

BIORESOURCE AND AGRICULTURAL ENGINEERING (BRAE)

undefined

BRAE Courses

BRAE 121. Agricultural Mechanics. 2 units

Identification and use of tools and materials; shop safety; tool sharpening and care; concrete mixes and materials; simple electric wiring; metal work; pipe fitting; basic woodworking; estimating quantities and costs. Students are required to meet safety regulations in laboratory work. 1 lecture, 1 laboratory.

BRAE 128. Careers in Bioresource and Agricultural Engineering. 2 units

Introduction to careers associated with BioResource and Agricultural Engineering, and Agricultural Systems Management. Professional engineering registration process. Engineering problem solution and report format. Design procedures. Engineering fundamentals. Laboratory includes visits to facilities relating to career opportunities. 1 lecture, 1 laboratory.

BRAE 129. Laboratory Skills and Safety. 1 unit

Prerequisite: BRAE and ASM majors only.

Introduction to fabrication and construction materials used in the field of Agricultural Engineering. Fabrication skills in the development of wood, metal, concrete projects, and creative design. Strength tests of wood, fasteners, concrete, and student design projects. 1 laboratory.

BRAE 141. Agricultural Machinery Safety. 3 units

Evaluation of safe tractor and equipment operation. Supervised field operation emphasizing the safe and efficient performance of modern farm and utility-industrial equipment. 2 lectures, 1 laboratory.

BRAE 142. Agricultural Power and Machinery Management. 4 units

Prerequisite: MATH 116 or equivalent.

Evaluation of agricultural machinery and tractor power performance. Equipment studied includes primary and secondary tillage tools, grain drills, row crop planters, sprayers, grain and forage harvesters, and specialty crop harvesters. Emphasis on management, selection, cost analysis using computers and efficient operation of agricultural machinery. 3 lectures, 1 laboratory.

BRAE 150. Design Graphics and CAD for Agricultural Engineering. 2 units

Visual communication in engineering design and problem solving. Principles of freehand sketching, and computer-aided-drafting. Computer aided drafting using CAD software. 2-D projections including automatic dimensioning and hatching. Plan set development and external references. Land grading design, using 3-D drawing software. Not open to students with credit in BRAE 133 and BRAE 151. 2 laboratories.

BRAE 152. 3-D Solids Modeling. 1 unit

Prerequisite: BRAE 133 and BRAE 151; or BRAE 150.

Introduction to 3-dimensional solids modeling using state-of-the-art software. Model generation and modification of associative properties, assembly modeling, extrusions and revolutions. 1 laboratory.

BRAE 200. Special Problems for Undergraduates. 1-4 units

Prerequisite: Consent of department head.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

BRAE 203. Agricultural Systems Analysis. 4 units

Prerequisite: MATH 118 or equivalent.

Agricultural Systems Analysis investigates the interrelationships between sub-components in an overall system. Problem solving algorithms, network analysis, project planning techniques, and optimization. 2 lectures, 2 activities.

BRAE 213. Bioengineering Fundamentals. 2 units

2020-21 or later catalog: GE Area B2

2019-20 or earlier catalog: GE Area B2

Prerequisite: MATH 142; for engineering students only. Corequisite: BIO 213. Recommended: CHEM 124.

Treatment of the engineering applications of biology. Genetic engineering and the industrial application of microbiology. Systems physiology with engineering applications. Structure and function relationships in biological systems. The impact of life on its environment. Course may be offered in classroom-based or online format. 2 lectures. Crosslisted as BMED/BRAE 213. Fulfills GE B2.

BRAE 216. Fundamentals of Electricity. 4 units

Prerequisite: BRAE 129; MATH 142; and PHYS 131 or PHYS 141.

Application of electricity in BioResource and Agricultural Engineering, including basic electric circuits. Will include wiring materials, code regulations, electrical measurements, R-L-C circuit fundamentals, system planning, motors, basic electronics, and an introduction to computer usage. 3 lectures, 1 laboratory.

BRAE 232. Agricultural Structures Planning. 4 units

Prerequisite: BRAE 150 or BRAE 151; and PHYS 132.

Planning of facilities required in production systems. Materials and processes used in construction of agricultural structures. Environmental factors affecting crop storage structures and animal housing. Design of structural environments to meet the needs of commodities, animals, and plants. 3 lectures, 1 laboratory.

BRAE 234. Introduction to Mechanical Systems in Agriculture. 4 units

Prerequisite: BRAE 152; and PHYS 131 or PHYS 141.

Introduction to elements used in the mechanical transmission of power and force in agricultural systems. Power transmission using v-belts. roller chain, gear and shaft drives, hydraulic actuators. Linear and nonlinear actuation devices including linkages, cams, and hydraulic/pneumatic cylinders. 3 lectures, 1 laboratory.

BRAE 236. Principles of Irrigation. 4 units

Prerequisite: MATH 141.

Land grading design, operation, management, and evaluation of irrigation methods. 3 lectures, 1 laboratory.

BRAE 237. Introduction to Engineering Surveying. 2 units

Prerequisite: MATH 119.

Introduction to field measurement using automatic levels, total stations, robotic stations, GNSS RTK receivers and field data collectors. Field procedures for differential and profile leveling, directional measurement, traversing and construction surveying. An understanding in direction, elevation and earthwork volume computations. 1 lecture, 1 laboratory.

BRAE 239. Engineering Surveying. 4 units

Prerequisite: MATH 119.

Field measurement using levels, robotic stations, RTK receivers, data collectors. Leveling, profiles, traverses, traverse adjustment, triangulation, earthwork volumes and curve alignment computations. Topographic surveys, topographic mapping, building layout, road design. Topics as geodetic survey, licensing, aerial mapping, GIS, and remote sensing. 2 lectures, 2 laboratories.

BRAE 240. Agricultural Engineering Laboratory. 1 unit

Prerequisite: Consent of instructor.

Individual projects. Total credit limited to 4 units. 1 laboratory.

BRAE 244. Precision Farming. 4 units

Prerequisite: AEPS 133 or AEPS 190 or AEPS 260 or BRAE 237 or BRAE 239.

Precision agriculture applications. Integrating GIS, GPS, and remote sensing technologies with site-specific farming practices to optimize agricultural productivity. Field trip required. 3 lectures, 1 laboratory. Crosslisted as AEPS/BRAE 244.

BRAE 247. Forest Surveying. 2 units

Prerequisite: NR 215.

Use and care of tapes, staff compass, abney levels, total stations, and GPS receivers. Keeping field notes, measurements by tape. Closed and open traverse by compass and total stations. Turning angles and determining directions of lines. Map reading and public land description. GPS measurements. Weekend field trips required. 1 lecture, 1 laboratory. Crosslisted as BRAE/NR 247.

BRAE 270. Selected Topics. 1-4 units

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

BRAE 301. Hydraulic and Mechanical Power Systems. 4 units

Prerequisite: BRAE 152; and PHYS 121 or PHYS 141.

Selection, application and use of hydraulic components and mechanical power transmission equipment. Use of standardized circuit design procedures. 3 lectures, 1 laboratory.

BRAE 302. Servo Hydraulics. 4 units

Prerequisite: BRAE 216 or BRAE 324 and BRAE 234 or BRAE 301.

Application of microcomputers and programmable logic controllers to hydraulic, pneumatic and mechanical systems. Theory, instrumentation and sensors used in process and control systems used in agricultural equipment. 3 lectures, 1 laboratory.

BRAE 312. Hydraulics. 4 units

Prerequisite: PHYS 132, ME 211.

Static and dynamic characteristics of liquids, flow in open and closed channels, uniform and nonuniform flow, flow measurement, pumps. 3 lectures, 1 laboratory.

BRAE 317. Agricultural Systems Management Theory. 4 units

Prerequisite: BRAE 203.

Introduction to systems and technical management with application in agricultural business settings, including logistics, reliability, system behavior, causal loops, feedback and delay. Data analysis, systematic decision-making, and simulation. Field trip required. 4 lectures.

BRAE 320. Principles of Bioresource Engineering. 4 units

Prerequisite: BRAE 232; BRAE 236; CHEM 125; and PHYS 132.

Theory and applications of bioprocess technology in biological and agricultural systems. Engineering properties of biological materials and organisms. Basic unit operations, fluid mechanics and heat/mass transfer as applied to bioprocess technology. Special requirements of agricultural and biological processes. 3 lectures, 1 laboratory.

BRAE 321. Agricultural Safety. 3 units

Prerequisite: Junior standing.

Principles of agricultural safety. Accident causation and prevention, hazard identification and abatement, laws and regulations. Machinery, electrical, chemical, livestock, shop and fire safety. Safety program development. 2 lectures, 1 activity.

BRAE 324. Principles of Agricultural Electrification. 4 units

Prerequisite: MATH 119, PHYS 121.

Applications of DC/AC electricity in agriculture. National Electric Code regulations. The wiring of agricultural structures and electrical distribution. Series, parallel and series-parallel circuits, R-L-C circuits, electric motors, electronics. 3 lectures, 1 laboratory.

BRAE 328. Measurements and Computer Interfacing. 4 units

Prerequisite: EE 321; EE 361; and CSC 231 or CSC 232 or CSC 234.

Transducers and engineering measurements in agricultural engineering. Covering transducer characteristics, signal processors and controllers, instrumentation techniques, and the use of the computer in the measurement and control of typical engineering problems. 3 lectures, 1 laboratory.

BRAE 331. Irrigation Theory. 3 units

Prerequisite: BRAE 236 or BRAE 340; MATH 141.

Plant-water-soil relations examining evapotranspiration, plant stress, soil moisture depletion, irrigation frequency and depth, salinity management, infiltration, drainage and climate control. 3 lectures.

BRAE 332. Environmental Controls for Agricultural Structures. 4 units

Prerequisite: BRAE 232.

Design of internal environments to meet the needs of commodities, animals, and plants. Thermodynamic and psychrometric principles for agricultural structures. Heat transfer, insulation and refrigeration. Sensing, monitoring and controlling environmental factors affecting crop storage structures and animal housing. 4 lectures.

BRAE 333. Aquacultural Engineering. 3 units

Prerequisite: Junior standing and MATH 118.

Application of aquacultural engineering principles for freshwater and marine food-production systems. Examination of system design constraints for maximizing productivity and minimizing environmental impacts, nutrient management, gas exchange and animal husbandry. Field trip required. 2 lectures, 1 laboratory.

BRAE 335. Internal Combustion Engines. 4 units

Prerequisite: Junior standing.

Principles of operation of internal combustion engines. Theory of operation and diagnosis evaluation and repair of small engines, gasoline and diesel engines and economics of operation, use and repair. Power analysis and application. 3 lectures, 1 laboratory.

BRAE 337. Landscape Irrigation. 4 units

Prerequisite: MATH 118.

Design of sprinkler and drip irrigation systems including: site characteristics, soil variables affecting water storage and infiltration rate, plant selection and hydrozones, hydraulics, nozzle spacing, selection of system components, back flow prevention, plumbing codes and cost estimating. Irrigation system evaluation and audit irrigation scheduling, and water budget. 3 lectures, 1 laboratory.

BRAE 339. Internship in Bioresource and Agricultural Engineering. 1-12 units

CR/NC

Prerequisite: Consent of internship instructor.

Students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Credit/No Credit grading only.

BRAE 340. Irrigation Water Management. 4 units

2020-21 or later: Upper-Div GE Area B

2019-20 or earlier catalog: GE Area B5, B6, or B7

Prerequisite: Junior standing; completion of GE Area A with grades of C- or better; completion of one course in GE Area B4 with a grade of C- or better (GE Area B1 for students on the 2019-20 or earlier catalogs).

California water supply and budget; water rights and issues. Local, state and federal water institutions. Water measurement; basic hydraulics; irrigation systems; distribution uniformity and efficiency. Soil-plant-water relationships; soil moisture measurement; evapotranspiration; irrigation schedules; practical constraints affecting scheduling; salinity and drainage. 3 lectures, 1 laboratory. Fulfills GE Area Upper-Division B (GE Areas B5, B6, or B7 for students on the 2019-20 catalog).

BRAE 342. Agricultural Materials. 4 units

Prerequisite: PHYS 121; SS 120 or SS 121; and MATH 119.

Physical properties of agricultural materials and their measurement. Strength of materials, material flow and transport, material deformation, shape and size classification, moisture relationships and biological interactions. Interactions between agricultural materials, the environment and equipment used to handle them. 3 lectures, 1 laboratory.

BRAE 343. Mechanical Systems Analysis. 4 units

Prerequisite: BRAE 342.

Use of statics and dynamics to make original calculations, plans, sketches, graphics, drawings, schemes and layouts for the fabrication and construction of machines. 3 lectures, 1 laboratory.

BRAE 344. Fabrication Systems. 4 units

Prerequisite: BRAE 343.

Fabrication systems including cutting, sawing, shearing, bending, welding, grinding, cleaning, painting and proper safety procedures. Experimental projects to include team design and construction, presentation, organization, and evaluation. 2 lectures, 2 laboratories.

BRAE 345. Aerial Photogrammetry and Remote Sensing. 3 units

Prerequisite: MATH 118.

Concepts of photogrammetry and remote sensing. Object recognition, stereoscopic viewing, elevation determination, and scale. State-of-the-art techniques for collecting, processing, and interpreting remote sensing data. Digital image analysis techniques such as image enhancement, change detection, unsupervised and supervised classifications. 2 lectures, 1 laboratory.

BRAE 348. Energy for a Sustainable Society. 4 units

2020-21 or later: Upper-Div GE Area B

2019-20 or earlier catalog: GE Area B5, B6, or B7

Prerequisite: Junior standing; completion of GE Area A with grades of C- or better; completion of one course in GE Area B4 with a grade of C- or better (GE Area B1 for students on the 2019-20 or earlier catalogs).

Study of how the transition can be made from fossil fuels to renewable energy sources including hydro, biomass, solar, wind, and energy conservation. Environmental, economic, and political consequences of a renewable energy-based sustainable society. 3 lectures, 1 activity. Fulfills GE Area Upper-Division B (GE Areas B5, B6, or B7 for students on the 2019-20 catalog).

BRAE 349. Water for a Sustainable Society. 4 units

2020-21 or later: Upper-Div GE Area D

2019-20 or earlier catalog: GE Area D5

Prerequisite: Junior standing; completion of GE Area A with grades of C- or better; one course in GE Area B4 with a grade of C- or better (GE Area B1 for students on the 2019-20 or earlier catalogs); and two lower-division courses in GE Area D.

Historical, political, economic, socio-technical, and cultural dimensions of water sustainability. Overview of complex systems with an emphasis on individual choices and their impact on water sustainability. Exploration of core sustainability concepts; practices, barriers and goals related to water resources. Course offered online only. 4 lectures. Crosslisted BRAE/NR 349. Fulfills GE Upper-Division D (GE Area D5 for students on the 2019-20 or earlier catalogs).

BRAE 355. Drone Assisted Surveying. 4 units

Prerequisite: BRAE 239; GEOG 328 or BRAE 345; NR 218 or GEOG 318; and STAT 217 or STAT 218.

Integration of remote sensing, surveying, natural resource management, applied drone technology. Understanding laws, regulations, measurement concepts, and big data. Field applications using Unmanned Aerial Systems and Global Navigation Satellite Systems. Creation of maps and supporting documents for use in GIS. 2 lectures, 2 laboratories. Crosslisted as BRAE/NR 355.

BRAE 400. Special Problems. 1-4 units

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems in agriculture. Total credit limited to 8 units, with a maximum of 4 units per quarter.

BRAE 403. Agricultural Systems Engineering. 4 units

Prerequisite: MATH 242 or MATH 244. Corequisite: STAT 312.

Engineering and economic principles combined with mathematical optimization techniques to evaluate parameters in agricultural production and processing systems. Project planning techniques, linear and nonlinear modeling, response surface methodology. Professional responsibilities in Agricultural Engineering including ethics, patents, copyrights, liability. 3 lectures, 1 laboratory.

BRAE 405. Chemigation. 1 unit

Prerequisite: BRAE 236 or BRAE 340; or graduate standing.

Fertilizer and chemical injection through irrigation systems. Hardware, fertilizer compounds, and distribution uniformity. Matching chemicals and equipment to specific irrigation methods. Safety. 1 laboratory.

BRAE 414. Irrigation Engineering. 4 units

Prerequisite: BRAE 331 or BRAE 340; BRAE 312 with a grade of C or better; or graduate standing.

Design of on-farm irrigation systems; micro, surface, and sprinkler irrigation systems; canals and pumps; economic and strategies of pipe design; pipeline protection. 3 lectures, 1 laboratory.

BRAE 418. Agricultural Systems Management I. 4 units

Prerequisite: BRAE 203; AGB 310; and completion of GE Area A3 with a grade of C- or better; or graduate standing.

Project management of agricultural systems. Emphasis placed on a team approach to problem solution. Case studies and student projects used to explore the following topics: project leadership, project organization, communication, needs assessment, feasibility studies, cost analysis, decision making, solution implementation, and evaluation. 3 lectures, 1 laboratory.

BRAE 419. Agricultural Systems Management II. 4 units

Prerequisite: BRAE 418.

Project management of agricultural systems. Emphasis placed on a team approach to problem solution. Case studies and student projects used to explore the following topics: project leadership, project organization, communication, needs assessment, feasibility studies, cost analysis, decision making, solution implementation, and evaluation. 2 lectures, 2 laboratories.

BRAE 421. Equipment Engineering I. 4 units

Prerequisite: BRAE 152; CE 204; and ME 212.

Design of specialized agricultural components and equipment. 3 lectures, 1 laboratory.

BRAE 422. Equipment Engineering II. 4 units

Prerequisite: BRAE 421.

Fabrication and construction of specialized agricultural components and equipment. 2 lectures, 2 laboratories.

BRAE 425. Computer Controls for Agriculture. 3 units

Prerequisite: BRAE 324.

Computer activated controls as applied to agricultural machinery, agricultural structures, processing and irrigation industries. Encompassing control logic to evaluate stability behavior of systems of computer interfacing, data input and control output. 2 lectures, 1 laboratory.

BRAE 428. Agricultural Robotics and Automation. 4 units

Prerequisite: BRAE 328.

Agricultural applications of signal processing, control theories, machine vision and robot basics for agricultural production and processing. Approaches and constraints related to agricultural automation and the use of robotics in field applications. Engineering approach to problem-solving and experimental data analysis. Field trip required. 3 lectures, 1 laboratory.

BRAE 432. Agricultural Buildings. 4 units

Prerequisite: PHYS 121, BRAE 342, BRAE 343.

Selection of buildings, storage units, and related equipment for production agriculture. Economics and functionality of various designs and construction materials. Environmental factors affecting crop storage and animal housing. 3 lectures, 1 laboratory.

BRAE 433. Agricultural Structures Design. 4 units

Prerequisite: BRAE 232, CE 204.

Structural analysis and design of agricultural service and processing buildings. Emphasis on use of wood, metals, and reinforced concrete in light construction. 3 lectures, 1 laboratory.

BRAE 434. Automotive Engineering for a Sustainable Future. 4 units

Prerequisite: Junior standing in any engineering or physical science major.

Multidisciplinary investigation of automotive renewable fuels and electric/hybrid vehicles. Analyze and design related technologies and systems. Methods for complete-cycle energy and GHG analysis. Comparative emissions, efficiency, power output, and infrastructure requirements. Laboratory projects converting engines and vehicles to operate on alternative fuels or electric propulsion. 3 lectures, 1 laboratory. Crosslisted as BRAE/EE 434.

BRAE 435. Drainage. 4 units

Prerequisite: BRAE 312 or BRAE 340; or graduate standing.

Relevant principles of hydrology and porous media flow. Flow nets, wells and ground water, design of simple surface and sub-surface drains. 3 lectures, 1 laboratory.

BRAE 436. Food and Agriculture Process Water Engineering. 4 units

Prerequisite: one of the following: BIO 111, BIO 161, BOT 121, BRAE 213, or MCRO 221; and CHEM 125 or CHEM 128.

Theory and design of facilities for physical and chemical treatment of water used in agricultural practices to sanitize crops as they are harvested, and water used while processing the commodities. This course also includes the design of chemical and biological reactors. 3 lectures, 1 activity.

BRAE 438. Drip/Micro Irrigation. 4 units

Prerequisite: BRAE 236 or BRAE 340; or graduate standing.

Drip/micro irrigation hardware and management. Emphasizes agricultural drip/micro irrigation with some landscape application. Filtration, emitters, chemical injection, agronomic constraints, and scheduling. Field trip(s) included. 3 lectures, 1 laboratory.

BRAE 440. Agricultural Irrigation Systems. 4 units

Prerequisite: BRAE 340 or graduate standing.

On-farm irrigation system evaluation and management. Drip, micro-spray, furrow, border strip, sprinkler systems. Irrigation efficiency and uniformity. Pumping costs. For non-BRAE majors only. 3 lectures, 1 laboratory.

BRAE 447. Advanced Surveying with GIS Applications. 4 units

Prerequisite: BRAE 239.

Field skills in precise mapping, high order control and terrestrial imagery. CAD mapping and design. Work with large datasets on regional surface models. Collect, manipulate data for GIS. Basics of boundary law and limitations of using land boundaries in GIS. 2 lectures, 2 laboratories.

BRAE 448. Bioconversion. 4 units

Prerequisite: MATH 118 or equivalent.

Biological, thermal and physical techniques for converting biomass into useful energy forms for agriculture and industry. Laboratory exercises include experiments with anaerobic digestion of animal wastes into methane, ethanol fermentation of grains and composting of agricultural residues. Technical and economic feasibility of biofuels. 3 lectures, 1 laboratory.

BRAE 450. Solar Photovoltaic System Engineering. 4 units

Prerequisite: one of the following: PHYS 104; PHYS 118; PHYS 121; or PHYS 141; and junior standing.

Engineering principles, design, and installation of solar photovoltaic power systems including grid-tie and off-grid systems. Photonic energy conversion, solar module engineering, solar power electronics, photovoltaic site planning, mechanical and structural considerations, permit processes, government incentives, and analysis of financial and investment issues. Field trips required. 3 lectures, 1 laboratory. Crosslisted as BRAE/EE/HNRS 450.

BRAE 460. Senior Project Organization. 1 unit

Prerequisite: Completion of GE Area A3 with a grade of C- or better.

Selection and organization of senior project. Involves time management, research techniques, budgeting and project presentation. Documentation of multidisciplinary team experience. 1 lecture.

BRAE 461. Senior Project I. 2 units

Prerequisite: BRAE 460.

Solution of an engineering or systems management problem in agriculture. May involve research methodology, problem statement, analysis, synthesis, project design, construction, and evaluation. Project requires 150 hours with a minimum of faculty supervision.

BRAE 462. Senior Project II. 2 units

Prerequisite: BRAE 461.

Solution of an engineering or systems management problem in agriculture. May involve research methodology, problem statement, analysis, synthesis, project design, construction, and evaluation. Project requires 150 hours with a minimum of faculty supervision.

BRAE 465. Senior Project Operation, Testing, and Safety. 2 units

Prerequisite: BRAE 419 or BRAE 422; and BRAE 460.

Final course in the senior design series. Preparation of an Operation, Maintenance and Safety manual for projects fabricated in the earlier courses. Develop a memorandum and video documenting the design, fabrication, and testing phases. Final oral presentation for each group. 1 lecture, 1 laboratory.

BRAE 470. Selected Advanced Topics. 1-4 units

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 lectures.

BRAE 471. Selected Advanced Laboratory. 1-4 units

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

BRAE 481. Advanced Agricultural Mechanics. 2 units

Prerequisite: Agricultural teacher candidates starting/returning from student teaching, senior or graduate standing or consent of instructor.

Advanced shop skills. Carpentry, electricity, plumbing, surveying, power mechanics, tractor equipment operation and maintenance. 1 lecture, 1 laboratory.

BRAE 485. Cooperative Education Experience in BioResource and Agricultural Engineering. 6 units

CR/NC

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience with an approved BioResource and Agricultural Engineering firm engaged in production or related business, industry or governmental agency. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 4 units; total credit limited to 12 units. Credit/No Credit grading only.

BRAE 495. Cooperative Education Experience in BioResource and Agricultural Engineering. 12 units

CR/NC

Prerequisite: Sophomore standing and consent of instructor.

Full time work experience with an approved BioResource and Agricultural Engineering firm engaged in production or related business, industry or governmental agency. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 4 units; total credit limited to 12 units. Credit/No Credit grading only.

BRAE 500. Individual Study. 1-3 units

Prerequisite: Consent of instructor.

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Total credit limited to 6 units, repeatable in same term.

BRAE 532. Water Wells and Pumps. 4 units

Prerequisite: BRAE 312 or BRAE 340 or CE 336 or ME 341.

Water well drilling, design, and development. Pump characteristics and system head. Series and parallel operation. Design of pump intakes. Variable speed electric drives and engines. Pump testing. 3 lectures, 1 laboratory.

BRAE 533. Irrigation Project Design. 4 units

Prerequisite: BRAE 312, BRAE 340 or equivalent (hydraulics/fluid mechanics course).

Advanced open channel and pipeline controls for unsteady flow. Social aspects of improved water delivery to customers. Engineering solutions for modernizing irrigation projects, including open-channel flow measurement, advanced control structure design, determining capacities, and Supervisory Control and Data Acquisition (SCADA) systems. 3 lectures, 1 laboratory.

BRAE 570. Selected Advanced Topics in BioResource and Agricultural Engineering. 1-4 units

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 12 units. 1 to 4 seminars.

BRAE 571. Selected Advanced Laboratory in Bioresources and Agricultural Engineering. 1-4 units

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

BRAE 599. Thesis in BioResource and Agricultural Engineering. 1-9 units

Prerequisite: Graduate standing and consent of instructor.

Systematic research of a significant problem in bioresource and agricultural engineering. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units.