

1 Cooperative Education Program. I, II, SS; 1 cr. Work experience which combines classroom theory with practical knowledge of operations to provide students with a background upon which to base a professional career. P: So st.

201 Surveying Fundamentals. I; 1 cr. Techniques with emphasis on the use of tapes, levels, and transits; note keeping and data reduction. P: So st, cons inst.

210 Livestock Housing and Waste Management. II; 3 cr (P-I). Emphasis on dairy, swine and beef; environmental factors related to housing; housing types and components; manure management systems. P: So st.

216 Irrigation Systems– Design and Use. II; 1 cr (P-I). Effect of irrigation development on agricultural and environmental characteristics of areas. Introduction to irrigation system component selection and effective utilization of irrigation systems. P: Soil Sci 301.

218 Drainage Systems. II; 1 cr. Introduction to the engineering aspects of surface and subsurface drainage systems. P: Soil Sci 301 or cons inst.

240 Operating and Management Principles of Agricultural Machines. I; 3 cr (P-E). Principles of performance, capacity, operation, and components of machines used in production agriculture: tillage, chemical application, planting and harvesting of agricultural crops. Economic analysis for profitable equipment sizing, scheduling and system selection. P: Math 112 or 114.

243 Operating and Management Principles of Off-Road Vehicles. II; 3 cr (P-E). Principles of operation of internal combustion engines, fuel metering, cooling, lubrication, clutches, mechanical and hydrostatic transmissions, final drives, hydraulics systems and traction systems. Selection and management of off-road vehicles for agriculture, construction, lawncare and turfgrass industries. P: Math 112 or 114. Not recommended for stdts in engineering.

249 Engineering Principles for Biological Systems. II; 3 cr. Applications of basic engineering principles such as mass and energy balances, psychrometric heat and mass transfer and fluid flow to problems encountered in agricultural and biological systems including grain conditioning, fruit and vegetable storage, food processing, animal housing, and environmental control. P: Math 221.

289 Honors Independent Study. II, SS; 1–2 cr. P: Enrolled in the Cals Honors Prgm & Jr or So st. Inter-Ag 288.

299 Independent Study. I, II; 1–3 cr (I). P: Fr, So or Jr st & written cons inst. Open to Fr.

351 Structural Design for Agricultural Facilities. II; 3 cr. Introduction to agricultural building codes and loads; structural analysis; wood, concrete and soil properties; wood and reinforced concrete design; construction specifications. P: EMA 201.

356 Sustainable Residential Construction. (Crosslisted with Land Arc, ETD) II; 3 cr. Properties and use of building materials, framing systems, HVAC systems, code requirements, conservation of natural resources in building construction and operation. P: Math 112 or equiv. Open to Fr.

364 Engineering Properties of Food and Biological Materials. I; 3 cr (P-D). Study of various physical, mechanical, thermal and other properties of food and biological materials. Importance of such property values on the design and operation of various food and bioprocess engineering systems. P: BSE 249 & ME 361 or ChE 310, or cons inst.

365 Measurements and Instrumentation for Biological Systems. II; 3 cr. Principles of instrumentation and measurement systems, analysis of experimental data, electronic components, instrumentation for measuring various parameters of biological systems (temperature, force, flow). P: Stat 224 & Physics 202 or cons inst.

367 Renewable Energy Systems. (Crosslisted with Envir St) I; 3 cr. Students will learn about the state-of-the-art in renewable energy applications including biomass for heat, electric power and liquid fuels as well as geo-energy sources such as wind, solar, and hydro power. Students will do engineering calculations of power and energy availability of renewable energy sources and learn about requirements for integrating renewable energy sources into production, distribution and end-use systems. P: College algebra, college-level phys sci crse.

372 On-Site Waste Water Treatment and Dispersal. (Crosslisted with Civ Engr, Soil Sci) I; 2 cr. On-site treatment and dispersal of waste water from homes, commercial sources and small communities. Sources, pretreatment units, nutrient removal units, constructed wetlands, surface and soil dispersal systems, recycle and reuse systems, regulations, alternative collection systems. P: Chem 103.

375 Special Topics. 1-4 cr. P: Cons inst.

399 Coordinative Internship/Cooperative Education. I, II, SS; 1-8 cr (A). P: So or Jr or Sr st & cons suprvsg inst & intrshp prog coordinator & advisor.

407 Topics in Appropriate Technology. (Crosslisted with ME) Irr.; 3 cr. Applications of alternative technologies to developing and developed areas of the world. Technologies adapted to intensive use of abundant resources and limited use of scarce resources. Quantitative comparison of alternative technologies relative to task fulfillment, resource requirements, and social priorities. P: Sr or Grad st in engr or phy sci or cons inst.

409 Career Management for Engineers. I, II; 1 cr. Information to aid engineers in career decision making including: personal time and fiscal management, job selection, career development, leadership, legal aspects of engineering, professional ethics. P: Sr st.

441 Rheology of Foods and Biomaterials. (Crosslisted with Food Sci, ME) II; 3 cr. Fundamentals of rheology and rheological evaluations of food and biomaterials; structure-function relationships. P: Physics 201 or CBE 320 or ME 363 or cons inst.

460 Biorefining: Energy and Products from Renewable Resources. II; 3 cr. Concepts, processes, status quo and future direction of biorefining for production of energy (fuels), chemicals and materials from biomass, with emphases on chemical, biological and engineering aspects of the biorefining. . P: Chemistry 109 or equivalent; organic chemistry or equivalent.

472 Sediment and Bio-Nutrient Engineering and Management. I; 3 cr. Hydrologic, biologic and engineering applications in the design and management of sediment and bio-nutrient control systems. P: Jr st in Engr or cons inst.

473 Irrigation and Drainage Systems Design. I; 2 cr. Engineering and management applications of soil-plant-water relationships applied to drainage and irrigation design. P: Jr st in Engr or cons inst.

475 Engineering Principles of Agricultural Machinery. (Crosslisted with ME) I; 3 cr. Engineering design principles of machines for the production, processing and handling of crops for food, fuel, bio-mass and fiber. Environmental and biological factors that influence machine design and operation. Economic and capacity analysis of machines and systems. P: EMA 202 or ME 240, or cons inst.

476 Engineering Principles of Off-Road Vehicles. (Crosslisted with ME) II; 3 cr. Engineering design principles of heavy-duty vehicles intended for off-road use: fuels, engine cycles, engine principles and construction, clutches, mechanical and hydrostatic transmissions, final drives, traction systems, traction modeling, dynamic behavior, suspension systems and braking. P: ME 361, EMA 202 or ME 240 or cons inst.

509 Biological Systems Engineering Senior Design. I; 3 cr. Individual or team work on a biological systems engineering design project: problem identification, information retrieval, specification writing, development and analysis of alternative solutions, selection methodology. P: Sr st.

517 Biology in Engineering Seminar. (Crosslisted with BME, CBE) I; 1 cr. Current topics at the interface of biology and engineering with special emphasis on the ways in which engineers have contributed to knowledge and advances in biology. P: Jr st in engr & one college-level biol crse.

542 Food Engineering Operations. (Crosslisted with Food Sci) II; 4 cr (r-B-A). Lectures and experiments in food engineering operations selected from topics such as: thermodynamics, transport processes, biological kinetics and bioreactor design, thermal process calculations, separation processes, process instrumentation and control, process design and economics, and the use of computers. P: Food Sci 440, Sr st, or cons inst.

571 Small Watershed Engineering. II; 3 cr. Application of engineering principles to small, ungauged watershed analysis. Application of hydrologic and sedimentologic principles to upland watersheds for run-off and sediment control. P: Sr in Engr or Grad st or cons inst.

642 Food and Pharmaceutical Separations. (Crosslisted with Food Sci) I; Odd yrs.; 2-3 cr. Basic principles of production-scale separation processes in the food and pharmaceutical industries including gravity sedimentation and centrifugation, extraction, adsorption, chromatography, precipitation, conventional and membrane filtration, crystallization, and drying. Third credit adds

group term project, integrating principles with experiments, defined by students' interests. P: Cons inst.

671 Topics in Natural Resources Engineering. I, II; 1–3 cr. Advanced topics in natural resource engineering. P: St or Grad st.

681 Senior Honors Thesis. I, II; 2–4 cr. P: Hon candidacy.

682 Senior Honors Thesis. I, II, SS; 2–4 cr. Continuation of 681. P: Honors program candidacy & BSE 681.

691 Senior Thesis. I, II; 2 cr. P: Sr st & cons inst.

692 Senior Thesis. 2 cr. .

699 Special Problems. I, II; 1–4 cr (A). P: Sr st & cons inst.