules of the Road, command and control in naval operations, communications, ASW warfare, international maritime law, and practical solution of relative motion problems. w.

103 Navy Management (3). Applies principles of management using Department of the Navy as a model. Emphasizes relationships between echelons and management of men, material and funds at each echelon. f.

104 Evolution of the Art of War (3). Evolution of strategy, tactics, weapons and leadership from earliest beginning through the Vietnam period. Development of military policy, the impact of warfare on the political, social and economic structure of nations. alt. f. even yrs.

105 Administration in the Naval Profession (1). Administrative aspects of naval leadership including selected current topics in personnel management, material management, organization and military law. w.

106 Amphibious Warfare (3). History and development of amphibious warfare, principles of amphibious warfare techniques; their application in selected examples from modern history. alt. f. odd years.

Respiratory Therapy

135 Teaching Practicum for Allied Health Sciences (3) (same as Curriculum & Instruction D135, Medical Technology 135, Occupational Therapy 135, Physical Therapy 135, Radiologic Technology 135).

151 Equipment and Techniques I (4). History, development and organization of respiratory therapy. Manufacture, supply, storage and piping of gases; pressure regulation, flow control, humidification. Cleaning, sterilizing, maintenance, safety. Equipment for pressure breathing, oxygen, aerosol therapy. Half class, half lab. f.

153 Clinical Practice I (2). To be taken concurrently with course 151, for which it serves as an extension of the laboratory time and an opportunity for structured clinical experience exposures. f.

155 Normal Respiratory Function (3). Mechanics, control, blood gas transport, work of breathing, and respiratory therapy aspects of acid-base balance. Prerequisite: physiology. f.

157 Drugs Used in Respiratory Therapy (2). General principles of drug dosage, absorption, action and excretion. Specific attention to general anesthetics and other central nervous system depressants, muscle relaxants, autonomic drugs (especially bronchodilators and vasoconstrictors), narcotics, cardiac drugs. f.

162 Equipment and Techniques II (4). Continuation of course 151, which is prerequisite. Covers airway management, ventilators, function testing, blood gas analysis and chest physiotherapy. Half class, half lab. Prerequisite: 151. w.

164 Disordered Respiratory Function (2). Course deals with cardiopulmonary pathology, surgery and injuries—any of the reasons why patients may require respiratory therapy. Prerequisite: 155. w.

168 Clinical Practice II (2). To be taken concurrently with course 162, for which it serves as an extension of the laboratory time, and an opportunity for structured clinical experience exposures. Prerequisite: 151/153, or equivalent. w.

171 Clinical Practicum (8). Clinical practicum in respiratory therapy in which the student practices the basic arts of respiratory therapy learned during the junior year. Patients are assigned each week for case history studies. Prerequisites: 151, 153, 155, 162, 164, 166, 168.

172 Respiratory Therapy Aspects of Neonates (2). General survey of respiratory physiology, diseases and treatment of the neonate. Evaluation and immediate care, X-ray interpretation and pharmacology. Covers respiratory therapy and management of the high-risk infant. Seniors only. f.

173 Clinical Practice III (2). Structured and supervised clinical experience based on work completed in courses 151/153 and 162/168, which are prerequisites.

175 Introduction to Research (1). Survey of research tools and techniques; ways to formulate research projects; statistical treatment of data and preparation of reports for journal publication. Seniors only. f.

177 Literature Survey Seminar (1). Professional literature survey; reports of meetings. Seniors only. f.

179 Clinical Respiratory Therapy I (3). Rounds, case studies and extended clinical practice. Specific applications of respiratory therapy in Emergency, Medicine, Surgery, Obstetrics, Pediatrics, etc. Prerequisites: 162/168 & 157/164, or equivalents. f.

180 Clinical Respiratory Therapy II (3). Continuation of course 179, which is prerequisite. Clinical rounds, case presentations and advanced study. Prerequisite: 179. w.

182 Organization and Administration (2). Studies ways to set up and operate service departments, educational programs. Quarters, facilities, personnel, procedures, record systems; ethics, medico-legal aspects, interdepartmental relations, curriculum development, planning for instruction. Prerequisites: 153 & some hospital experience. w.

184 Research (2-6). Selected research projects guided by a senior staff member. Prerequisite: 175. w.

186 Advanced Seminar (1). Advanced case study and problem solving. Seniors only. w.

188 Clinical Practice IV (2). An extension of the supervised practicum begun in course 173, which is prerequisite.

Romance Languages

French

Students entering with 0 to 1 high school unit in French should take 1 for 5 hours credit. Those with 2 high school units in French may take 2 for 5 hours credit or 1 for 5 hours credit. Students with 3 high school units in French may take 103 for 3 hours credit, or 2 for 5 hours credit, or 1 for 5 hours credit. Those entering with 4 high school units satisfy the language requirement for College of Arts & Science and School of Journalism. They may enroll in 106, 109, or 203. Those entering with 5 or more units of French should consult the chairperson.

1 Elementary French I (5), cor.

2 Elementary French II (5), Continuation of 1. Prerequisite: grade of C or better in 1 or its equivalent. cor.

103 French Reading (3), Prerequisite: 2 or equivalent. cor.

106 French Composition (3), Prerequisite: 2 or equivalent.

109 French Conversation (3), Prerequisite: 2 or equivalent.

110 French Civilization (3), Open to any student interested. No knowledge of French required.

111 French Literature in Translation (3), May not be included in Area of Concentration in French. Subject matter varies with instructor.

196 Honors Reading in French (1), Directed readings in area of Honors Thesis. Prerequisite: admission to departmental Honors Program.

197 Honors Thesis in French (3), Required of Honors candidates.

202 Advanced French Reading (3), Prerequisite: 103 or equivalent.

203 Masterpieces of French Literature (3), Study of selected masterpieces of French literature from the Middle Ages to the present day. Prerequisite: 103 or equivalent.

206 Advanced French Composition (3), Prerequisite: 106 or equivalent.

207 Intensive Beginning French (3), Rapid acquisition of a reading knowledge of French. Cannot be taken to fulfill undergraduate language requirement.

209 Advanced French Conversation (3), Prerequisite: 109 or equivalent.

211 Intensive Beginning French I (5), Intense approach designed for rapid advancement in acquisition of multi-skills of the language.

212 Intensive Beginning French II (5), Intensive approach designed for rapid advancement in acquisition of multi-skills of the language. Prerequisite: 211 or equivalent.

256 Stylistics (3), Technical study of French as a means of communication and of self-expression, involving levels of meaning, rhetorical structure and textual analysis. Prerequisite: 206 or equivalent.

French Literature

201 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable with departmental consent.

301 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable with departmental consent.

312 French Medieval Literature (3), Prerequisite: 103 or equivalent. Recommended: 203.

316 French Renaissance (3), Prerequisite: 103 or equivalent. Recommended: 203.

317 Seventeenth-Century French Literature (3), Prerequisite: 103 or equivalent. Recommended: 203.

318 Eighteenth-Century French Literature (3), Prerequisite: 103 or equivalent. Recommended: 203.

319 Nineteenth-Century French Literature (3), Prerequisite: 103 or equivalent. Recommended: 203.

320 Twentieth-Century French Novel. (3), Prerequisite: 103 or equivalent. Recommended: 203.

321 Introduction to the Contemporary French Theatre (3), Prerequisite: 103 or equivalent. Recommended: 203.

323 Introduction to Contemporary French Poetry (3), Prerequisite: 103 or equivalent. Recommended: 203.

329 Nineteenth-Century French Novel (3), Prerequisite: 103 or equivalent. Recommended: 203.

350 Special Readings (1-3), Undergraduates must have permission of department chairperson. Independent study through readings, conferences, reports. Prerequisite: 103 or equivalent.

353 Readings in French (2-3), Subject varies according to instructor. Prerequisite: 103 or equivalent.

400 Problems (cr. arr.)

401 Bibliography and Methods (3), Principles and aims of literary scholarship; systematic study of bibliographic resources for research.

410 Seminar (2-3), Subject varies according to instructor.

412 Studies in French Medieval Literature (3), Prerequisite: 411.

416 Studies in the French Renaissance (3), Recommended: 316.

417 Studies in Seventeenth-Century French Literature (3), Recommended: 317.

418 Studies in Eighteenth-Century French Literature (3), Recommended: 318.

419 Studies in Nineteenth-Century French Literature (3), Recommended: 319.

420 Studies in Twentieth-Century French Literature (3), Recommended: 320, 321, or 323.

430 Studies in the French Theatre (3).

431 Studies in the French Novel (3).

432 Studies in French Poetry (3).

480 Readings (3-6), Independent readings in preparation for the Ph.D. comprehensive examination in French.

490 Research (cr. arr.)

French Language

304 Phonetics (3), Comparison of French and English phonetic features, with application to the teaching of pronunciation. Prerequisites: 106 & 109 or equivalent.

311 History of the French Language (3) (same as Linguistics 311). Required of M.A. candidates. Prerequisite: French 103.

378 Structure of Modern French (3) (same as Linguistics 378). An introductory presentation of the phonological and syntactic systems of contemporary standard French. Prerequisite: French 206 or equivalent or instructor's consent.

402 French Composition for Graduate Students (3), Intensive practice in writing French. Advanced explication de textes. Prerequisites: 206 & 209 or equivalent.

411 Old French (3), Prerequisite: knowledge of Latin, to be demonstrated by passing a departmental written examination or by completing Latin 201 with grade of B or better. Recommended: 311.

For the Teaching of French, see Curriculum and Instruction D116.

Italian

1 Elementary Italian I (5).

2 Elementary Italian II (5), Continuation of 1. Prerequisite: grade of C or better in 1 or its equivalent.

- 103 Italian Reading (3).** Prerequisite: 2 or equivalent.
- 106 Italian Composition (3).** Prerequisite: 2 or equivalent.
- 109 Italian Conversation (3).** Prerequisite: 2 or equivalent.
- 110 Italian Civilization (3).** Open to any student interested. No knowledge of Italian required.
- 111 Italian Literature in Translation (3).** May not be included in Area of Concentration in Italian. Subject varies with instructor.
- 196 Honors Reading in Italian (1).** Directed readings in area of Honors thesis. Prerequisites: major in Italian & admission to departmental Honors Program.
- 197 Honors Thesis in Italian (3).** Required of Honors candidates. Prerequisite: major in Italian.
- 201 Topics (cr. arr.)** Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable with departmental consent.
- 206 Advanced Italian Composition (3).** Prerequisite: 106 or equivalent.
- 207 Intensive Beginning Italian (3).** Designed for rapid acquisition of a reading knowledge of Italian. Cannot be taken to fulfill undergraduate language requirement.
- 209 Advanced Italian Conversation (3).** Prerequisite: 109 or equivalent.
- 211 Intensive Beginning Italian I (5).** Intense approach designed for rapid advancement in acquisition of multi-skills of the language.
- 212 Intensive Beginning Italian II (5).** Intense approach designed for rapid advancement in acquisition of multi-skills of the language. Prerequisite: 211 or equivalent.
- 301 Topics (cr. arr.)** Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable with departmental consent.
- 311 Survey of Italian Literature I (3).** From 1200 to 1600. Prerequisite: 103, 207 or equivalent.
- 312 Survey of Italian Literature II (3).** From 1700 to present. Prerequisite: 103, 207 or equivalent.
- 319 Nineteenth-Century Italian Literature (3).** Prerequisite: 103 or equivalent.
- 321 Dante (3).** Prerequisite: 103 or equivalent.
- 350 Special Readings (1-3).** Independent study through readings, conferences, reports. Prerequisite: 103 or equivalent. f.w.
- 400 Problems (cr. arr.)**

Portuguese

- 1 Elementary Portuguese I (5).**
- 2 Elementary Portuguese II (5).** Continuation of 1. Prerequisite: grade of C or better in 1 or equivalent.
- 103 Portuguese Reading (3).** Prerequisite: 2 or equivalent.
- 106 Portuguese Composition (2).** Prerequisite: 2 or equivalent.
- 109 Portuguese Conversation (3).** Prerequisite: 2 or equivalent.
- 201 Topics (cr. arr.)** Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable with departmental consent.
- 206 Advanced Portuguese Composition and Conversation (3).** Prerequisite: 106 or 109.
- 207 Intensive Beginning Portuguese (3).** Designed for rapid acquisition of a reading knowledge of Portuguese. Cannot be taken to fulfill undergraduate language requirement.
- 211 Intensive Beginning Portuguese I (5).** Intensive approach designed for rapid advancement in acquisition of multi-skills of the language.

212 Intensive Beginning Portuguese II (5). Intense approach designed for rapid advancement in acquisition of multi-skills of the language. Prerequisite: 211 or equivalent.

301 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable with departmental consent.

311 Survey of Portuguese Literature (3). Masterpieces of continental Portuguese literature from its origins to present. Prerequisite: 103, 207 or equivalent.

331 Survey of Brazilian Literature (3). Survey of Brazilian literature from colonial period to present. Prerequisite: 103, 207 or equivalent.

350 Special Readings (1-3). Independent study through readings, conferences, reports. Prerequisite: 103 or equivalent.

353 Readings in Portuguese (2-3). Subjects in either Brazilian or Portuguese literature. Varies according to instructor.

400 Problems (cr. arr.)

Provençal

413 Old Provençal (3).

Spanish

Students entering with 0 to 1 high school unit in Spanish should take 1 for 5 hours credit. Those with 2 high school units in Spanish may take 2 for 5 hours credit or 1 for 5 hours credit. Students with 3 high school units in Spanish may take 103 for 3 hours credit, or 2 for 5 hours credit, or 1 for 5 hours credit. Those entering with 4 high school units satisfy Arts and Science and Journalism language requirement. They may enroll in 106, 109 or 203. Those entering with 5 or more units of Spanish consult the chairperson.

1 Elementary Spanish I (5). cor.

2 Elementary Spanish II (5). Continuation of 1. Prerequisite: grade of C or better in 1 or its equivalent. cor.

103 Spanish Reading (3). Prerequisite: 2 or equivalent. cor.

106 Spanish Composition (3). Prerequisite: 2 or equivalent.

109 Spanish Conversation (3). Prerequisite: 2 or equivalent.

110 Hispanic Civilization (3). Open to any student interested. No knowledge of Spanish required.

111 Spanish Literature in Translation (3). May not be included in Area of Concentration in Spanish. Subject varies with instructor.

196 Honors Readings in Spanish (1). Directed readings in areas of Honors Thesis. Prerequisite: admission to departmental Honors Program.

197 Honors Thesis in Spanish (3). Required of Honors candidates.

202 Advanced Spanish Readings (3). Prerequisite: 103 or equivalent.

206 Advanced Spanish Composition (3). Prerequisite: 106 or equivalent.

207 Intensive Beginning Spanish (3). Designed for rapid acquisition of a reading knowledge of Spanish. Cannot be taken to fulfill undergraduate language requirement.

209 Advanced Spanish Conversation (3). Prerequisite: 109 or equivalent.

211 Intensive Beginning Spanish I (5). Intense approach designed for rapid advancement in acquisition of multi-skills of the language.

212 Intensive Beginning Spanish II (5). Intense approach designed for rapid advancement in acquisition of multi-skills of the language. Prerequisite: 211 or equivalent.

256 Stylistics (3). Prerequisite: 206 or equivalent.

Peninsular Spanish Literature

309 Spanish Medieval Literature (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

310 Renaissance and Golden Age Poetry (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

311 Renaissance and Golden Age Prose (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

312 Spanish Theatre in the Golden Age (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

313 Don Quijote (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

317 Spanish Poetry in the Nineteenth and Twentieth Centuries (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

318 Nineteenth-Century Spanish Drama (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

319 Nineteenth-Century Spanish Novel (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

320 Twentieth-Century Spanish Drama (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

321 Twentieth-Century Spanish Novel (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

322 Spanish Essay in the Nineteenth and Twentieth Centuries (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

412 Studies in Spanish Literature of the Medieval Period (3). Prerequisite: 203 & 204 or equivalent. Recommended: 460.

415 Studies in Spanish Literature of the Renaissance (3). Prerequisites: 203 & 204 or equivalent. Recommended: 310.

416 Studies in Spanish Literature in the Golden Age (3). Prerequisites: 203 & 204 or equivalent. Recommended: 311, 312, or 313.

418 Studies in Eighteenth-Century Spanish Literature (3). Prerequisites: 203 & 204 or equivalent.

419 Studies in Nineteenth-Century Spanish Literature (3). Prerequisites: 203 & 204 or equivalent. Recommended: 317, 318, 319, or 322.

420 Studies in Twentieth-Century Spanish Literature (3). Prerequisites: 203 & 204 or equivalent. Recommended: 317, 320, 321 or 322.

Spanish-American Literature

331 Survey of Spanish-American Literature I (3). From beginning to 1880. Prerequisite: 103 or equivalent. Recommended: 203 & 204.

332 Survey of Spanish-American Literature II (3). From 1880 to present. Prerequisite: 103 or equivalent. Recommended: 203 & 204.

335 Mexican Literature (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

341 Argentine Literature (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

345 Modernista and Contemporary Poetry (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

355 The Spanish-American Theatre (3). Prerequisite: 103 or equivalent. Recommended: 203 & 204.

430 Studies in Spanish-American Poetry (3). Prerequisites: 203 & 204 or equivalent.

431 Studies in Spanish-American Fiction (3). Prerequisites: 203 & 204 or equivalent.

432 Studies in the Spanish-American Essay (3). Prerequisites: 203 & 204 or equivalent.

433 Studies in the Spanish-American Theatre (3). Prerequisite: 332 or instructor's consent.

Peninsular Spanish & Spanish-American Literature

201 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable with departmental consent.

203 Introduction to Hispanic Literature I (3). Selected prose fiction and nonfiction prose of Spain and Spanish America. Prerequisite: 103 or equivalent.

204 Introduction to Hispanic Literature II (3). Selected plays and poetry of Spain and Spanish America. Prerequisite: 103 or equivalent.

301 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable with departmental consent.

350 Special Readings (1-3). Independent study through readings, conferences, reports. Prerequisite: 103 or equivalent. Undergraduates must have department chairperson's consent.

353 Readings in Spanish (2-3). Subject varies according to instructor. Prerequisite: 103 or equivalent. Recommended: 203 & 204.

400 Problems (cr. arr.)

401 Literary Research in Hispanic Studies (3). Principles and aims of literary scholarships; systematic study of bibliographic resources for research.

410 Seminar (2-3). Subject varies according to instructor. Prerequisites: 203 & 204 or equivalent.

480 Readings (3-6). Independent readings in preparation for Ph.D. comprehensive examination in Spanish.

490 Research (cr. arr.)

Spanish Language

360 Phonetics (3) (same as Linguistics 360). Prerequisites: 103 & 109 or equivalent.

361 History of the Spanish Language (3) (same as Linguistics 361). Diachronic analysis of phonological, morphological and syntactical systems of Spanish, from Vulgar Latin to contemporary dialects.

379 Structure of Modern Spanish (3) (same as Linguistics 379). Synchronic analysis of phonology, morphology and syntax of spoken Spanish dialects. Prerequisite: 103 or equivalent or instructor's consent.

402 Spanish Composition for Graduate Students (3). Intensive practice in writing Spanish.

460 Old Spanish—Phonology, Morphology and Syntax (3). Prerequisite: knowledge of Latin, to be demonstrated by passing departmental written examination or by completing Latin 201 with grade of B or better.

For the Teaching of Spanish, see Curriculum and Instruction D117.

Romance Languages

210 Theory and Art of Literary Translation (3) (same as Comparative Literature 210).

350 Special Readings (1-3). Prerequisites: 372 or equivalent & instructor's consent.

370 Linguistics for Teachers of Romance Languages (3).

371 Introduction to General Linguistics (3) (same as Anthropology 371, Linguistics 371). Fundamentals of linguistic theory; collateral readings, problems. No prerequisite.

372 Linguistic Analysis (3) (same as Anthropology 372, Linguistics 372). Problems in analyzing data from various languages. Prerequisite: introductory course in linguistics or instructor's consent.

373 Phonology (3) (same as Anthropology 373, Linguistics 373). Introduction to linguistic phonetics and generative phonology. Readings, problems. Prerequisite: 371 or equivalent.

374 Syntax (3) (same as Anthropology 374, Linguistics 374). Survey of syntactic and semantic theory, with emphasis on transformational-generative notions; problems. Prerequisite: 371 or equivalent.

380 Advanced Study in the Techniques of Language Teaching (3). Prerequisite: teaching experience.

400 Problems (cr. arr.) Prerequisites: 372 or equivalent & instructor's consent.

490 Research (cr. arr.)

493 Advanced Phonology (3) (same as Anthropology 493, Linguistics 493). Examination of current theory and methods of describing sound patterns of language; particular attention to the generative model and distinctive features. Prerequisites: 373, 374.

Rural Sociology

For additional courses in Rural Sociology, see Sociology.

1 Rural Sociology (3). Introduction to sociology of rural and small town society, structure, functioning, trends and interrelations with the larger society. No credit for both Rural Sociology 1 and Sociology 1. cor.

120 Population and Ecology (3) (same as Sociology 120). Changes in the numbers of people, their characteristics, where they live and the quality of their lives. The cities, states, nation and world are considered in relation to natural resources and other factors.

150 The Amish Community (3) (same as Sociology 150). Examines historical antecedents and contemporary culture and social structure of the Amish. Topics include cultural symbols, life ceremonies, the family, countercultural pressures, stresses, social change. Prerequisite: 1, Sociology 1, or Anthropology 1.

155 Agriculture in Communal Settings (3). Comparative analysis of agricultural communitarian social systems. Special attention given to Hutterites, Israeli kibbutz and moshav, collective agriculture in Soviet Union. Agrarian communal groups in other societies and modern American rural communes examined.

170 Sociological Aspects of Poverty (3) (same as Sociology 170).

175 Corporate Farms vs. Family Farms (3). For agricultural students; assumes a basic understanding of food production/distribution system. Examines current structures in agricultural production systems, forces for change, possible social consequences of alternative structures. Prerequisite: introductory rural sociology or sociology.

180 Social Research I (3) (same as Sociology 180).

181 Social Research II (3) (same as Sociology 181).

182 Senior Seminar (3) (same as Sociology 182). Senior sociology majors only.

184 Social Impact Analysis (3) (same as Sociology 184). Procedures for predicting the social consequences of energy and water resources development, industrial plants, highways and housing projects. Introduction to use of sociological materials in preparing social impact reports. Prerequisite: 1 or Sociology 1.

185 Contemporary Social Problems (3) (same as Sociology 185). Issues and groups which are the basis for social conflict. Prerequisite: 1 or Sociology 1. cor.

201 Organization and Leadership in Modern Society (3) (same as Sociology 201). Examination of dynamics of group leadership in voluntary community organizations; study of how leader's behavior is related to success or failure of organization's program.

214 The Family (3) (same as Sociology 214).

225 Social Processes of Communication and Diffusion (3) (same as Sociology 225). Overview of the social process of effective interpersonal communication, mass media impact and strategies for implementing the acceptance of new ideas and practices within social systems or societal sectors. Prerequisite: 1 or Sociology 1.

255 Youth in Today's World (3) (same as Sociology 255). Study of what factors influence the development of youth in today's society. Examined are types of behavior such as mating, deviance and the role of schools, parents, TV and friendship groups. Prerequisite: 1 or Sociology 1.

270 The Sociology of Religion (3) (same as Sociology 270). Structure and function of religious organizations in various types of societies, nature of religious leadership, type of religious participation, relationship of religion to other social institutions. Prerequisite: 1 or Sociology 1.

290 Practicum (cr. arr.) (same as Sociology 290). Independent research or professional experience under faculty supervision. Projects must be arranged by student and faculty member prior to registration. Prerequisites: junior standing, consent required.

299 Recent Theories in Sociology (3) (same as Sociology 299).

300 Problems (cr. arr.)

301 Topics in Rural Sociology (2-3). Organized study of selected topics. Subjects and earnable credit vary from semester to semester. May be repeated with departmental consent. Prerequisites: 1 or Sociology 1 & junior or senior standing.

304 Human Ecology (3) (same as Sociology 304). Ecological theories as applied to rural and urban communities; basic ecological concepts with reference to the spatial distribution of population. Prerequisite: 1 or Sociology 1. f.w.

310 Rural Social Organization (3) (same as Sociology 310). Comprehensive review of rural society. Prerequisite: 1 or Sociology 1.

311 Applied Sociology (3) (same as Sociology 311).

335 Social Change and Trends (3) (same as Sociology 335). Nature of social change. Emphasis on sociological theories and models of social change and their application in analysis and implementation of change in social structures. Prerequisite: 1 or Sociology 1.

340 Community Social Structure (3) (same as Sociology 340).

347 The Sociology of Community Health (3) (same as Family & Community Medicine 347, Sociology 347).

375 Social Statistics (3) (same as Sociology 375). Non-parametric tests of hypothesis, regression correlation analysis, scaling and sociometric models. Required for Ph.D. in Sociology. Prerequisite: introductory course in statistics.

376 Advanced Social Statistics (3) (same as Sociology 376).

400 Problems (cr. arr.) Research for student capable of semi-independent work.

422 Human Migration (2) (same as Sociology 422). Systematic analysis of historical and contemporary international and internal migration; some possible social causes and consequences. Prerequisite: 120 or Sociology 305 or instructor's consent.

425 Communication and the Diffusion of Information (3) (same as Sociology 425). Factors conditioning communication and diffusion of ideas and practices; exercise of personal influence; role of change agents and agencies in the process of change. Prerequisite: graduate standing or instructor's consent.

426 Studies in Comparative World Population (2) (same as Sociology 426). Seminar on present situation, causes and consequences of population change in various cultures of the world. Prerequisite: 120 or Sociology 305 or instructor's consent.

430 Techniques of Social Investigation (3) (same as Sociology 430). Sample selection, questionnaire construction, interviewing, machine tabulation, analysis and report writing. Two lectures, one hour lab weekly. Required for M.A. in Sociology.

432 Research Methods in Sociological Theory Construction and Verification (3) (same as Sociology 432). Philosophy and structure of science, critical examination of selected methods, models and theories with special concern for theory construction.

435 Advanced Group Organization and Leadership (3). Theory, practices of group organization and leadership; emphasis on interpretation of research findings related to leadership development. Prerequisite: 201 or instructor's consent.

444 Readings in Advanced Rural Sociology (cr. arr.)

450 Research (cr. arr.) Research not expected to terminate in thesis or dissertation. Prerequisite: instructor's written consent. f,w,s.

490 Research (cr. arr.) Research leading to dissertation.

491 Seminar in Social Prediction (2) (same as Sociology 491).

Russian (See Germanic & Slavic Studies)

Social Work

101 Topics in Social Work (1-3). Special and emerging topics in social work and social welfare. Subject, content and credit varies depending on available faculty and student interest. For undergraduate students only.

125 Social Welfare and Social Work (3). Examines the nature of social welfare institutions, social work and the relationship between them. Focuses on policy issues with special reference to poverty, racism and sexism. Required for BSW majors as sophomores or juniors.

145 Introduction to Public Assistance (3). Nature of social and economic dependency; review of historical and present cultural response to these problems. Discussion of possible future programs for alleviation of social and economic dependency. Prerequisites: 125 & senior standing.

150 Child Welfare (2). Evolution of problems of child welfare; services offered by public and private agencies. Prerequisites: junior standing & 125 for social work students.

201 Topics in Social Work (1-3). Special and emerging topics in social work and social welfare. Subject, content and credit varies depending on available faculty and student interest. For undergraduate students and graduate students outside the School.

225 Medical Social Problems (2). Interrelations of biological, psychological, social factors in understanding people with common physical illnesses. Prerequisites: junior standing & instructor's consent.

300 Problems in Social Work (1-3). Research and independent study projects offered on a tutorial basis to undergraduate social work students. Prerequisites: adviser's and instructor's consent.

301 Topics in Social Work (1-3). Special and emerging topics in social work and social welfare. Subject, content and credit varies depending on available faculty and student interest. For undergraduate and graduate students.

303 Social Justice and Social Policy (2). Based on the concepts of human need and social justice, an historical and analytical approach to social welfare policies and programs. Prerequisite: 125 or graduate standing in social work.

304 Introduction to Community and Organizational Processes (3). Introduction to contextual framework of social work practice with particular emphasis on community and organization as social systems. Prerequisite: junior standing in social work and 125.

305 Child Care and Protection (3). Safeguards for children involving parent-child relationship, child labor, delinquency, adoption, dependency, neglect. Facilities for foster care. Prerequisites: graduate standing; 30 hours social science or education.

306 Introduction to Social Work Practice (3). Introductory, generic practice theory course promoting student's understanding of professional social work practice as holistic, identifiable, unique configuration of knowledge, values and skills. Prerequisite: junior standing in social work.

307 Delinquency and Social Treatment (2). Nature, extent of delinquency, theory of causation, structure and function of courts, other treatment and prevention programs. Prerequisites: senior standing & instructor's consent.

308 Comparative Social Policy (2-3) (same as South Asia Studies 308). A comparative study of social policy aspects in the framework of international development. Policy areas include South Asia, as well as other regions relevant to such study. Prerequisite: instructor's consent required.

309 Social Work Practice (3). This course develops the generalist approach to social work knowledge, values, systems and processes with emphasis upon the generic aspects of intervention at several levels of social organization. Prerequisite: graduate standing in social work. f.

312 Research Methods for Social Work (3). Survey of research methods germane to the development of the knowledge base of social work practice. Prerequisite: senior or graduate standing in social work. f,w.

315 Dynamics of Interviewing (3). Analysis of interviewing techniques employed in communication for securing reliable, valid data to modify behavior in accordance with professional objectives. Prerequisites: junior standing & instructor's consent.

319 Social Statistics (3). No credit for graduate social work students. Descriptive, analytic techniques applied to qualitative and quantitative social data. Prerequisite: senior standing.

320 Social Psychological Perspectives in Human Development for Social Work (3). Substantive sources from behavioral sciences used in social work toward understanding the biosocial process and constraints of human development. Prerequisites: 125 and course in personality or human development.

321 Social Deviance (3). Basic concepts and principles regarding psychological/social dynamics of deviance; implications for social welfare policy and social interventions. Prerequisite: senior or graduate standing or instructor's consent.

330 Interaction Skills Workshop (3). Interaction skills for generalist practice at individual, group and community levels. Group, communication and social influence theories address generic and unique aspects of interaction across systems. Uses laboratory instruction. Prerequisite: junior or graduate standing in social work.

340 Supervision in the Public Welfare Agency (2). Study of supervisory principles and methods within framework of the public welfare agency. Prerequisite: second-year graduate standing. Course also open to agency supervisors and those eligible for advancement to agency supervisory positions.

350 Special Readings (1-3). Extensive readings in selected areas of intensive reading in a special field. Prerequisites: adviser's & instructor's consents.

360 Strategies of Social Work Intervention (3). Examines social structures, processes; underlying assumptions/concepts of social change, client constellation, organizational arrangements, role relationships by which social workers define professional intervention. Prerequisite: senior or graduate standing in social work.

370 Law and Social Work Practice (3). Legal processes and law relevant to social policy and social work practice. Legal procedures, court testimony, case method, study of decisions affecting major social problems. Prerequisite: senior or graduate standing in social work.

380 Social Work Practice with Minorities: Afro-American Emphasis (3). Provides students with an appreciation of the Black experience in the United States on a knowledge and feeling level. Prerequisite: instructor's consent.

390 Interventive Processes I (6). Supervised social work practice in a School-approved agency focusing on development of direct practice skills. Fall semester, three days per week. Prerequisites: BSW senior standing, 125, 303, 304, 306, 320, 330. Corequisite: 361.

391 Interventive Processes II (6). Supervised social work practice in a School-approved agency providing a full range of interventive experiences. Winter semester, three days per week. Graded S/U. Prerequisites: admission to MSW program, 303, 309, 313, 320, 330. Corequisite: 360.

400 Problems (1-6). Intensive study of an area of social welfare related to special interest of student. Prerequisites: adviser's & instructor's consents.

401 Topics in Social Work (1-3). Special and emerging topics in social work and social welfare. Subject, content and credit varies depending on available faculty and student interest. For graduate and doctoral students only.

405 Social Work Practice in Health Settings (2). Orientation to function and structure of health agencies and methods used specifically in health field. Prerequisites: adviser's & instructor's consents.

410 Professional Practice Seminar I (3). Provides integrative learning experience in social work practice in an area of beginning specialization in autonomous social work practice. Prerequisites: graduate standing in social work, 360 & 391.

411 Seminar: The Offender (3). Designed to deepen understanding of offenders; social institutions dealing with them. Prerequisites: graduate standing in social work & instructor's consent.

412 Research Design in Social Work (2-3). Examines research methodology and design as applied to the study of social work techniques and problems. Emphasizes differential uses of scientific observation and techniques for developing knowledge and improving practice. Prerequisite: graduate standing.

430 Community Organization for Social Welfare (3). The theory and practice of community organization as a social work problem-solving method. Approaches emphasized include locality development, social planning and social action. Prerequisite: graduate standing in social work.

431 Advanced Social Group Work (3). An intensive exposure to the theories and models of social group work practice through cognitive, affective and experiential (laboratory) methods of teaching/learning. Prerequisites: graduate standing, 330 and instructor's consent.

435 Supervision and Administration in Social Work (3). Introduction to functions of personnel management, quality/quantity control and resource utilization from the perspective of social service agency administrator; particular emphasis on the teaching and supervisory roles. Prerequisite: instructor's consent.

450 Independent Study (1-6). Intensive investigation of phenomena germane to area of concentration carried out with guidance of faculty. May include data collection and leads to a written report in publishable format. Prerequisites: graduate status and 412 or equivalent.

465 Readings in Casework and Social Welfare (1-3). Selected readings based on student's needs and advanced field experience. Prerequisites: 30 hours graduate social work & adviser's & instructor's consents.

490 Research (1-6). Independently conducted research which includes concept development, data collection, statistical analysis and social policy implications prepared in a format suitable for publication. Prerequisites: graduate standing and 412.

491 Professional Leadership Practice (10). Field instruction tailored to concentrating interests, developing depth in clinical skills in direct service or in administration, staff development, and/or supervision. With few exceptions students leave the Columbia area. Prerequisite: 391. Corequisite: 410.

Sociology

For additional courses in Sociology, see Rural Sociology.

1 Introduction to Sociology (3). Nature of organization and activities of human groupings—family, community, crowd, social class, etc.; structure, function of institutions; social influences shaping personality, behavior, social change. No credit for both Sociology 1 and Rural Sociology 1. cor.

40 Crisis in American Society (3). Structural changes taking place in the economy class structure, politics, education and life styles in "post-industrial" America. For non-majors.

50 Social Deviance (3). Deviations from group norms; crime, prostitution, alcoholism, mental illness. Prerequisite: 1. cor.

52 Perspectives in Sociology (3). Social writings of modern critics and observers examined for contributions to a theory of society.

120 Population and Ecology (3) (same as Rural Sociology 120).

127 Ethnic and Racial Minorities (3). The experience of ethnic and racial minorities in America; inequality, assimilation, ethnic and racial conflict, accommodation. Prerequisite: 1. cor.

150 The Amish Community (3) (same as Rural Sociology 150).

154 Power in America (3). The structure of power in American society—who has the wealth, who benefits from government, the role of elections, the dynamics of political change.

160 Social Bases of War and Peace (3) (same as Peace Studies 160). Social conditions associated with and preceding war and peace; war as a social institution; international images and stereotypes; proposals for preventing war and reducing international hostilities. Prerequisite: 1.

170 Sociological Aspects of Poverty (3) (same as Rural Sociology 170). Social characteristics of poverty as reflected in rural and urban settings. Analyzes causes and consequences of poverty, and attempts to alleviate this problem. Prerequisite: 1 or Rural Sociology 1 or instructor's consent.

180 Social Research I (3) (same as Rural Sociology 180). Theoretical and logical procedures in research; assumptions, abstractions, conceptualization, analysis, synthesis, classification, hypotheses, causes-effect, definitions, measurement theory, effects of social change on theory.

181 Social Research II (3) (same as Rural Sociology 181).

182 Senior Seminar (3) (same as Rural Sociology 182). For senior majors. Integrates perspectives, methods, substantive foci of undergraduate courses. Emphasizes analysis of sociology as a discipline, opportunities for graduate study including process of applying to graduate schools. Recommended for preprofessionals. Prerequisite: senior sociology majors only.

184 Social Impact Analysis (3) (same as Rural Sociology 184).

185 Contemporary Social Problems (3) (same as Rural Sociology 185). cor.

198 Honors in Sociology (3). Extensive work in a selected field, including reading and special investigation, for Honors candidates.

199 Honors in Sociology (3). Continuation of 198.

200 Social Inequality (3). Introduction to literature of social stratification. Emphasis on stratification as related to behavioral, institutional and psychological phenomena; social mobility; power and authority. Prerequisite: 1 or instructor's consent.

201 Organization and Leadership in Modern Society (3) (same as Rural Sociology 201).

210 Public Opinion and Communication (3). Nature of public opinion; processes of opinion formation; special publics, pressure groups; effects of communication through personal contacts and mass media; propaganda, censorship; opinion surveying.

211 Criminology (3). Sociology of law; constitutional, psychological, sociological theories of criminal behavior; process of criminal justice; treatment of corrections; control of crime.

212 Contemporary Corrections (3). Development of concepts of punishment, treatment. Contemporary penal and correctional institutions; problems of custody, classification, education, industry and treatment program; probation, parole. Prerequisite: 211 or instructor's consent.

214 The Family (3) (same as Rural Sociology 214). Family as agency of personality development, cultural transmission. Socialization process examined; family related in structure and function to wider forms of social organization. Prerequisite: 1. cor.

215 Collective Behavior (3) (same as Peace Studies 215). Analysis of mass behavior and related phenomena. Includes types, organization of social movements; crowd behavior, social epidemics; fashions, fads; leadership authority

216 Urban Sociology (3). Urbanism as world phenomenon; ecological, demographic characteristics of cities; organization of urban society including status systems, occupational structure, formal and informal associations, racial and cultural relations, forms of communications; housing, city planning.

217 The Sociology of Work and Leisure (3). Orientations toward work and differences in the use of leisure time. Includes analysis of sports, play, games and their relationship to both work and economic and social structures. Prerequisite: 1.

219 Organization and Institutions (3). Patterns of social organization in modern societies; interrelation of social institutions; formation and change of institutions; problems of an organizational society. Prerequisite: 1.

225 Social Processes of Communication and Diffusion (3) (same as Rural Sociology 225).

252 Occupations and Professions (3). Analysis of occupational, professional aspects of American society. Division of labor; occupational mobility; work and the self; collegueship and informal organizations of work. Prerequisite: 1.

255 Youth in Today's World (3) (same as Rural Sociology 255).

260 Social Psychology (3) (same as Psychology 260).

262 Sociology of Age and Sex Roles (3). Influence of age and sex on behavior and attitudes. Includes labor force participation, urbanization and interpersonal relations influenced by age and sex roles. Prerequisite: 1 or instructor's consent.

270 The Sociology of Religion (3) (same as Rural Sociology 270).

290 Practicum (cr. arr.) (same as Rural Sociology 290).

298 The Rise of American Sociology (3). Historical survey of significant 19th- and early 20th-century developments in American sociology; emphasis on emergence of sociology in American university. Prerequisite: 12 hours sociology.

299 Recent Theories in Sociology (3) (same as Rural Sociology 299). Introduction to major theoretical positions and issues in contemporary American sociology. Primary attention directed to logical and intellectual structure of major theoretical schools: functionalism, conflict, exchange, symbolic interaction, phenomenological-ethnomethodological theories. Prerequisite: 12 hours sociology.

301 Topics in Sociology (cr. arr.) Organized study of selected topics. Subjects and earnable credit vary from semester to semester. May be repeated with departmental consent. Prerequisites: junior standing & instructor's consent.

302 Sociology of Science (3). Reciprocal relations between science and society. Differential effects of setting on scientific work and communication. Social process of scientific discovery. For graduate and undergraduate Honors credit. Prerequisite: 6 hours sociology or instructor's consent.

304 Human Ecology (3) (same as Rural Sociology 304).

305 Dynamics of Population (3). General demographic theories; age, sex and ethnic composition of population; fertility, mortality and migration as components of population change; social, economic and political implications of demographic trends. Prerequisites: 1 & junior standing.

310 Rural Social Organization (3) (same as Rural Sociology 310).

311 Applied Sociology (3) (same as Rural Sociology 311). Survey of past, present, future interactions between sociology as a discipline and planned social change. Goal: Development of analytical skills for diagnosis of social problems and formation, implementation, evaluation of public policy. Prerequisites: 1, 185, 219.

318 Industrial Sociology (3). Industrialization and characteristics of industrial societies. Formal, informal groups within an industrial plant; stratification, mobility; factors in cooperation, conflict. Prerequisite: 1.

322 Aging in American Society (3). Examination of the aged in modern society; demographic, social, psychological and comparative cultural features of this social role. Prerequisites: junior standing & 1 or equivalent. cor.

323 Death and Dying (3). Death and dying explored from demographic, sociological and social psychological perspectives. Topics: trends and differentials; definitions of death; dying as a social process; funerals and survivors; cultural solutions to problem of death. Prerequisite: instructor's consent.

324 Sociological Concepts and Health (3). Examination of sociological concepts and data as related to health field; introductory analysis of field of medical sociology. Prerequisite: junior, senior, or graduate standing.

326 The Sociology of Sickness and Illness (3). Social processes of becoming sick, expectations attached to being sick, social responses to sickness; place of mental and physical sickness in support and change of social systems. Prerequisite: 324 or graduate standing.

- 333 Comparative Sociology (2-3).** Social systems of class and caste, minority groups and their interrelations, population trends and urbanization, institutional structures and functions, directed and undirected social change. May deal with Latin American, African, Asian or European cultures.
- 335 Social Change and Trends (3)** (same as Rural Sociology 335).
- 336 Social Movements and Conflicts (3).** Survey of approaches and research on social movements and social change. Historical and contemporary social movements in the U.S.; collective protest and violence; political revolutions. Prerequisite: 3 hours sociology.
- 337 Racial and Cultural Relations (3).** Interracial, intercultural relations in various societies. Attitudes, social tensions, forms of adjustment. Prerequisite: 1 or a course in anthropology.
- 339 The Black Americans (3).** Historical background of Blacks in America. Contemporary Black community in United States, its institutions, style of life, problems of intergroup relations. Prerequisite: 1.
- 340 Community Social Structure (3)** (same as Rural Sociology 340). Study of the nature and function of the community as a social system providing locality relevant functions. Prerequisite: 1 or Rural Sociology 1.
- 343 Advanced Social Psychology (3)** (same as Psychology 343).
- 344 Group Dynamics and Role Theory (3)** (same as Psychology 344).
- 347 The Sociology of Community Health (3)** (same as Family & Community Medicine 347, Rural Sociology 347).
- 350 Special Readings (cr. arr.)** Extensive reading in selected area or special field. Prerequisites: 12 hours sociology & departmental approval. cor.
- 353 Sociology of Education (3).** Structural and social psychology analyses of contemporary institutionalized educational patterns within the context of professional community and societal organization. Prerequisite: 1 or equivalent.
- 354 Political Sociology (3)** (same as Peace Studies 354). Social bases of power and politics, economic and political elites and their perpetuation, bases of power in the economy and politics, sources of political conflict and change.
- 369 Comparative Family Study (3).** The family studied in historical and cross-cultural perspective. Networks, kin extension and systems of family organization analyzed comparatively. Prerequisite: 214 or 6 hours sociology & instructor's consent.
- 371 Attitude Change (3)** (same as Psychology 371).
- 372 Professional Employees in Complex Organizations (3).** Designed for graduate students in professional programs with little background in sociology. Provides insight into the role of a professional within the context of a bureaucracy. f.
- 375 Social Statistics (3)** (same as Rural Sociology 375).
- 376 Advanced Social Statistics (3)** (same as Rural Sociology 376).
- 400 Problems (cr. arr.)** Directed research not leading to thesis or dissertation. Prerequisites: 12 hours sociology & departmental approval.
- 402 Social Stratification (3).** Theories, character of status systems; comparative analysis of class, caste in different societies; stratification and power; personality and social structure; social mobility. Prerequisite: 12 hours sociology or instructor's consent.
- 403 Professional Problems (2).** Problems of training, employment, professional organization, ethics of the academic professions. Required for assistant instructor.
- 405 Theories of Society (3).** Fundamental theoretical developments in modern sociology seen as empirical discipline. Required for M.A. students. Prerequisite: 8 hours sociology or instructor's consent.
- 406 Social Change and Problems in Underdeveloped Areas (3)** (same as South Asia Studies 406). Social, economic, demographic changes in major underdeveloped areas, principally Asia, Africa, Latin America, Middle East. Programs of planned social change.
- 409 Social Organization (3).** Concepts and theories used in analyzing social structures and processes. Required of M.A. students. Prerequisite: graduate standing or instructor's consent.
- 411 Seminar in the Professions (2).** Institutionalization, structure, function of major professions in America. Relation of professions to other segments of society. Prerequisite: 1.
- 414 Seminar in Urbanism (2-3).** Prerequisite: instructor's consent.
- 415 Seminar in Family Organization (2).** Characteristics of the family as a unit of social organization. Kinship, kindred and family interaction. Prerequisite: 12 hours sociology.
- 420 Independent Readings in Preparation for the Comprehensive Examination for the Ph.D. (1-8).** Independent readings for Ph.D. comprehensives. Open only to Ph.D. candidates who have completed all but their final semester of course work. Prerequisite: major adviser's consent.
- 421 Seminar in Population (2).** Population problems in underdeveloped areas. Readings, reports on demographic trends in various parts of world; economic, social implications.
- 422 Human Migration (2)** (same as Rural Sociology 422).
- 423 Demographic Methods (2).** Census methods, vital registration, measures of fertility, measures of mortality, measures of migration, measures of composition, life tables, estimates and projections. Prerequisite: 220 or 305.
- 425 Communication and the Diffusion of Information (3)** (same as Rural Sociology 425).
- 426 Studies in Comparative World Population (2)** (same as Rural Sociology 426).
- 428 Seminar on Race Relations (3).**
- 429 Seminar in Criminology and Deviant Behavior (3).** Survey of empirical research and sociological theory in criminology and deviant behavior. May be repeated once with instructor's consent. Prerequisites: 211 & graduate standing or instructor's consent.
- 430 Techniques of Social Investigation (3)** (same as Rural Sociology 430).
- 431 Advanced Field and Laboratory Research (3).** Analytical study of methods applicable to sociological data. Critical examination of measurement methods employed in recent researches. Required for Ph.D. candidates. Prerequisite: 430.
- 432 Research Methods in Sociological Theory Construction and Verification (3)** (same as Rural Sociology 432).
- 433 Seminar in Social Psychology I (3)** (same as Psychology 433).
- 434 Seminar in Social Psychology II (3)** (same as Psychology 434).
- 435 Structure of Interpersonal Behavior (3)** (same as Psychology 435).
- 438 Sociological Theory I (3).** Traces development of objectivity in sociological theory out of political, social, moral philosophy from pre-Socratic Greeks through 19th century. Required for Ph.D. candidates. Prerequisite: 12 hours sociology or equivalent training.

439 Sociological Theory II (3). Theoretical developments in sociology in Europe and United States since 1900. Recent formulations, controversies. Required of Ph.D. candidates. Prerequisite: 438 or equivalent training.

440 Seminar in Contemporary Sociological Theory (3). Critical evaluation of selected points of view in current sociological theory. Prerequisite: either 405, 438, or 439.

441 Seminar in Historical Sociology (2). Historical sociology considered as a sub-discipline. Systematic analysis of writings in the field, centering on Max Weber.

450 Research (2-3). Research not expected to terminate in thesis or dissertation. Prerequisite: instructor's written consent.

451 The Social Structure of Health Care (3). Organizational bases of health care agencies; recruitment, socialization, professionalization, structure of health occupations. Comparison of bureaucratic and professional models; continuity crises and charisma; occupational autonomy, functional interdependence. Prerequisite: graduate standing or instructor's consent.

454 Social Epidemiology (3). Through use of demographic and ecological orientation, course examines social determinants and consequences of health, illness, disease as nonrandomly distributed phenomena in various populations. Prerequisite: graduate standing in sociology or instructor's consent.

456 Current Sociological Issues in Health Care Delivery (3). Analysis of current issues in health care delivery and organization; application of sociological theory to real world problems in health care. Prerequisite: graduate standing in sociology or instructor's consent.

458 Practicum in Health Care Research (1-18). Practice experiences in the application of sociology to teaching, research, planning in health field. Required for doctoral preparation in medical sociology. Prerequisites: admission to medical sociology doctoral program & instructor's consent.

461 Seminar in Bureaucratic Organization (3). Bureaucratic organization and special interest groups with special reference to their structural characteristics and their functional relations to the larger urban social system.

468 Seminar in Social Gerontology (2). Continuation of the study of social gerontological problems, literature and research methodologies. Prerequisite: 322 or instructor's consent.

470 Social Interaction Research (3) (same as Psychology 470).

490 Research (cr. arr.) Advanced work leading to thesis or dissertation.

491 Seminar in Social Prediction (2) (same as Rural Sociology 491). Basic theory and methods in sociology. Prerequisite: 12 hours social science or senior standing.

South Asia Studies

1 Elementary Hindi-Urdu I (5). Oral-aural and structural approach. Devangari script. f.

2 Elementary Hindi-Urdu II (5). Continuation of 1. w.

101 Survey of Classical and Folk Literature of South Asia (3). Selections from folk and classical writings (in translation), with emphasis on cultural context.

102 Survey of Modern South Asian Literature (3). Intensive examination of modern South Asian literature (in translation), with emphasis on the intricacies of various South Asian societies to the literature they produced. w.

103 Hindi Readings I (4). Continued conversation and composition reading from modern Hindi literature, newspapers, speeches of Indian political leaders. f.

104 Hindi Readings II (4). Continuation of 103. w.

110 Civilization of India (3) (same as Anthropology 110, History 110).

181 Asian Civilizations (3) (same as History 181, Political Science 181).

203 Advanced Hindi Readings I (4). Directed readings in the literature of the student's area of concentration, and advanced conversation. f.

204 Advanced Hindi Readings II (4). Continuation of 203. w.

211 Elementary Sanskrit I (5) (same as Classical Studies 211). Forms, grammar, syntax, Devanagari script, readings. Prerequisite: knowledge of an Indo-European foreign language or instructor's consent.

212 Elementary Sanskrit II (5) (same as Classical Studies 212). Forms, grammar, syntax; readings from original Sanskrit classics. Prerequisite: 211 or equivalent.

301 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated with departmental consent.

308 Comparative Social Policy (2-3) (same as Social Work 308).

311 Intermediate Sanskrit I (3). Intensive study of forms, grammar, syntax; introduction to Panini's *Astadyayi*; practice in composition; selected readings from Vedic and classical literature. Prerequisites: 211 & 212 or instructor's consent.

328 Bibliography and Reference in South Asia (3). Systematic study of bibliographies and other aids to knowledge-building in South Asian studies. Development of critical judgment in evaluating bibliographical/reference sources and skills in bibliographic compilation. Maximizes use of the Library.

350 Special Readings in South Asian Languages (1-6). Individual advanced study of desired South Asian language. Prerequisite: two years of South Asian languages.

360 Asian Philosophy (3) (same as Philosophy 360).

362 Philosophy of India (3) (same as Philosophy 362).

364 Contemporary Indian Philosophy (3) (same as Philosophy 364).

371 Rimlands of Asia (3) (same as Geography 371).

372 Geography of South Asia (3) (same as Geography 372).

373 The Political Cultures of South Asia (3) (same as Political Science 373).

374 Contemporary South Asian Political Systems (3) (same as Political Science 374).

384 Religion and Politics in Modern India, 1857-1947 (3) (same as History 384).

400 Problems (3) (same as History 400).

403 Readings in South Asian History (1-6) (same as History 403).

404 Seminar in South Asian History (1-12) (same as History 404).

406 Social Change and Problems in Underdeveloped Areas (3) (same as Sociology 406).

459 Problems in Comparative Politics (3) (same as Political Science 459).

472 Studies in the Geography of Asia (2) (same as Geography 472).

474 Problems of South Asia (3) (same as Political Science 474).

Spanish (See Romance Languages)

Special Education

- L50 Freshman Readings in Special Education (1).** Introduction to special education through small discussion groups that read and review books relating to lives of exceptional children. Prerequisite: departmental consent.
- L51 Freshman Practicum in Special Education (1-2).** Freshman practicum experience as teacher's aide in a special education setting. Prerequisite: departmental consent.
- L101 Survey of Special Education (2).** Historical orientation, prevalence of problems, current concepts, and educational programming in special education. Prerequisite: Education S75 or instructor's consent. cor.
- L150 Special Readings (1-3).** Directed study of literature and research reports in special education.
- L199 Student Teaching in Special Education (cr. arr.)** Hours, credit must be arranged before registration. Application should be made in term preceding registration. Prerequisite: curriculum course in area of specialization.
- L321 Introduction to Mental Retardation (3).** Overview of field of mental retardation through study of certain historical developments, concepts, problems, issues, definitions and nomenclature basic to its understanding. Prerequisites: L101 & Educational Psychology A102; or L339.
- L323 Curriculum for Severely and Trainable Mentally Retarded (3).** Practices, problems in curriculum development for trainable and severely mentally retarded children and youth; identification of needs, goals; content determination; material and classroom organization; instructional methods. Prerequisites: L321 & L339.
- L330 Teaching the Mentally Retarded (2).** Study of learning characteristics, evaluation, teaching techniques, and methods and curriculum adaptations for mentally retarded. Prerequisite: Educational Psychology A102.
- L331 Reading and Writing Braille I (3).**
- L332 Reading and Writing Braille II (3).**
- L334 Introduction to Education of the Crippled and Health Impaired (3).** An overview of crippled and health impaired youth through a study of historical developments, concepts, problems, issues, causes, definitions, nomenclature basic to its understanding. Prerequisites: L101 & Educational Psychology A102.
- L336 Education of the Multi-Handicapped (2).** Study of the many problems associated with the education of multi-handicapped children and youth, with specific attention directed to needs of the cerebral palsied. Prerequisites: L334 & L339.
- L338 Introduction to Education of the Gifted (2).** Consideration of identification, creativity, educational planning and methods of teaching gifted pupils. Prerequisite: Educational Psychology A102.
- L339 Education of Exceptional Children (3).** Prerequisite: Educational Psychology A102.
- L342 Introduction to Learning Disabilities (3).** Overview of field of learning disabilities through study of certain historical developments, concepts, problems, issues, definitions and nomenclature basic to its understanding. Prerequisites: L101, L339 & Educational Psychology A102.
- L351 Introduction to Education of Behaviorally Disordered Children (3).** Provides overview of field of education of emotionally disturbed children/youth through study of certain historical developments, concepts, problems, issues, definitions, nomenclature basic to its understanding. Prerequisite: L339 or Educational Psychology A102.
- L353 Educational and Behavioral Intervention Procedures in Special Education (2-3).** Acquaints students with historical background, developments, concepts, definitions, terminology and techniques of educational and behavioral intervention; practical application of these procedures. Prerequisite: Educational Psychology A102.
- L360 Topics in Special Education (cr. arr.)** In-depth study of certain developments, findings, trends and issues in one or more areas of special education. Prerequisite: Educational Psychology A102.
- L361 Psychoeducational Assessment of Exceptional Children (2).** Observation procedures, skill inventories, philosophy, techniques employed in appraisal of exceptional children; structured observation, skill inventories, standardized tests, formation of educational recommendations. Prerequisite: junior standing in Special Education.
- L362 Psychoeducational Assessment of Exceptional Children—Laboratory Experiences (2).** Structured experience in administration and interpretation of observation techniques and assessment instruments with the exceptional child. Prerequisite: L361 or concurrently.
- L363 Management of Behavior in the Interpersonal Relationships of Exceptional Children (2).** Acquaints student with psychosocial determinants of behavior and procedures for effective behavioral intervention in the education of exceptional children. Prerequisite: junior standing in Special Education.
- L364 Management of Behavior in the Interpersonal Relationships of Exceptional Children—Laboratory Experiences (2).** An opportunity to gain practical experiences in application of behavioral management and intervention procedures with exceptional children. Prerequisite: L363 or concurrently.
- L365 Instructional Programming for Exceptional Children (2).** Orientation to theoretical and pragmatic aspects of curriculum development and instructional programming with the exceptional child. Prerequisite: junior standing in Special Education.
- L366 Instructional Programming for Exceptional Children—Laboratory Experiences (2).** Simulated and actual experiences relative to curriculum development and instructional programming. Prerequisite: L365 or concurrently.
- L367 The Use of Instructional Materials with Exceptional Children (2).** Identification, development, evaluation of materials and media appropriate for instruction of exceptional children. Prerequisite: junior standing in Special Education.
- L368 The Use of Instructional Materials with Exceptional Children—Laboratory Experiences (2).** Exposure to materials and media in an instructional materials center and special education programs. Prerequisite: L367 or concurrently.
- L400 Problems in Special Education (cr. arr.)**
- L410 Seminar in Special Education (1-3).**
- L415 Practicum in Special Education Area of Handicapped (2-8).** Provides graduate practicum experience relevant to the education of exceptional children. Prerequisites: L339 & instructor's consent.
- L420 Trends and Issues in Special Education (3).** A study of the historical developments and related trends, issues and problems associated with the education of exceptional children. Prerequisites: admission to graduate study & instructor's consent.
- L421 Research with Exceptional Children (3).** Explores historical, significant and current research in special education. Emphasizes the application of research, methodology and findings relative to problems facing the practitioner. Prerequisites: admission to graduate study & instructor's consent.

L422 Assessment and Remediation of Learning Disabilities (3). Provides an in-depth study of the methods, materials and current research to identify psychological educational assessment and program planning for the disabled learner. Prerequisites: A303, admission to graduate study, & instructor's consent.

L423 Modules on Curriculum and Instruction for Exceptional Children (3). Emphasizes development of skills needed by educators who serve as consultants or resource persons in special education programs. Prerequisites: admission to graduate study & instructor's consent.

L424 Programmatic Approaches to the Education of Children with Behavioral Disorders (3). Course provides an in-depth study of the major educational treatment programs for behavior-disordered children. Prerequisites: admission to graduate study & instructor's consent.

L425 Psychological and Sociological Aspects of Mental Retardation (3). Explores basic psychological and sociological factors in mental retardation. Learning characteristics of the mentally retarded and mental retardation as a social problem. Prerequisites: admission to graduate study & instructor's consent.

L490 Research in Special Education (cr. arr.)

Speech & Dramatic Art

2 Voice and Articulation (2). Techniques for improving speaking voice; theories underlying techniques. Attention to student's articulation, pronunciation, voice quality, general expressiveness. f,w.

3 Television and Radio in Modern Society (2). Introduction to broadcasting; emphasis on role of television, radio in modern society. f,w.

4 Stage Movement for the Actor (2). Basic work in techniques that comprise movement training for the actor. Prerequisite: instructor's consent.

6 The Theatre in Society (2). Examines the role and scope of the theatre in the modern world community. f,w.

20 Principles of Technical Theatre Production (2). Theory and practice of executing theatrical designs for scenery, properties, lighting, costumes, etc., stressing terminology and philosophy.

22 Introduction to Speech Pathology-Audiology (1). Types of speech, language, hearing disorders; preparation of speech pathologists, audiologists; professional settings, requirements, ethics.

43 Stage Makeup (1). Character analysis, facial anatomy, color for stage and television makeup. Practice in application. f,w.

60 Principles of Script Analysis (2). Methodologies of script analysis for theatrical purposes.

75 Introduction to Speech Communication (3). Principles, process of speech communication in conversational, small group, public speaking situations. One large assembly, two small task-oriented group meetings per week.

105 Principles of Radio and Television (2). Beginning radio, television speaking in varied types of programs. Prerequisite: 3 or instructor's consent. f,w.

106 Elementary Radio and Television Production (3). Elementary principles, practices of broadcast production in varied program formats. Prerequisite: 105 or equivalent. f,w.

110 Great Speakers (2). Analysis of masterpieces of British, American oratory. Audience, occasion, speaker, subject. Prerequisite: sophomore standing. f,w.

120 Technical Theatre Practicum (1). Credit earned by serving on one major technical crew for a main stage production. Prerequisite: 20. f,w,s.

141 Nonverbal Communication (3). Analysis of form and content of nonverbal communication. Emphasis on role of nonverbal cues in interpersonal communication. Prerequisite: 75.

143 Acting for Non-Majors (3). Basic theory and practice of acting for the non-theatre major.

161 Interpersonal Communication (3). Principles of interpersonal speech communication in development of societal, educational and vocational relationships. Prerequisite: 75.

171 Group Communication (3) (same as Peace Studies 171). Procedures and techniques of interpersonal communication in small groups.

172 Collegiate Debate (1). Procedures, practice in collegiate debating leading to intercollegiate debates. Prerequisite: 7 or instructor's consent. f,w.

173 Argument and Advocacy (3). Principles of argument, strategies in advocacy, evidence, fallacies; designed for pre-law students.

196-197 Honors in Speech (2); (2). Special work for Honors candidates in speech. f,w.

220 Technical Theatre Practicum (1). Credit earned by serving as an assistant crew chief for one major technical crew for a main stage production. Prerequisite: 120. f,w,s.

222 Communicative Disorders in the Classroom (3). Not open to speech pathology-audiology majors. Survey of defects of speech, remedial approaches to elementary, secondary, special classrooms. Emphasis on articulatory disorders.

233 Oral Interpretation of Literature (3). Analysis, oral reading of prose, poetry, drama. Planned to meet needs of prospective teachers of English or speech or those interested in public speaking, theatre, broadcasting. Conferences, classroom presentation. f,w.

243 Acting I (3). Basic theory, practice of acting, stage movement. f,w.

244 Acting II (3). Play analysis for the actor. Theories of characterization. Individual and group rehearsal, performance. Prerequisite: 243 or instructor's consent. f,w.

252 Stagecraft (3). Fundamentals of properties and scenic construction, decoration and lighting.

253 Production Design (4). Survey of the theory and practice of theatrical design of scenery, costumes, properties and lighting. Prerequisite: 252.

272 Principles of Debate (3). Principles of advocacy, practice in propositional analysis, briefing, use of evidence in debate, preparation and delivery of debates. Prerequisite: 75 or instructor's consent. f,w.

273 Communication in Campaigns (3). Study of role and impact of communication in political and marketing campaigns; historical and contemporary study of influence by communication; case studies and practicum.

276 Persuasive Speaking (3). Principles, techniques of persuasive speaking. Prerequisite: 75 or instructor's consent. f,w.

283 Contemporary American Speakers (3). Criticism and analysis of speakers and speeches from 1950 to present. Emphasis on contemporary issues. Prerequisite: sophomore standing. w.

301 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. May be repeated with departmental consent. Prerequisites: junior standing & instructor's consent.

304 Radio and Television Programming (3). Role of broadcasting in society; audience analysis, research, methodology as indices to effective programming. Prerequisite: 105 or instructor's consent. w.

305 Basic Television Techniques (3). Various types of television program production; studio practice. Prerequisites: 106 or equivalent & instructor's consent. f.

- 306 Advanced Television Direction (3).** Application of principles to advanced television production, direction. Prerequisites: 305 & instructor's consent. w.
- 307 Broadcast Regulation and Responsibility (3).** Federal, state regulations affecting programming, operating policies of American broadcast stations; administrative authority of Federal Communications Commission; responsibility of broadcast license. Prerequisite: instructor's consent. w.
- 309 Film Production (3).** Writing, filming, editing motion pictures. Prerequisites: 105 & instructor's consent. f,w,s.
- 310 Documentary Film (3).** Directed readings; viewing of representative films, criticism, discussion of documentary film movement. Prerequisite: instructor's consent.
- 311 American Phonetics (3)** (same as Linguistics 310). Analysis of sounds of Midwestern American dialect. Standards of pronunciation, feature analysis, transcription, articulatory mechanics in assimilation, coarticulation.
- 312 Psychosocial Aspects of Speech (3)** (same as Linguistics 312). Applications of learning theory to speech acquisition; functions of speech in social behavior. Prerequisites: 2 & Psychology 1 or Psychology 2 or equivalent.
- 313 The Development of Spoken Language (2).** Acquisition of oral language by preschool child; attention to developmental stages. Prerequisite: 222 or 322.
- 315 Beginning Playwriting (3)** (same as English 315).
- 320 Theatre Practicum (1-3).** Credit earned in advanced juried projects in acting, directing and theatrical design. Prerequisite: instructor's consent. f,w.
- 321 Speech Science (3)** (same as Linguistics 321). Introduction to anatomical, functional aspects of speech mechanism. Prerequisite: 2.
- 322 Speech Pathology (3).** Systematic survey of disorders of speech, hearing, language; emphasis on articulatory problems. Lectures, case presentations, demonstrations, readings. w.
- 323 Speech Therapy I (3).** Survey of therapeutic methods and materials in speech pathology. Prerequisite: 322 or equivalent. f.
- 324 Speech Therapy II (3).** Survey of diagnostic procedures in speech pathology. Prerequisite: 322 or equivalent. w.
- 326 Audiology (3).** Mechanism, functioning of hearing. Speech measurement, sound perception. w.
- 327 Clinical Practice I (2).** Application, in clinical practice, of remedial techniques for speech, hearing, language disorders. Prerequisite: 322. f.
- 328 Clinical Practice II (2).** Additional clinical practice. Prerequisite: 322. w.
- 329 Aural Rehabilitation (3).** Principles of training those with hearing impairment to comprehend speech through residual hearing or visual cues. Prerequisite: 326. f.
- 340 Summer Repertory Theatre (cr. arr.)** Seminar, participation, laboratory in Summer Repertory Theatre. May be repeated. Prerequisite: instructor's consent. s.
- 341 Development of American Theatre I (3).** Development of the American theatre from the beginning to 1915. Prerequisite: upper division or graduate standing.
- 342 Development of American Theatre II (3).** Development of American theatre from 1915 to the present. Prerequisite: upper division or graduate standing.
- 345 Creative Dramatics for Children (3).** Principles, methods in creating informal drama with children. Development of creative thinking and expression through pantomime, dialogue, other aspects of dramatics. Prerequisite: 243 or instructor's consent.
- 347 Acting III (3).** Acting styles, period, modern. Special projects in interpretation, rehearsal, creation of roles. Prerequisite: 244 or instructor's consent.
- 350 Directed Reading (1-3).** Independent reading, reports. Prerequisite: instructor's consent.
- 351 Theatre Organization and Management (3).** Practical and theoretical procedures of various types of theatre organization: personnel, play selection, stage and house management, public relations, publicity, box office procedures, budgets and business practices.
- 352 Scenic Design (3).** Theory and practice of scenic design for the theatre, with particular attention to design theory and rendering. Prerequisite: 253.
- 353 Advanced Theatrical Costume Design (3).** Theory and practice of costume design for the theatre. Prerequisite: 253.
- 354 Stage Lighting Design (3).** Theory and practice of lighting for theatre production. Prerequisite: 253.
- 361 Theatrical Directing (4).** Theory and practice of directing in the theatre, covering script selection, casting, play analysis, blocking and rehearsal procedures. Prerequisite: 60. f,w.
- 362 Advanced Directing (3).** Advanced principles of theatrical directing; emphasizes stylistic variations. May be repeated once. Prerequisite: 361. w.
- 363 Development of Dramatic Art I (3).** Comparative study of major dramas and their production from the Greeks to 1875.
- 364 Development of Dramatic Art II (3).** Comparative study of major dramas and their production from 1875 to present.
- 366 Children's Theatre (3).** History, principles, purposes of children's theatre. Selection, casting, direction, production of plays for children. Prerequisite: 361 or instructor's consent.
- 367 Theatre History I (3).** Development of theatre, dramatic literature from classical Greek to Restoration. f.
- 368 Theatre History II (3).** Major dramatic movements from Restoration to present. w.
- 369 Senior Seminar in Theatre (3).** Survey of the theatre profession—commercial, educational and avocational—including the professional organizations and resources. Prerequisite: senior standing.
- 374 Persuasion (3).** Studies persuasive process, attitude formation, modification. Prerequisite: 276.
- 376 Communication in Organizations (3).** Theories of communication systems and processes in organizational structures; study of communication behavior in formal and informal organizational settings. Prerequisite: 171 or instructor's consent.
- 381 Principles of Rhetoric (3).** Development of rhetoric from time of Corax with emphasis on Aristotle; derivation, application of standards for judging effectiveness in communication. Prerequisite: 75 or instructor's consent. f.
- 382 Process of Speech Communication (3).** Modern theories of persuasion; behavioral, experimental studies of speaker, subject, audience, occasion. Prerequisite: instructor's consent. f.
- 393 Writing for Radio, Television, Film (3).** Writing dramatic, non-dramatic programs for broadcast purposes. Prerequisites: 304 & instructor's consent. f.
- 400 Problems (cr. arr.)** Individual study not leading to thesis or dissertation. Prerequisite: instructor's consent.
- 401 Topics (cr. arr.)** Study of selected topics in Speech and Dramatic Art. Topic and credit may vary from semester to semester. Repeatable upon consent of department. Prerequisite: instructor's consent.

- 402 Theories of Speech Communication (3).** Quantitative methods of speech research; studies of speaker, subject, audience, occasion. Prerequisite: 382, 441, or instructor's consent. w.
- 403 Seminar in Speech Communication (3).** Directed research on selected topics concerning theories of speech communication. May be repeated. Prerequisite: instructor's consent. w.
- 404 History and Criticism of Broadcasting (3).** Cultural, technical development of broadcasting with emphasis on responsible criticism. Prerequisite: instructor's consent. w.
- 405 Seminar in Film Theory (3).** Directed readings, research in significant theories of film; study of film as social, political, artistic force. Prerequisite: instructor's consent. f,s.
- 406 International Broadcasting (3).** Comparative systems of broadcasting; influence, purposes of international propagandistic broadcasting; importance of international networks and satellite communication. Prerequisite: instructor's consent. w.
- 407 Educational Television (3).** Studies research, application, methods of transmission, administration, equipment; program preparation, production, utilization.
- 408 Seminar in Broadcasting (1-6).** Research in broadcasting. Prerequisites: 9 hours broadcasting courses or equivalent & instructor's consent.
- 410 Studies in Broadcasting (1-6).** Directed readings in current philosophical, historical, social, political, economic aspects of broadcasting. Prerequisite: instructor's consent.
- 411 Acoustic Phonetics (3)** (same as Linguistics 411). Research methodologies in analysis of acoustic features underlying speech, language processes. Prerequisite: 311 or equivalent.
- 412 Physiological Phonetics (3)** (same as Linguistics 412). Research methodologies in analysis of physiological features underlying speech, language processes. Prerequisite: 321 or equivalent.
- 413 Laboratory Instrumentation in Speech Pathology and Audiology (3).** Theory, practice in use of instruments for evaluation of normal/abnormal voice, articulation. Fundamentals of experimental design. Prerequisite: 321, 324, or equivalent.
- 420 Developmental Linguistic Disorders (3).** Disorders of oral language; linguistic retardation, acquired aphasia. Prerequisite: 313, 321, 324; or instructor's consent. w.
- 421 Acquired Linguistic Disorders (3).** Nature, etiology, management of dysphasias. Prerequisite: 420, B.A. major.
- 422 Disorders of Oral Communication I (3).** Studies in causes, symptoms of disorders of speech, language; review of current theories, recent experimental work. Prerequisite: 322 or equivalent. f.
- 423 Disorders of Oral Communication II (3).** Diagnostic principles, practices of analysis, therapy for neurologically or structurally based disorders of speech, language. Prerequisite: 323 or 324 or instructor's consent. w.
- 424 Studies in Speech Disorders (2).** Directed reading in current theories; class discussions of recent publications; special lectures. May be repeated. Prerequisite: 422 or equivalent.
- 425 Pathology of Hearing (3).** Various pathologies of the ear that cause hearing losses. Emphasizes audiological considerations of each disorder. Prerequisite: 326 or equivalent. w.
- 426 Studies in Hearing (2).** Directed reading in current theories; class discussions of recent publications in audiology, related fields. May repeat to 6 hours maximum. Prerequisite: 326 or equivalent. f,s.
- 427 Clinical Practice III (2).** Supervised clinical practice in centers participating in graduate training program in speech pathology-audiology. Prerequisite: 327 or 328 or equivalent. May repeat to 4 hours maximum. f.
- 428 Clinical Practice IV (2).** Continuation of clinical practice. Prerequisite: 327 or 328 or equivalent. May repeat to 4 hours maximum. w.
- 429 Advanced Audiology (3).** Advanced pure tone and speech audiometry; special tests, exploratory techniques; principles, procedures for hearing aid selection. Prerequisite: 326 or equivalent. w.
- 441 Introduction to Graduate Study (3).** Introduction to research methods in speech; research problems. f.
- 450 Research (cr. arr.)** Independent research of advanced nature leading to report. Prerequisite: instructor's consent.
- 451 Seminar in Speech Education (3).** Directed research on selected problems in instruction and research methods in the field of speech. Prerequisite: instructor's consent. May be repeated. w,s.
- 460 Seminar in Theatre History (3).** Selected problems in theatre history. May be repeated.
- 462 Backgrounds of Modern Theatre Practice (3).** Survey of outstanding contemporary theatricians, their aesthetics and practice. Emphasis on European theatre since 1875.
- 463 Studies in Dramatic Theory (3).** Examination of past and present dramatic theories and their relevance to contemporary theatre production. Prerequisite: graduate standing. f.
- 464 Studies in Dramatic Criticism (3).** Historical survey of methods of criticism of scripts and performance. Prerequisite: graduate standing. w.
- 466 Seminar in Dramatic Theory and Criticism (3).** Directed research on selected topics in dramatic theory and criticism. Prerequisite: instructor's consent.
- 481 Rhetoric and Public Address in Early America (3).** Readings in the origins of American rhetorical traditions; the rhetoric of controversy in public affairs in 18th and 19th centuries. f.
- 482 Rhetoric and Public Address in Modern America (3).** Readings in the rhetoric of controversy in American public affairs in 20th century; studies of leading spokesmen. w.
- 483 Seminar in American Rhetoric and Public Address (1-6).** Directed research on selected topics in American rhetoric and public address. Prerequisite: instructor's consent. w.
- 485 Rhetorical Criticism (3).** Principles, practice of rhetorical theory from 16th century to present. Prerequisite: 381 or instructor's consent. f.
- 486 Seminar in Theories of Rhetoric and Criticism (1-6).** Directed research on selected topics in rhetorical theory and criticism. Prerequisite: instructor's consent. f,s.
- 487 Philosophic Foundations of Speech (3).** Examines, evaluates research and trends in theories, practices in representative areas of speech. w.
- 488 Rhetoric of British Thought (3).** Rhetorical approach of British speakers from Pitt to Churchill to such issues as revolution and war, freedom of speech and assembly, lifting of religious restrictions, reform of parliament. w.
- 489 Seminar in British Rhetoric and Public Address (1-6).** Directed research on selected topics in British rhetoric and public address. Prerequisite: instructor's consent. f,w.
- 490 Research (cr. arr.)** Research leading to thesis or dissertation. Prerequisite: instructor's consent.

For teaching of Speech, see Curriculum and Instruction D113.

For Instructional Television and other Audio-Visual Media, see Curriculum and Instruction, Media Education.

Speech and Hearing Clinic. UMC students and residents of Missouri may be admitted to the Speech and Hearing Clinic when facilities permit. Those requesting assistance must comply with regulations governing the Clinic.

Statistics

31 Elementary Statistics (3). Collection, presentation of data; averages; dispersion; introduction to statistical inference, regression and correlation. Prerequisite: Math 10. f,w,s. cor.

150 Introduction to Probability and Statistics I (3). Designed primarily for students in College of Business & Public Administration. Prerequisite: for 250. Probability theory; random variables; expectation; probability distributions; descriptive statistics; sampling distributions. Prerequisite: Math 61. f, w.

198-199 Honors (2 hrs. each). Special work for Honors candidates in Statistics.

207 Statistical Analysis (3). For graduate students and superior seniors with no previous training in statistics. Intensive study of concepts, techniques of statistical analysis, and their applications. Prerequisite: Math 10 or equivalent. f,w.

234 Intermediate Statistics (3). Probability concepts; elements of sampling; tests of hypotheses; methods of estimation; regression and correlation. Prerequisite: 31. f,w,s.

234A Computing Laboratory (1). Relates computer concepts to statistical concepts and techniques discussed in 234. Prior knowledge of computer concepts not required. Prerequisite: concurrent enrollment in appropriate section of 234. f,w.

250 Introduction to Probability and Statistics II (3). Continuation of 150. Estimation; hypothesis testing; regression; correlation; statistical decision theory; non-parametric methods. Prerequisite: 150. f,w.

300 Problems (1-3). Independent investigations. Reports on approved topics. Prerequisite: consent of faculty member involved. f,w,s.

301 Topics (cr. arr.) Organized study of selected topics. Subjects and earnable credit may vary from semester to semester. Repeatable with departmental consent. Prerequisite: junior standing and instructor's consent.

307 Nonparametric Statistical Methods (3). Statistical methods when the functional form of the population is unknown. Applications emphasized. Comparisons with parametric procedures. Goodness-of-fit, chi-square, comparison of several populations, measures of correlation. Prerequisite: 207 or 234 or equivalent.

320 Introduction to Mathematical Statistics (3) (same as Mathematics 320). Introduction to theory or probability and statistics using concepts and methods of calculus. Prerequisite: Math 201 or instructor's consent. f,w,s.

325 Introduction to Probability Theory (3) (same as Mathematics 325). Probability spaces; random variables and their distributions; repeated trials; probability limit theorems. Prerequisite: Math 201 or instructor's consent. f,w,s.

326 Statistical Inference I (3) (same as Mathematics 326). Sampling; point estimation; sampling distribution; tests of hypotheses; regression and linear hypotheses. Prerequisite: 325.

328 Introduction to Stochastic Processes (3). Study of random processes selected from: Markov chains, birth and death processes, random walks, Poisson processes, renewal theory, Brownian motion, Gaussian processes, white noise, spectral analysis, applications such as queueing theory, sequential tests. Prerequisite: 325.

329 Applied Probability (3). Probability in its applied context. Designed for seniors and beginning graduate students. Construction of probability models. Examples

in physical and behavioral sciences. Multivariate normal and exponential distributions, extreme value distributions, stochastic processes, queueing. Prerequisite: 325 or equivalent.

360 Industrial Statistics (3). Probability and statistical techniques as applied in controlling quality of manufactured products. Prerequisite: 207 or 234 or 250 or 320 or 326.

370 Sampling Techniques (3). Theory of probability sampling designs. Unrestricted random sampling. Stratified sampling. Cluster sampling. Multi-stage or sub-sampling. Ratio estimates. Regression estimates. Double sampling. Prerequisite: 207 or 234 or 250 or 320 or 326. w,s.

375 Operations Research (3). Study of mathematical and statistical models employed in operations research. Prerequisite: 207 or 234 or 250 or 320 or 326. f.

380 Statistical Forecasting (3) (same as Management 380, Marketing 380, Finance 380).

385 Regression and Correlation Analysis (3). Measurement of relationships among variables, including multiple regression, partial correlation, and some nonparametric methods. Prerequisites: 207 or 234 or 250 or 320 or 326 & Math 80. f,w.

395 Analysis of Variance (3). Problems of measuring separate and joint effects of two or more factors on results of an experiment. Prerequisite: 207 or 234 or 250 or 320 or 326. f,w.

400 Problems and Special Readings (cr. arr.) Approved reading and study, independent investigations and reports on approved topics. Prerequisites: graduate standing & consent of faculty member involved. f,w,s.

401 Probability Theory (3) (same as Mathematics 401). More sophisticated treatment of topics in 325. Introduction to probability integral; characteristic functions; probability limit theorems: Borel-Cantelli lemmas and strong law of large numbers. Prerequisite: Math 310 or Math 302 or instructor's consent. f.

403 Statistical Inference II (3). Multivariate distribution functions. Multivariate normal. Asymptotic methods. Asymptotic distributions of maximum likelihood estimators and chi-square goodness-of-fit statistic. Optimal statistical procedures. Statistical decision theory. Prerequisites: 326, Math 310 or Math 302, & Math 331.

406 Measure Theory (3) (same as Mathematics 406).

407 Design and Analysis of Research (3). Advanced treatment of methods and models associated with operations research. Prerequisites: 326, 375, & Math 331 or instructor's consent.

410 Probability Seminar (cr. arr.)

411 Statistics Seminar (cr. arr.)

416 Statistical Consulting (3). Participation in statistical consulting under faculty supervision. Formulation of statistical problems. Planning of surveys and experiments. Statistical computing. Data analysis. Interpretation of results in statistical practice. Prerequisites: 326; 464 or 385 & 395; instructor's consent.

423 Experimental Design (3). Examination and analysis of modern statistical techniques applicable to experimentation in social, physical, or biological sciences. Prerequisite: 395 or instructor's consent.

430 Life Testing and Reliability (3). Statistical failure models. Parametric procedures. Robustness considerations. Nonparametric life test procedures. Bayes methods in reliability. System reliability. Accelerated life testing. Prerequisite: 403 or instructor's consent.

440 Advanced Probability (3) (same as Mathematics 440). Measure theoretic probability theory. Characteristic functions; conditional probability and expectation; sums of independent random variables including strong law of large numbers and central limit problem. Prerequisites: 325 or 401, & 406; or instructor's consent.

441 Stochastic Processes (3) (same as Mathematics 441). Markov processes, martingales, orthogonal sequences, processes with independent and orthogonal increments, stationarity, linear prediction. Prerequisite: 440.

451 Special Topics in Probability (cr. arr.) Prerequisite: instructor's consent.

452 Special Topics in Statistics (cr. arr.) Prerequisite: instructor's consent.

460 Theory of Estimation (3). Methods of estimation and small and large sample optimality criteria. Least squares. Method of moments. Maximum likelihood. Completeness. Sufficiency. Unbiasedness. Bhattacharyya bounds. Admissible, Bayes, minimax, and sequential estimation, Empirical Bayes, etc. Prerequisite: 403.

461 Theory of Hypothesis Testing (3). Uniformly most powerful tests; unbiasedness; invariance; the general linear hypothesis; Bayes and minimax procedures; sequential tests. Prerequisite: 403.

464 Linear Models I (3). Elementary regression (curve fitting) and analysis of variance (crossed classification, blocking, analysis of covariance) applied to scientific examples. Various numerical examples provided. Prerequisites: calculus & a first course in statistical inference. f.

465 Linear Models II (3). Mathematically more mature study and application of the general linear model. Other related regression and analysis of variance models. Prerequisite: 464. Corequisites: 326, Math 302 or 310, Math 331. w.

466 Multivariate Analysis (3). Distribution of sample correlation coefficients. Derivation of generalized T^2 and Wishart distributions. Distribution of certain characteristic roots, vectors. Tests of hypotheses about covariance matrices and mean vectors. Discriminant analysis. Prerequisite: 403 or instructor's consent.

470 Theory of Nonparametric Statistics (3). Estimation, hypothesis testing, confidence intervals, etc., when functional form of the population distribution is unknown. Prerequisite: 403 or instructor's consent.

490 Research (cr. arr.)

Surgery

Surgery Clerkship. Two periods of time are allotted to the Department of Surgery during the junior and senior years. Although the required clerkship is completed during these two periods, additional surgical experience may be obtained during the student's elective and/or free time.

Junior Surgery (10). Students spend the entire time on General Surgery. Emphasis is placed upon surgical physiology and anatomy and upon the principles of diagnosis and treating common surgical disorders. Students are an integral part of the surgical team and participate in the preoperative examination and evaluation of the patients, assist in the surgical procedures and aid in the postoperative management. Teaching rounds are supplemented by lectures, seminars and conferences.

Senior Surgery (10). Students spend one week in the Emergency Department and then elect to spend three weeks on one of the surgical specialties of Cardio-Thoracic Surgery, Neurological Surgery, Orthopedic Surgery, Otolaryngology, Plastic Surgery or Urologic Surgery, and four weeks on another. The student assumes junior house officer responsibilities while on each service and is expected to function as a member of that surgical team. Clinical responsibilities are increased in proportion to the student's knowledge and ability. Lectures, seminars and conferences are held in addition to the teaching rounds.

Surgical Electives (10). Each of the surgical divisions offers electives in clinical and investigational surgery. These electives offer the student an opportunity to obtain an in-depth experience with very close supervision.

Postgraduate Instruction. Formal training programs are established in the following divisions of surgery: Orthopedic Surgery, 4 years; Ophthalmology, 3 years; General Surgery, 4 years; Neurosurgery, 4 years; Genito-Urinary Surgery, 4 years; Thoracic Surgery, 2 years; Otolaryngology, 3 years; and Plastic Surgery, 2 years.

Veterinary Anatomy-Physiology

200 Problems (cr. arr.) Assignment of problems for training in research.

202V Veterinary Anatomy (8). Correlative study of the anatomy of domestic and laboratory animals in which microscopic, developmental and gross anatomy are integrated. Attention given to medical nomenclature, connective tissues, muscular, respiratory and circulatory systems.

203V Veterinary Anatomy (10). Continuation of 202V. Particular attention given to the nervous, urogenital and digestive systems, endocrine glands, skin and its derivatives.

219 Elements of Veterinary Anatomy (3). For agriculture and other students desiring basic knowledge of anatomical terminology and the comparative functional anatomy (developmental, microscopic and gross) of domestic animals. Prerequisite: 5 hours biological sciences (zoology) or equivalent.

220V Veterinary Physiology (5). Physiology of muscle, nervous, circulatory, respiratory systems. Lecture, lab designed to emphasize principles important to practice of veterinary medicine.

221V Veterinary Physiology (6). Continuation of 220V. Digestion, excretion, endocrinology and reproduction.

222 Fundamentals of Animal Physiology (3). For students not enrolled in the professional Veterinary Medicine curriculum. Relationship of structure and function in the common domestic animals. Study of intercellular material, cells, tissues, organs and systems.

224V Veterinary Physiological Chemistry (5). Chemistry of carbohydrates, lipids, proteins, other physiologically important chemical systems. Basic intermediary metabolism with special attention to areas of importance to veterinary medicine.

226V Veterinary Pharmacology (3). General principles of pharmacology. Particular emphasis on pharmacodynamics.

227V Veterinary Pharmacology/Anesthesiology (3). Systemic study of drugs commonly employed in veterinary practice. Particular emphasis on pharmacotherapy, anesthetics and drugs affecting the central nervous system.

228V Veterinary Toxicology (3). Biological responses to foreign chemicals, especially those not discussed in nutrition and pharmacology. The principles and molecular basis of intoxication are presented.

300 Problems (cr. arr.) Assignment of special problems or topics for training in research.

303 Cytology, Histology and Microscopic Anatomy of Domestic Animals (5). Detailed study of cytology, histology and microscopic anatomy: an examination of organology of domestic animals through lecture and laboratory activities. Prerequisites: graduate standing, background in biological sciences, instructor's consent.

305 Histological and Anatomical Techniques (cr. arr.) Detailed study and practice of techniques used in preparation of specimens for microscopic and macroscopic study. Prerequisites: background in chemistry & anatomy; instructor's consent.

307 Embryology and Development of Domestic Animals (2). Developmental anatomy of domestic animals. Special written report and/or review required. Prerequisites: background in biological science & departmental consent.

311 Canine Dissection (6). Study of gross anatomy of the dog by lecture, dissection, discussion. Special written report and/or review required. Prerequisites: background in biological science & departmental consent.

312 Anatomy of Common Domestic Animals (5). Gross anatomy of horse, ox, sheep, pig, cat, chicken; particular attention to areas of veterinary medical importance. Special written report and/or review required. Prerequisites: 311 or equivalent, biological science background & departmental consent.

326 Veterinary Pharmacology (3). General principles of pharmacodynamics in domesticated animals.

327 Principles of Physiologic Adaptation (3). Physiologic mechanisms in individual mammals in coping with acute and chronic alterations in physical environment. Pressure, temperature, gravity and radiation considered. Prerequisite: vertebrate physiology or physiological zoology, 4 credits; chemistry, 5 credits; or instructor's consent.

328 Adaptation to Xenobiotics (3). Essentials of toxicology and survey of major toxicant groups, including poisonous plants, and the industrial and agricultural chemicals. Prerequisite: biochemistry or instructor's consent.

400 Problems (cr. arr.) Selected problems and/or topics for advanced study in special areas to meet needs of individual students.

409 Advanced Microscopic Anatomy (cr. arr.) Advanced microscopic study of selected topics in vertebrate microscopic anatomy. Special report required. Prerequisites: graduate standing, 303 or equivalent, instructor's consent.

410 Seminar (1). Presentation and discussion of investigations and topics in Veterinary Anatomy-Physiology or related fields, by qualified students, instructors and guests. Prerequisite: departmental consent.

418 Correlative Neuroanatomy (4). Comprehensive study of neuroanatomy of common domestic and laboratory animals. Prerequisite: graduate standing and/or instructor's consent.

420 Veterinary Physiology (5). Systematic physiology for graduate students with primary interest in animals other than man. Function of nerve, muscle, circulatory and respiratory systems. Prerequisites: Biochemistry 270 & Biochemistry 272, or equivalent.

421 Veterinary Physiology (5). Continuation of 420. Digestion, excretion, endocrinology, reproduction.

427 Fate of Drugs in the Animal Body (2) (same as Pharmacology 427). Principles concerned with absorption, distribution, excretion and biotransformation of drugs. Prerequisites: 10 hours physiology, 5 hours pharmacology & 5 hours biochemistry. alt. w. odd yrs.

450 Research (cr. arr.) Open to graduate students with requisite preparation. Research not expected to terminate in thesis.

490 Research (cr. arr.) Open to graduate students with requisite preparation. Research expected to be presented as thesis.

Veterinary Medicine & Surgery

200V Problems (cr. arr.) Studies in specific areas of Veterinary Medicine and Surgery.

251V Food Animal Medicine and Surgery I (10). Technical, diagnostic and therapeutic procedures common to the practice of large animal medicine and surgery. Experience in the operation of a large animal hospital and farm outpatient practice. Offered six times yearly.

252V Food Animal Medicine and Surgery II (1-10). Continuation of 251V, with opportunity for concentrated study and experience. Available as part of Continuing Education Program. Prerequisite: 251V.

253V Small Animal Medicine I (10). Practical discussion of medical diseases of dogs, cats and exotic pets as they affect body systems. Practical experience in the operation of a small animal hospital and outpatient practice. Offered six times yearly.

254V Small Animal Medicine II (1-10). Continuation elective offered to 3rd- and 4th-year students. Opportunity for concentrated study and experience in medical areas. Enrollment subject to approval of course coordinator. Available to veterinarians under Continuing Education Program. Prerequisite: 253V or equivalent.

255V Equine Medicine and Surgery I (10). Technical, diagnostic and therapeutic procedures common to equine practice. Emphasis on fundamental principles. Offered six times yearly.

256V Equine Medicine and Surgery II (1-10). Open to 3rd- and 4th-year students, subject to approval of course coordinator. Continuation of 255V, with opportunity for concentration in specific area of interest. Available to veterinarians under Continuing Education Program.

257V Small Animal Surgery I (10). Diagnostic procedures and surgical techniques applicable to companion animal surgery. Practical experience in the operation of a small animal surgical practice. Offered six times yearly.

258V Small Animal Surgery II (1-10). Continuation of 257V, with opportunity for concentrated study and advanced surgical experience. Available to veterinarians under Continuing Education Program. Prerequisite: 257V or equivalent.

259V Theriogenology I (10). Diseases of the male and female reproductive system. Manipulative and surgical techniques applicable to normal and abnormal parturition. Practical experience in reproductive diagnostic techniques, breeding soundness examination and herd reproductive health programs. Offered six times yearly.

260V Theriogenology II (1-10). Continuation of the prerequisite 259V, with opportunity for concentrated study and experience. An elective, subject to approval of course coordinator and faculty member(s) who supervise student's work. Available to veterinarians as part of a Continuing Education Program.

261V Medical Services I (10). Fundamentals of radiology and anesthesiology: indications for use, techniques, pathophysiologic alterations, interpretation of results, patient aftercare, protective measures against radiation hazards. Practical experience provided under hospital and outpatient practice conditions. Offered six times yearly.

262V Medical Services II (1-10). Continuation of the prerequisite 261V, with opportunity for concentrated study and experience. An elective, subject to approval of course coordinator and faculty member(s) who supervise student's work. Available to veterinarians as a Continuing Education Program.

265V Laboratory Animal Medicine and Management I (10). Principles of veterinary medicine applied to animals used as experimental subjects in biomedical research. Consideration of procurement, husbandry, facilities, handling techniques and diseases of these animals. Offered twice yearly.

266V Laboratory Animal Medicine and Management II (1-10). Elective offered 3rd- and 4th-year students, subject to approval of course coordinator and supervising faculty. Concentrated study/experience in laboratory animal disease(s)/colony management. Available to veterinarians as a Continuing Education Program.

267V Herd Health Management and Nutrition I (1-10). Experience in feed lot, dairy, calf/cow and swine herd veterinary practice. Stresses nutrition, herd health management, and contractual and preventive veterinary practice. Offered two times yearly.

268V Herd Health Management and Nutrition II (10). Elective offered 3rd- and 4th-year students, subject to course coordinator approval. Concentrated study/experience in feed lot, dairy, cow/calf, swine herd agribusiness enterprises applicable to veterinary practice. Prerequisites: 251V & 259V.

271V Introduction to Clinical Sciences (7). Integrates preclinical sciences with a systems-oriented approach to medicine and surgery. Offered in the ninth instructional period only.

272V Small Animal Surgery (2½). Lectures (fundamental through advanced) on small animal surgery. Practical lab involvement in soft and hard tissue procedures. Offered in the tenth instruction period only.

273V Radiology (2). Introduces through lectures and demonstrations the principles of radiographic examination and interpretation of disease processes of domestic animals. Offered in the ninth instructional period only.

274V Small Animal Medicine (2½). Didactic presentations regarding pathophysiology, diagnosis and therapeutic management of organ system diseases in small animals. Offered in the tenth instructional period only.

275V Food Animal Medicine and Surgery (3½). Introduction to medical and surgical diseases of food-producing animals. Diagnostic and therapeutic procedures related to bovine, porcine and ovine disorders emphasized. Offered in the tenth instructional period only.

276V Laboratory Animal Medicine (1½). Principles of veterinary medicine applied to laboratory animals as pets and in research. Husbandry, handling and clinical techniques, diseases, and use as disease models are discussed. Offered in the tenth instructional period only.

300 Problems (cr. arr.) Studies in specific areas of Veterinary Medicine and Surgery.

328 Introductory Radiation Biology (3) (same as Radiology 328, Nuclear Engineering 328, Biological Sciences 328).

351 Advanced Surgical Techniques (cr. arr.) Special application to large, small animals. Prerequisite: D.V.M.

355 Advanced Techniques in Radiology (cr. arr.) Special application to domestic animals. Prerequisite: D.V.M.

356 Advanced Studies of Poisonous Plants and Toxicology (cr. arr.) Prerequisite: D.V.M.

400 Problems (cr. arr.) Advanced studies to meet needs of individual student.

410 Seminar (1). Discussion of current research.

450 Research (cr. arr.) Open to graduate students with requisite preparation.

458 Facilitative Surgery (3) (same as Laboratory Animal Medicine Area 458). Lab experience in performance of a wide variety of surgical procedures used on various animals to facilitate experimental studies. Prerequisite: departmental consent. alt. w. odd yrs.

468 Laboratory Animal Biology (3) (same as Laboratory Animal Medicine Area 468). Reproduction, genetics, nutrition, epidemiology and husbandry of the eight common lab animals (cat, dog, guinea pig, hamster, monkey, mouse, rabbit, rat). Prerequisite: departmental consent. alt. f. even yrs.

469 Laboratory Animal Colony Management (3) (same as Laboratory Animal Medicine Area 469). Procurement, conditioning, control of use of lab animals. Cost accounting and record maintenance. Facility design and construction, environmental requirements and design. Prerequisite: departmental consent. alt. f. odd yrs.

475 Methodology of Animal Experimentation (1). Application of specific species or strains of animals and techniques to various types of medical investigation. Prerequisite: departmental consent. alt. w. odd yrs.

487 Nuclear Medicine (3). Degrees equivalent to D.V.M. acceptable. Principles of radiation detection instrumentation, monitoring radiological safety and diagnostic procedures used in veterinary nuclear medicine. Prerequisites: one year college physics, D.V.M. degree & departmental consent.

488 Radiation Therapy (3). Radiobiological basis for radiation therapy, principles of dosimetry, and radiological safety and treatment. Designed for conditions common in veterinary medicine. Prerequisites: one year college physics, D.V.M. degree & departmental consent.

490 Research (cr. arr.) Open to graduate students with requisite preparation.

Veterinary Microbiology

241V Veterinary Immunology (2). Fundamentals of immunology as applied to domestic animals. Instructional period 4.

242AV Veterinary Bacteriology I (3). Classification and properties of pathogenic bacteria and fungi of animals; relationship to public health; considers pathogenesis, immunology of infection. Prerequisite: enrollment in College of Veterinary Medicine. Instructional period 5.

242BV Veterinary Bacteriology II (2). Continuation of 242AV. Prerequisite: same as 242AV. Instructional period 6.

243V Veterinary Virology (3). Classification and properties of viruses. Considers the etiologic, pathologic and immunologic aspects of viral diseases of animals. Prerequisite: enrollment in the College of Veterinary Medicine. Instructional periods 6 & 7.

245AV Veterinary Parasitology I (3). Parasites and parasitic diseases of ruminants, horses, swine, dogs, cats, poultry and other animals. Includes classification, morphology and bionomics of protozoa, helminths and arthropods. Prerequisite: enrollment in the College of Veterinary Medicine. Instructional period 5.

245BV Veterinary Parasitology II (3). Continuation of 245AV. Prerequisite: same as 245AV. Instructional period 6.

246V Introduction to Epidemiology and Infectious Disease (2). Introduces and applies epidemiologic methodology. Considers the multifactorial causes of infectious disease. Instructional period 7.

247V Veterinary Clinical Epidemiology and Preventive Medicine (4). Epidemiology, food hygiene control, ecology and interrelationships of disease in populations of animals and man. Primary prevention stressed. Instructional period 8.

269V Public Health and Epidemiology (10). Epidemiology, ecology and interrelationships of disease in populations of animals and man; food hygiene control, environmental influences on health and disease; primary prevention stressed. Offered two or three times yearly. Not offered after 1978-79.

270V Epidemiology and Community Health (1-10). Elective covering advanced aspects of epidemiology and community health. Emphasizes problem solving and is designed to meet needs of the individual student. Prerequisite: instructor's consent. Instructional period arranged.

300 Problems (cr. arr.) f, w, s.

340 Microbial Physiology (3). Microbial structure and function; emphasizes biochemistry of life processes at cell and subcellular levels. Demonstration laboratories on basic instrumental methods. For microbiology students. Prerequisites: one course in microbiology & one in general biochemistry. alt. f. odd yrs.

343 Concepts and Methods in Animal Virology (3). Lectures and laboratories on properties and host cell relationships of animal viruses and on methods for their detection and study. Prerequisites: general microbiology & general biochemistry & instructor's consent. alt. f. odd yrs.

345 Veterinary Parasitology I (3). Parasites and parasitic diseases of domesticated and non-domesticated animals. For upper level undergraduate and graduate students. Presented concurrently with 245AV. Instructional period 5. Prerequisites: Biological Sciences 210 or equivalent & instructor's consent.

346 Veterinary Parasitology II (3). Continuation of 345. Also concurrent with 245BV. Instructional period 6. Prerequisites: Biological Sciences 210 or equivalent & instructor's consent.

347 Clinical Epidemiology and Environmental Health (1-10). Ecologic basis of health and disease and cause-effect relationships. Evaluation of control programs. Includes epidemiology of important acute and chronic animal diseases. Prerequisite: enrollment in a professional medical, dental or public health curriculum.

348 Epidemiology of Zoonotic Diseases (1-10). Zoonotic diseases of major public health importance in North America. Includes epidemiology and transmission of these diseases, with particular emphasis on control/eradication methods. Prerequisite: enrollment in a professional medical, dental or public health curriculum.

410 Seminar (1). Open to graduate students in Veterinary Microbiology and allied biological sciences. Study and discussion of current knowledge and research in microbiology, infectious diseases and epidemiology. w.

421 Advanced Epidemiology (3) (same as Family & Community Medicine 421).

441 Topics in Veterinary Microbiology (1-3). Subjects appropriate to Veterinary Microbiology and/or epidemiology, taught on a one-time basis or infrequently. May include highly specialized topics. Specific course must be approved by departmental faculty. Prerequisites: graduate standing & instructor's consent.

442 Advanced Veterinary Microbiology (3). Advanced study of pathogenic bacteria. Prerequisites: graduate standing & instructor's consent.

443 Viral Infection and Immunity (3). Study of virus infection at the level of the intact animal. Includes immunology of domestic animal species. Prerequisites: graduate standing & instructor's consent. alt. w. even yrs.

444 Diseases of Laboratory Animals (3) (same as Laboratory Animal Medicine Area 444). Identification and characterization of diseases of commonly used lab animals excluding primates. alt. w. even yrs.

445 Advanced Veterinary Parasitology (3). Parasitic diseases of domestic and exotic animals and those of public health significance. Prerequisites: one course in general parasitology & graduate standing. alt. w. odd yrs.

447 Oncogenic Animal Viruses (3). Molecular biology of RNA- and DNA-containing animal tumor viruses and their *in vitro* and *in vivo* interactions with host cells. Prerequisites: general microbiology, virology, general biochemistry, & instructor's consent. alt. f. even yrs.

449 Epidemiology of Zoonoses (3) (same as Family & Community Medicine 449). Detailed study of epidemiology and ecology of zoonotic diseases: control and prevention. Prerequisites: epidemiology & medical microbiology or instructor's consent. alt. f. odd yrs.

490 Research (cr. arr.) Nutrition, metabolism and pathogenicity of microorganisms; host resistance mechanisms, epidemiology or preventative medicine.

Veterinary Pathology

200 Problems (cr. arr.) Assignment of special topics for research training in Veterinary Pathology.

230 Animal Sanitation and Disease Prevention (3). Preventive measures for diseases and parasites of farm animals. Prerequisite: Veterinary Anatomy-Physiology 219 or Veterinary Anatomy-Physiology 222.

231V General Pathology (3). Fundamental biochemical and anatomic alterations of disease. Includes disturbances in metabolism, circulation, growth and cell differentiation. Also includes the pathology of tumors. f.

232AV Systemic and Special Pathology I (3). Pathologic manifestations of disease in the organ systems. Includes changes caused by infectious agents and metabolic disturbances. Stresses gross and microscopic criteria by which definitive diagnoses are made. w.

232BV Systemic and Special Pathology II (3). Continuation of 232AV.

263V Diagnostic Pathology and Special Species Medicine I (10). Application of lab techniques used to diagnose disease by macroscopic, microscopic, biochemical, microbiologic and toxicologic findings. Case-method of teaching. Domestic avian species and laboratory animals included. Six times yearly.

264V Diagnostic Pathology and Special Species Medicine II (1-10). Third- and fourth-year students. Elective. Approval of coordinator and supervisory staff. Continuation of 263V with more depth. Available to D.V.M.'s as part of Continuing Education Program. Prerequisite: 263V or equivalent.

300 Problems (cr. arr.) Prerequisites: D.V.M. & departmental consent.

335 Techniques in Pathology (cr. arr.) Methods and techniques in fixing, preparing, staining pathological specimens.

410 Seminar (1). Presentation of research to topics of animal diseases. Section 1: for students in the Pathology Area Program. Section 2: for students not in the area program. For students in Veterinary Medicine and allied biological fields. f, w.

430 Comparative Pathology (3) (same as Plant Pathology 430, Pathology 430). Biochemical and morphologic lesions related to the mechanism of disease expression in plants and animals.

431 Advanced Veterinary Pathology (3-5). Specific assignments on diagnostic methods, including surgical pathology, necropsies, toxicology. Prerequisite: departmental consent.

432 Advanced Histopathology (5). Advanced microscopic study of pathological tissues. Prerequisite: departmental consent.

433 Veterinary Oncology (3). Study of animal neoplasms. Prerequisite: departmental consent.

434 Advanced Clinical Pathology (4). Lab techniques; application to diagnosis of animal diseases. Prerequisite: departmental consent. alt. f. even yrs.

437 Pathology of Laboratory Animals (3) (same as Laboratory Animal Medicine Area 437). Gross and microscopic study of spontaneous and naturally occurring diseases in lab animals. Prerequisite: departmental consent. alt. w. even yrs.

438 Primatology (3) (same as Laboratory Animal Medicine Area 438). Diseases and pathology of primates. Prerequisite: departmental consent. alt. f. even yrs.

450 Research (cr. arr.)

490 Research (cr. arr.) Open to graduate students with requisite preparation. Research on specific animal diseases, prevention and treatment.

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