

FAMILY AND CHILD ECOLOGY

991B* **Marriage and Family Therapy Supervision**
3(2-3)
R: Open only to graduate students in the Marriage and Family Therapy emphasis of Family and Child Ecology. Approval of department. Models of marriage and family therapy and related supervision principles. Development of perceptual, cognitive, and executive supervisory skills. Ethical, legal, educational issues.

993* **Internship**
Fall, Spring, Summer. 1 to 9 credits.
May reenroll for a maximum of 12 credits.
R: Open only to Family and Child Ecology graduate students. Approval of department. Supervised practicum, or internship.
QA: FCE 901

999* **Doctoral Dissertation Research**
Fall, Spring, Summer. 1 to 24 credits.
May reenroll for a maximum of 50 credits.
R: Open only to majors in Family Ecology.
QA: FCE 999

FAMILY MEDICINE FM

590* **Special Problems in Family Medicine**
Fall, Spring, Summer. 1 to 8 credits.
May reenroll for a maximum of 32 credits.
R: Open only to graduate-professional students in the colleges of Osteopathic and Human Medicine. Approval of department. Each student works under faculty direction on an experimental, theoretical, or applied problem.
QA: FM 590

601* **Clinical Practicum in Family Medicine**
Fall, Spring, Summer. 4 to 24 credits in increments of 2 credits. May reenroll for a maximum of 24 credits.
R: Open only to graduate-professional students in the College of Osteopathic Medicine. Units I and II.
Direct involvement in a family practice emphasizing patient, office, and personnel management.
QA: FM 600

620* **Directed Studies**
Fall, Spring, Summer. 2 to 24 credits in increments of 2 credits. May reenroll for a maximum of 48 credits.
R: Open only to graduate-professional students in the colleges of Osteopathic and Human Medicine. Approval of department. Individual or group projects on special problems related to family medicine.
QA: FM 620

640* **Principles of Family Medicine I**
Fall. 1(00-04)
R: Open only to graduate-professional students in the College of Osteopathic Medicine. Unit I; Systems Biology course or concurrently. Preceptorship experience in family medicine taught by faculty and clinical preceptors at multiple sites.
QP: PHM 520 QA: FM 652 FM 662

650* **Principles of Family Medicine II**
Spring. 1(00-04)
P: FM 640. R: Open only to graduate-professional students in the College of Osteopathic Medicine. Unit I; Systems Biology course or concurrently.
Continuation of FM 640.
QP: FM 652 PHM 520 QA: FM 672 FM 682

FAMILY PRACTICE FMP

515. **Health Care in Underserved Areas**
Fall of even-numbered years. 2 to 3 credits. Interdepartmental with the Department(s) of Family Medicine.
R: Graduate-professional students in colleges of Human and Osteopathic Medicine. Professional, economic, and personal issues confronting the physician practicing in medically underserved areas. Impact of practice location, federal programs, changing patterns of practice, health maintenance organizations.

516. **Migrant Worker Health Care**
Spring. 2 to 4 credits. May reenroll for a maximum of 8 credits.
Interdepartmental with the Department(s) of Family Medicine.
R: Graduate-professional students in colleges of Human and Osteopathic Medicine. Health beliefs, patient attitudes, economic situations and medical problems of migrant agricultural workers. Introduction to occupational medicine in the agricultural sector.

517. **Introduction to Sports Medicine**
Fall. 2(2-0) Interdepartmental with the Department(s) of Osteopathic Medicine.
R: Graduate-professional students in colleges of Human and Osteopathic Medicine. Causes, diagnosis, treatment, and prevention of common sports injuries. Drugs, nutrition, exercise physiology and sports psychology. Emphasis on family practice approach to sports medicine.

518* **Sports Medicine II**
Spring. 1(0-2)
P: FMP 517 R: Grad Prof Stud in College of Human and Osteopathic Medicine Students in College of Nursing
The course is intended to provide the medical student or graduate level student with an awareness of and experience in multidisciplinary aspects of sports medicine through direct observations and hands-on tutorials
QA: FMP

520. **Primary Care in Developing Countries**
Fall of odd-numbered years. 2(2-0)
R: Graduate-professional students in colleges of Human and Osteopathic Medicine. Practical skills for medical problem solving in developing countries: physician experiences, cross-cultural training, instruction of health workers, resource allocation; coping with special challenges, e.g., malnutrition.

580. **Special Topics in Family Practice**
Fall, Spring, Summer. 2 to 3 credits.
May reenroll for a maximum of 6 credits.
R: Graduate-professional students in colleges of Human and Osteopathic Medicine. Exploration of special aspects of family practice. Possible examples include ethnicity and aging, clinical nutrition, sports medicine, death and dying, health care of women, research methods in primary care.

602* **Clinical Medicine in the Community**
Fall, Spring, Summer. 6(-)
P: Passed preclinical curriculum R: Grad Professional Students in College of Human Medicine
Data gathering with formulation and presentation of plans for patients. Assessment of readiness for clinical clerkships. Exposure to community hospitals and out-patient settings
QA: FMP 602

607* **Ambulatory Care Clerkship**
Fall, Spring, Summer. 1 to 3 credits.
Interdepartmental with the Department(s) of Medicine, Pediatrics.
P: FMP 602 R: Graduate Professional Students in College of Human Medicine
Outpatient experience, lasting an equivalent of 36 half days and extending over a minimum of 26 weeks. Continuous and comprehensive patient care under supervision of appropriate physicians
QP: FMP 602 QA: FMP 607 PHD 607 MED 607

610* **Family Practice Clerkship**
Fall, Spring, Summer. 6 to 12 credits in increments of 6 credits. May reenroll for a maximum of 6 credits.
P: FMP 602 R: Graduate Professional students in College of Human Medicine
Experience in family practice in diverse settings. Emphasis on primary, continuing and comprehensive care
QP: FMP 602 QA: FMP 610

612* **Inpatient Clerkship in Family Practice**
Fall, Spring, Summer. 6 to 12 credits in increments of 6 credits. May reenroll for a maximum of 6 credits.
P: FMP 602 R: Grad professional students in College of Human Medicine
Demonstration of the role of the family physician in the hospital setting, including management of consultations and referrals
QP: FMP 602 QA: FMP 612

615* **Medical Care in Developing Countries**
Fall, Spring, Summer. 6 to 12 credits in increments of 6 credits. May reenroll for a maximum of 6 credits.
P: FMP 602 R: Grad Professional students in College of Human Medicine
Supervised experience in hospitals, outpatient clinics, villages and medical research centers in developing countries
QP: FMP 602 QA: FMP 615

617* **Sports Medicine Clerkship**
Fall, Spring, Summer. 6 to 12 credits in increments of 6 credits. May reenroll for a maximum of 6 credits.
P: FMP 602 R: Grad Professional students in College of Human Medicine
Clinical elective experience concentrating on the primary care aspects of sports medicine. Involves care of acute and chronic sports injuries, mostly of college level athletes
QP: FMP 602 QA: FMP 617

FINANCE AND INSURANCE FI

311* **Financial Management**
Fall, Spring, Summer. 3(3-0)
P: ACC 202 or ACC 230 or ACC 251H or HRI 302. R: Open only to juniors and seniors in the College of Business and in programs that list FI 311 as a catalog requirement.
Optimal management of the firm's assets and financing requirements. Analysis of financial statements, financial markets, risk, valuation, long-term and short-term financing and investment. International and ethical implications.
QP: ACC 202 ORACC 230ORACC 251H QA: FI 391

312* **Introduction to Investments**
Fall, Spring, Summer. 3(3-0)
P: FI 311. R: Open only to majors in the College of Business.
Theoretical and empirical analyses of securities. Risk and return formation. Security analysis and concepts of market efficiency. Common stocks, bonds, options, futures, and international securities.
QP: FI 391 QA: FI 392

FINANCE AND INSURANCE

331*. **Principles of Risk Management and Insurance**
 Fall, Spring. 3(3-0)
 P: STT 315. R: Open only to majors in the College of Business.
 Legal aspects of insurance contracts. Organization of insurance companies. Personal and business insurance coverages. Insurance regulation. International relationships.
 QP: STT 315 QA: FI 350

413*. **Management of Financial Institutions**
 Fall, Spring. 3(3-0)
 P: FI 311. R: Open only to majors in the College of Business.
 Management, decision-making and policy formulation for depository and non-depository financial institutions. Emphasis on commercial banking, with attention also to S&Ls, credit unions and non-bank financial institutions.
 QP: FI 391 QA: FI 492

414*. **Advanced Business Finance**
 Spring. 3(3-0)
 P: FI 312; FI 413 or concurrently. R: Open only to seniors in the College of Business.
 Advanced financial management of business firms. Theoretical and case applications that integrate capital budgeting, valuation, capital structure, mergers, international business finance, working capital management and ethical considerations.
 QP: FI 392 FI 492 OR CONCURRENTLY. QA: FI 493

434*. **Life and Health Insurance**
 Spring. 3(3-0)
 P: STT 315, FI 311. R: Open only to majors in the College of Business.
 Economics of life and health insurance in the United States, with international comparisons. Actuarial models, underwriting, marketing, and taxation. Diversity issues such as gender-based underwriting and the financial impact of AIDS.
 QP: STT 315 FI 391

451*. **International Financial Management**
 Fall. 3(3-0)
 P: FI 311 and MTA 310 or EC 340 R: Juniors and Seniors Business
 Financial management of multinational business firms. Theoretical and applied coverage of international capital budgeting, capital structure, cash management, and exchange rate risk. Ethical considerations.
 QP: FI 391 QA: FI 430

455*. **Computer Applications for Financial Modeling**
 Fall, Spring. 3(3-0)
 P: FI 311; MTA 317 or STT 422 or STT 442. R: Open only to majors in the College of Business.
 Application of personal and mainframe computers and software to corporate, personal and international financial analysis.
 QP: FI 391 MTA 317 OR STT 422 OR QA: FI 496

478*. **Investment Strategies and Speculative Markets**
 Fall, Spring, Summer. 3(3-0)
 P: FI 312. R: Open only to majors in the College of Business.
 Pricing, trading, hedging and speculating in financial markets. Effects of risk and maturity on security prices. Strategies with futures, options, and other financial instruments in domestic and international markets. Ethical considerations.
 QP: FI 392 QA: FI 491 FI 494

490*. **Independent Study**
 Fall, Spring, Summer. 1 to 3 credits.
 R: Open only to seniors in Financial Administration. Approval of department.
 Supervised independent study of special topics in finance or insurance.
 QA: FI 495

817*. **Financial Decision Models**
 Spring. 3(3-0) Interdepartmental with the Department(s) of Accounting.
 P: FI 889 R: Graduate or PPA Business
 MBA or PPA
 Development and application of computerized financial models in finance, accounting, and control activities. Use of financial planning software on personal and mainframe computers. Emphasis on models in case analysis.
 QP: FI 888 QA: FI 817

850*. **Risk Management for Commercial and Public Entities**
 Spring. 3(3-0)
 R: Graduate Business
 Application of risk management techniques to businesses and public entities. Analysis of exposures, risk management alternatives, and their social, legal and economic implications. Cost/benefit analysis of decisions.
 QA: FI 850

861*. **International Financial Management**
 Fall. 3(3-0)
 P: FI 889 R: Graduate Business
 Financial management in an international environment including capital budgeting, capital structure decisions, cash management, foreign currency markets and exchange rate risk mgmt; ethical and tax considerations.
 QP: FI 888

870*. **Financial Markets and Strategies**
 Spring. 3(3-0)
 P: FI 874 R: Graduate or PPA Business
 MBA or PPA
 Theories concerning domestic and international financial markets and instruments. Effects of risk and maturity on prices. Special focus on managing business and portfolio risk and returns with options and futures.
 QP: FI 871 QA: FI 870

872*. **Advanced Managerial Finance**
 Fall, Spring. 3(3-0)
 P: FI 889 R: Graduate Business
 Advanced management and financing of corporate assets and long term financial policies. Financial planning and control using financial theory and management techniques and applied in an international setting. Use of business cases.
 QP: FI 888 QA: FI 872 FI 873

874*. **Introduction to Investments**
 Fall, Spring. 3(3-0)
 P: FI 889 or equivalent R: Graduate or PPA Business
 MBA or PPA
 Analysis and application to security risk and return concepts. Security analysis and concepts of market efficiency. Emphasis on equity investments. Bonds, options, futures, and international securities.
 QP: FI 888 QA: FI 874

878*. **Bank Management**
 Spring. 3(3-0)
 P: FI 889 R: Graduate Business
 The nature, structure and management of commercial banks. Focus on products and services offered, risks, policies and strategies, both domestically and internationally.
 QP: FI 888 QA: FI 878

889*. **Managerial Finance**
 Fall, Spring. 3(3-0)
 P: ACC 800 or equivalent R: Graduate or PPA Business
 MBA or PPA
 Managerial finance covering short-, intermediate- and long-term problems. Financial planning and control using financial theory and management techniques. Applications in both domestic and international settings.
 QP: ACC 839 QA: FI 889

890*. **Special Problems**
 Fall, Spring. 1 to 3 credits. May reenroll for a maximum of 6 credits.
 R: Graduate Business Approval of Department
 Independent study of special topics in finance or insurance
 QA: FI 890

990*. **Theory of Finance**
 Fall. 3(3-0)
 R: Ph.D. students or approval of Department
 Business Approval of Department
 Introduction to the financial theory of the firm. Theoretical models dealing with capital structure, cost of capital, dividend policy and leasing.
 QA: FI 990

991*. **Corporate Finance Theory**
 Spring of odd-numbered years. 3(3-0)
 P: FI 990 R: Ph.D. students Business
 Approval of Department
 The theoretical foundations of corporate finance, recent empirical research in capital structure, dividend policy, and agency theory.
 QP: FI 990 QA: FI 991

992*. **Investment Theory**
 Spring of even-numbered years. 3(3-0)
 P: FI 990 R: Ph.D. Business
 Approval of Department
 Theoretical and empirical basis for investments. Topics include market efficiency, stochastic processes, option pricing, efficient set mathematics, intertemporal asset pricing and arbitrage pricing theory.
 QP: FI 990 QA: FI 992

993*. **Finance Workshop**
 Fall. 3(3-0)
 P: FI 990 R: Ph.D. Business
 Finance
 Approval of Department
 Critical evaluation of original research papers by faculty and students.
 QP: FI 990

999*. **Doctoral Dissertation Research**
 Fall, Spring, Summer. 1 to 24 credits.
 May reenroll for a maximum of 99 credits.
 R: Ph.D. students Business Finance and Insurance
 QA: FI 999

FISHERIES AND WILDLIFE FW

100*. **Introduction to Fisheries and Wildlife**
 Fall. 1(1-0)
 Fisheries and wildlife history, philosophy and management in the context of conservation ethics.
 QA: FW 100

203. **Resource Ecology**
 Fall, Spring. 3(3-0)
 Basic concepts of ecology which provide a foundation for examining environmental problems and their solutions.
 QP: BOT201 NS142

205. **Principles of Fisheries and Wildlife Management**
 Spring. 3(3-0)
 Characteristics of the fish and wildlife resource. Ecological and societal factors influencing the management of fish and wildlife. Management techniques.
 QA: FW 305

FISHERIES AND WILDLIFE

207. Great Lakes: Biology and Management
 Spring. 3(3-0) Interdepartmental with the Department(s) of Resource Development.

Living aquatic resources of the Great Lakes: environmental history, biological resources and their management. Policy issues.

284. Natural History and Conservation in Michigan
 Fall. 3(2-3)
 R: Not open to freshmen.

Identification, habitat requirements, and distribution of Michigan's flora and fauna. Interrelationships which influence natural resource use. Field trips required.
 QA: FW 402

324*. Wildlife Biometry
 Fall. 3(2-3)
 P: MTH 116, ZOL 250

Problems in fisheries and wildlife examined using formulas, methods, and applications of statistics and microcomputers.
 QP: MTH 111 ZOL 389 QA: FW 340

328. Vertebrate Pest Control
 Spring. 3(3-0)
 P: BS 110.

Role of vertebrate animals as agents damaging to human interests. Damage evaluation. Damage control strategies and techniques.
 QP: BS 212 QA: FW 328

364*. Ecosystem Processes
 Spring. 3(2-2)
 P: CEM 141, FW 324.

Concepts of ecosystem structure and function developed from basic scientific laws and relationships.
 QP: FW 340 ZOL 389CEM 141 QA: FW 302

410*. Upland Ecosystem Management
 Spring. 4(3-3)
 P: FOR 404 or ZOL 250.

Analysis and management of upland ecosystems to meet wildlife management and biodiversity objectives. Mitigation of human impact.
 QP: BOT 450 FOR 304 QA: FW 410

412*. Wetland Ecosystem Management
 Fall. 3(3-0)
 P: FW 364 or ZOL 250.

Ecosystem components and processes applied to wetland management. Mitigation of human impact.
 QP: FW 302 FW 340 QA: FW 412

420*. Stream and Aquatic Insect Ecology
 Fall. 3(2-3) Interdepartmental with the Department(s) of Entomology, Zoology.
 P: BS 110, CEM 141.

Biological and environmental factors determining structure and function of stream and aquatic insect communities. Aquatic insect systematics.
 QP: BS 212 QA: FW 478 ENT 420

424*. Population Analysis and Management
 Fall. 4(3-3)
 P: FW 364.

Statistical, ecological and management concepts and methods needed to analyze and interpret demographic data and manage fish and wildlife populations.
 QP: FW 340 ZOL 389 QA: FW 424

434*. Human Dimensions of Fisheries and Wildlife Management
 Spring. 3(3-0)
 P: FW 324. R: Not open to freshmen and

sophomores. Sociological implications of public policy and planning processes in fisheries and wildlife management resources.
 QP: FW 410 FW 412FW 413 QA: FW 434

444. Conservation Biology
 Fall. 3(3-0) Interdepartmental with the Department(s) of Zoology.
 P: BS 110.

Ecological theories and methodologies to manage species, communities and genetic diversity on a local and global scale.
 QP: BS 212

471*. Ichthyology
 Fall. 3(2-3) Interdepartmental with the Department(s) of Zoology.
 P: ZOL 228.

Fish morphology, physiology. Development, behavior, evolution and ecology. World fishes with emphasis on freshwater fishes.
 QP: FW 301 ZOL 307ZOL 428 QA: FW 471 ZOL 471

472*. Limnology
 Fall. 3(3-0) Interdepartmental with the Department(s) of Zoology.
 P: ZOL 250 and CEM 141

Ecology of lakes with emphasis on interacting physical, chemical and biological factors affecting their structure and function.
 QP: CEM 141 ZOL 389 QA: FW 476

474*. Fishery and Limnological Techniques
 Fall. 3(1-6) Interdepartmental with the Department(s) of Zoology.
 P: FW 472 or concurrently

Techniques of limnology and fishery science used in field and laboratory investigations of physical, chemical, and biological parameters of lakes and streams.
 QP: FW 476 QA: FW 477 FW 473

475*. Aquaculture
 Spring. 3(3-0)
 P: ANS 313 or FW 364 or ZOL 250.

Propagation and rearing of aquatic organisms used for food, bait and recreational fisheries management. Culture principles and techniques for important aquatic species. Commercial potential.
 QP: ANS 313AANS 313BORFW 302OR QA: FW 475

479*. Fisheries Management
 Spring. 3(2-2)
 P: FW 424, FW 471, FW 474.

Manipulation of aquatic populations and their habitats to achieve societal goals for fishery resources. Management of human impact and biotic diversity.
 QP: FW 471 QA: FW 473

484*. Environmental Education
 Spring. 3(3-0)
 P: AEE 101 or PRR 320 or RD 201 or TE 150. R: Not open to freshmen and sophomores.

Methods, materials and theory for teaching environmental education in formal and nonformal educational settings.
 QP: RD 301 ORPRR 320 QA: FW 484

490*. Independent Studies of Fisheries and Wildlife Problems
 Fall, Spring, Summer. 1 to 5 credits.
 May reenroll for a maximum of 5 credits.
 P: BS 110. R: Not open to freshmen and

sophomores. Approval of department and application required. Special topics in fisheries and wildlife.
 QP: BS 212 QA: FW 404

810*. Human Dimensions Research in Fisheries and Wildlife
 Fall of even-numbered years. 3(3-0)
 R: Graduate

Methods of surveying, educating and involving the public to achieve fish and wildlife management goals. Review of human dimensions research and current case studies.
 QA: FW 810

814*. Environmental Chemodynamics
 Fall. 4(4-0)
 P: Chemistry

Chemical and environmental factors which control the distribution of organic and inorganic chemicals in air, water and soil and monitoring.
 QA: FW 802

824*. Analysis of Wildlife Populations
 Spring of even-numbered years. 3(2-3)
 R: Graduate Students

Statistical and ecological concepts, methods and computer techniques needed to analyze and interpret demographic data from fish and wildlife studies.

826*. Ecology and Management of Waterfowl
 Fall of even-numbered years. 3(2-3)
 P: FW 412, FW 424

Physiological, behavioral, and population characteristics of waterfowl. Current issues and management.
 QP: FW 412 FW 424 QA: FW 826

828*. Conservation and Genetics
 Fall of odd-numbered years. 3(3-0)
 P: ZOL 341 or CSS 350 or ANS 314

Population genetic principles applied to ecology and management of fish and wildlife.
 QP: ZOL 441 CSS 350ANS 314 QA: FW 828

831*. Aquatic Toxicology
 Spring of odd-numbered years. 4(3-2)
 P: Basic Biology, Chemistry

Techniques for assessing acute and chronic effects of toxicants on biochemical, physiological, organismal, population, community and ecosystem levels of organization.
 QA: FW 831

860*. Wildlife Nutrition
 Fall of odd-numbered years. 3(2-2)

Nutritional ecology of wild species. Techniques for analyzing and improving nutritional qualities.
 QA: FW 860

872*. Fishery Habitat Analysis and Management
 Spring of odd-numbered years. 3(3-0)
 P: FW 471, FW 420, FW 479

Fish habitat use. Analysis and manipulation of habitats to enhance fish production in freshwater ecosystems.
 QP: FW 471 FW 473FW 478ENT 420

875*. Advanced Aquaculture
 Fall of odd-numbered years. 3(3-0)
 P: FW 475 R: Seniors and above

Adaptations and responses of aquatic organisms to environmental change in aquaculture systems. Research methods and applications for aquaculture planning and management decisions.
 QP: FW 475

876*. Applied Limnology
 Spring of even-numbered years. 3(3-0)

Applied aquatic ecology. Quantitative relationships between physical, chemical and biological parameters in polluted and unpolluted lakes.
 QA: FW 876

FISHERIES AND WILDLIFE

877*. **Fish Population Dynamics**
 Fall of even-numbered years. 3(3-0)
 P: FW 479
 Quantitative analysis of fish populations. Evaluation, causes and impact of the rates of change in survival, growth, reproduction and recruitment for fish populations and their yield.
 QA: FW 877

878*. **Dynamics of Trace Contaminants in Aquatic Systems**
 Spring of even-numbered years. 5(3-4)
 P: Calculus, Computer Science
 Chemical and environmental parameters which control the movement and disposition in aquatic environments. Use of fate models.
 QA: FW 878

879*. **Advanced Limnology**
 Spring of odd-numbered years. 3(3-0)

Physical, chemical and biological processes that affect productivity of aquatic ecosystems.
 QP: FW 477 QA: FW 874 FW 875

891*. **Advanced Topics**
 Fall, Spring, Summer. 2 to 4 credits.
 May reenroll for a maximum of 10 credits.

In depth study of advanced topics in fisheries and wildlife
 QA: FW 802

892*. **Seminar in Fisheries and Wildlife**
 Fall, Spring. 1(1-0) May reenroll for a maximum of 7 credits.

Study and research in advanced problems and current development in Fisheries and Wildlife
 QA: FW 801

898*. **Master's Research**
 Fall, Spring, Summer. 1 to 6 credits.
 May reenroll for a maximum of 10 credits.
 R: 6 19 25
 Master's degree Plan B research paper

899*. **Master's Thesis Research**
 Fall, Spring, Summer. 1 to 6 credits.
 May reenroll for a maximum of 24 credits.
 R: 6 19 25

QA: FW 899

999*. **Doctoral Dissertation Research**
 Fall, Spring, Summer. 1 to 24 credits.
 May reenroll for a maximum of 48 credits.
 P: Admission to doctoral program in Fisheries and Wildlife R: Doctoral level-7 College of Agriculture and Natural Resources- 19 Fisheries and Wildlife- 25

QA: FW 999

FOOD ENGINEERING FE

329*. **Fundamentals of Food Engineering**
 Spring. 3(4-0) Interdepartmental with the Department(s) of Food Science.
 P: MTH 124, PHY 231, FSC 211 R: Juniors and above
 Unit operations in the food industry including: fluid mechanics, heat transfer, rate processes, refrigeration, freezing, and dehydration. Thermal process calculations.
 QP: PHY 237 FSC 211MTH 109ORMTH 111
 QA: ATM 329 FSC 430

381*. **Food Process Engineering I**
 Fall. 3(3-0)
 P: CHE 311 or CE 321 or ME 332 R: Juniors and above Engineering
 Rheological behavior of fluid and semi-solid foods. Applications in mixing, pipeline design, extrusion, calendaring, and coating.
 QP: MTH 310 CHE 340ORCE 321OR QA: FE 475

433*. **Food Dehydration**
 Spring. 3(3-0)
 P: CHE 321 or ME 410 R: Engineering majors
 Dehydration of food and agricultural products, including bin, belt, rotary, spray, microwave, and solar drying of food products.
 QP: AE 352 CHE 343 QA: FE 433

483*. **Food Process Engineering II**
 Fall. 3(3-0)
 P: FE 381 or concurrent, MPH 205, CHE 321 or concurrent, CEM 362 or con R: Juniors and above Engineering
 Kinetics of biological and food reactions, design and analysis of biological reactors, thermal processing, microbial death kinetics, sterilization and pasteurization, thermal process evaluation, aseptic processing.
 QP: CHE 341 FE 475CEM 363MPH 200 QA: FE 477

485*. **Food Process Engineering III**
 Fall. 3(3-0)
 P: FE 381, FE 483 or concurrently or ME 410 R: Juniors and above Engineering
 Diffusion, mass transfer coefficients, separations, freezing, dehydration, process integration and design concepts.
 QP: CHE 340 FE 475ME 411FE 477 QA: FE 373

487*. **Food Engineering Design Project**
 Spring. 4(2-4)
 P: FE 483, FE 485 R: Seniors and above
 FE
 Food engineering design and process integration. Process analysis and modification. Feasibility. Food industry regulations. Case histories from food, pharmaceutical and bioprocess industries.
 QP: AE 486 FE 477 QA: FE 487

490*. **Directed Study**
 Fall, Spring, Summer. 1 to 4 credits.
 May reenroll for a maximum of 9 credits.
 P: FSC 211 or MMM 221 or MTH 235.
 R: Open only to Engineering majors. Approval of department; application required.
 Supervised individual student research and study in food engineering.
 QP: MTH 310 ORFSC 241 QA: FE 480

491*. **Special Topics in Food Engineering**
 Fall, Spring, Summer. 1 to 4 credits.
 May reenroll for a maximum of 8 credits.
 P: FSC 211 or MMM 221 or MTH 235.
 R: Open only to Engineering majors. Approval of department.
 Special topics in food engineering.
 QA: FE 490

FOOD SCIENCE FSC

211*. **Principles of Food Science**
 Fall. 3(3-0)
 P: CEM 141 R: None None None None
 Scientific principles, historical perspective and current status of technology related to food composition, safety, toxicology, processing, preservation and distribution.
 QP: CEM 141B QA: FSC 211

330*. **Food Processing: Fruits and Vegetables**
 Fall. 2(3-3)
 P: MTH 116, FSC 211 R: Sophomore and above
 Fruit and vegetable composition and quality indices. Harvest and post harvest technology. Preservation systems: canning, freezing and specialized techniques.
 QP: MTH 108 ANDMTH 109ORMTH 111
 QA: FSC 460

331*. **Food Processing: Cereals**
 Fall. 2(3-3)
 P: MTH 116, FSC 211 R: Sophomores and above
 Classification and composition of cereals, milling processes, and cereal product manufacture.
 QP: FSC 211 MTH 108ANDMTH 109OR QA: FSC 470

332*. **Food Processing: Dairy Foods**
 Spring. 2(2-6)
 P: MTH 116, FSC 211 R: Sophomores and above
 Fluid milk. Principles and technology involved in manufacturing dairy products. Marketing, distribution and regulations regarding dairy foods.
 QP: MTH 108 ANDMTH 109ORMTH 111
 QA: FSC 400 FSC 405

333*. **Food Processing: Meat, Poultry and Fishery Products**
 Spring. 2(2-6)
 P: MTH 116, FSC 211 R: Sophomores and above
 Meat animal, muscle foods and egg processing technology, product formulation and quality control. Manufacturing practices and principles of fresh, frozen and cured meats, sausages and processed products.
 QP: MTH 108 ANDMTH 109ORMTH 111
 QA: FSC 445

401*. **Food Chemistry**
 Fall. 3(3-0)
 P: FSC 211, CEM 251. R: Not open to freshmen and sophomores. Not open to students with credit in HNF 300.
 Chemical properties of food constituents. Chemical changes in foods during processing and storage affecting texture, color, flavor, stability, and nutritive quality.
 QP: FSC 211 CEM 241 QA: FSC 333 FSC 402

402*. **Food Chemistry Laboratory**
 Fall. 1(0-3)
 P: FSC 401 or concurrently. R: Open only to majors in Food Science, Foods: Technology and Management, and Food Engineering.
 Chemical changes in food constituents which affect stability of food products and properties such as color, flavor and texture.
 QP: FSC 333 QA: FSC 333L

421*. **Food Laws and Regulations**
 Spring. 3(3-0)
 P: HNF 150 or HNF 311 or FSC 211. R: Not open to freshmen and sophomores.
 Adoption, interpretation and enforcement of laws and regulations governing food processing and foodservice systems. Impact of regulation on food production, availability, marketing and safety.
 QP: HNF 102 ORFSC 211ORHNF 411 QA: FSC 205

432*. **Advanced Food Processing: Dairy Foods**
 Fall of odd-numbered years. 3(2-3)
 P: FSC 332 R: Juniors and above
 Theoretical and practical principles of the manufacture of cheese, frozen desserts, butter and powders. Concentration and fractionation techniques for producing dairy based ingredients for food systems.
 QP: FSC 400 QA: FSC 405