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, calendering, 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