**BIOLOGICAL SYSTEMS ENGINEERING (BSE)**

**BSE 1 — COOPERATIVE EDUCATION PROGRAM**
1 credit.

Work experience which combines classroom theory with practical knowledge of operations to provide students with a background upon which to base a professional career. Enroll Info: So st

Requisites: Consent of instructor
Course Designation: Workplace - Workplace Experience Course
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2021

**BSE 170 — PRODUCT DESIGN PRACTICUM**
2 credits.

Working in small groups, students design, fabricate and test a device that solves a real world problem. Lectures address information retrieval techniques, specification writing, methods for enhancing creativity, selection methodologies, safety engineering, sustainability in design, shop safety, fabrication equipment and techniques, and oral and written communication. Enroll Info: This course is intended for first year students (freshman or transfer) declared in Biological Systems Engineering or Pre-Biological Systems Engineering

Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2021

**BSE 201 — LAND SURVEYING FUNDAMENTALS**
1 credit.

Basic surveying terminology, equipment, note keeping, computations and data presentation. Emphasis on differential leveling, radial topographic surveying and radial stakeout using a total station survey instrument. Enroll Info: So st, cons inst

Requisites: None
Course Designation: Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Fall 2019

**BSE 243 — OPERATING AND MANAGEMENT PRINCIPLES OF OFF-ROAD VEHICLES**
3 credits.

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. Enroll Info: MATH 112 or 114. Not recommended for sttds in engineering

Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2015

**BSE 249 — ENGINEERING PRINCIPLES FOR BIOLOGICAL SYSTEMS**
3 credits.

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. Enroll Info: MATH 221

Requisites: None
Repeatable for Credit: No
Last Taught: Fall 2020

**BSE 270 — INTRODUCTION TO COMPUTER AIDED DESIGN**
3 credits.

Introduction to computer aided design (CAD) concepts and techniques, including two- and three-dimensional drawing presentation, methods of graphic communication and design synthesis. Specific topics include parametric solid modeling, part design, survey data and surface construction, orthographic drawings, dimensioning rules and drawing standards, assemblies, and animation. Enroll Info: None

Requisites: None
Repeatable for Credit: No
Last Taught: Summer 2021

**BSE 289 — HONORS INDEPENDENT STUDY**
1-2 credits.

Enroll Info: Enrolled in the CALS Honors Prgm Jr or So st. INTER-AG 288

Requisites: Consent of instructor
Course Designation: Honors - Honors Only Courses (H)
Repeatable for Credit: Yes, unlimited number of completions

**BSE 299 — INDEPENDENT STUDY**
1-3 credits.

Enroll Info: Freshmen, Sophomore or Junior standing written consent of instructor. Open to Freshmen

Requisites: Consent of instructor
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Summer 2021

**BSE 308 — CAREER MANAGEMENT FOR ENGINEERS**
1 credit.

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. Enroll Info: None

Requisites: None
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2021
**BSE 310 — PROJECT ECONOMICS & DECISION ANALYSIS**

3 credits.

Evaluation techniques for research, development engineering projects. Covers the time value of money and other cash-flow concepts, capital budgeting, economic practices and techniques used to evaluate and optimize decisions, and research development project portfolio management techniques. Enroll Info: None

**Requisites:** MATH 113, 114, or (MATH 171 and 217)

**Course Designation:** Breadth - Social Science

**Level:** Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

**Repeatable for Credit:** No

**Last Taught:** Spring 2021

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**BSE 349 — QUANTITATIVE TECHNIQUES FOR BIOLOGICAL SYSTEMS**

3 credits.

Principles of how energy and materials are utilized in Cells, organisms and ecosystems. Mass transfer, heat and energy balances applied to cell metabolism, plants, and ecosystems. Quantification of biological processes to allow manipulation for human benefit. Enroll Info: None

**Requisites:** None

**Course Designation:** Breadth - Biological Sci. Counts toward the Natural Sci req

**Level:** Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

**Repeatable for Credit:** No

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**BSE 351 — STRUCTURAL DESIGN FOR AGRICULTURAL FACILITIES**

3 credits.

Introduction to agricultural building codes and loads; structural analysis; wood, concrete and soil properties; wood and reinforced concrete design; construction specifications. Enroll Info: EMA 201

**Requisites:** None

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Fall 2016

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**BSE/DS/LAND ARC 356 — SUSTAINABLE RESIDENTIAL CONSTRUCTION**

3 credits.

Properties and use of building materials, framing systems, HVAC systems, code requirements, conservation of natural resources in building construction and operation. Enroll Info: None

**Requisites:** MATH 112, 114, or 171

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Sustain - Sustainability**

**Repeatable for Credit:** No

**Last Taught:** Spring 2016

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**BSE 364 — ENGINEERING PROPERTIES OF FOOD AND BIOLOGICAL MATERIALS**

3 credits.

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. Enroll Info: BSE 249 ME 361 or ChE 310, or cons inst

**Requisites:** None

**Course Designation:** Breadth - Physical Sci. Counts toward the Natural Sci req

**Repeatable for Credit:** No

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**BSE 365 — MEASUREMENTS AND INSTRUMENTATION FOR BIOLOGICAL SYSTEMS**

3 credits.

Principles of instrumentation and measurement systems, analysis of experimental data, electronic components, instrumentation for measuring various parameters of biological systems (e.g., temperature, force, flow). Enroll Info: None

**Requisites:** Declared in Biological Systems Engineering program.

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Spring 2021

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**BSE/ENVIR ST 367 — RENEWABLE ENERGY SYSTEMS**

3 credits.

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. Enroll Info: None

**Requisites:** MATH 112 or 114 or graduate/professional standing

**Course Designation:** Breadth - Physical Sci. Counts toward the Natural Sci req

**Level:** Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Grad 50% - Counts toward 50% graduate coursework requirement

**Sustain - Sustainability**

**Repeatable for Credit:** No

**Last Taught:** Summer 2021

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**BSE/CIV ENGR/SOIL SCI 372 — ON-SITE WASTE WATER TREATMENT AND DISPERSAL**

2 credits.

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. Enroll Info: None

**Requisites:** CHEM 103, 109, or 115

**Course Designation:** Sustain - Sustainability

**Repeatable for Credit:** No

**Last Taught:** Fall 2020
BSE 375 — SPECIAL TOPICS
1-4 credits.

Enroll Info: None
Requisites: None
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Summer 2021

BSE 380 — INTRODUCTORY DATA SCIENCE FOR THE AGRICULTURAL AND LIFE SCIENCES
3 credits.

Agricultural and life scientists need to creatively apply physical, chemical, and biological principles to address technical, business, and environmental challenges. Many of these challenges involve numerical analyses, including the interpretation of large datasets. The fundamentals of computer coding using numerical software will be taught, using real-world data science challenges from the agricultural and life sciences. Enroll Info: None
Requisites: (CHEM 103, 109, or 115) and (MATH 112, 114, 217 or placement into MATH 211 or 221)
Repeatable for Credit: No

BSE 399 — COORDINATIVE INTERNSHIP/COOPERATIVE EDUCATION
1-8 credits.

Enroll Info: So or Jr or Sr st cons suprvsg inst intrshp progm coordinator advisor
Requisites: Consent of instructor
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S Workplace - Workplace Experience Course
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Summer 2020

BSE 400 — STUDY ABROAD IN BIOLOGICAL SYSTEMS ENGINEERING
1-6 credits.

Provides an area equivalency for courses taken on Madison Study Abroad Programs that do not equate to existing UW courses. Enroll Info: Current enrollment in a UW-Madison study abroad program
Requisites: None
Repeatable for Credit: Yes, unlimited number of completions

BSE/FOOD SCI/M E 441 — RHEOLOGY OF FOODS AND BIOMATERIALS
3 credits.

Fundamentals of rheology and rheological evaluations of food and biomaterials; structure-function relationships. Enroll Info: None
Requisites: (PHYSICS 201, 207, 247 or E M A 201) and (B M E 320 or M E 363), or graduate/professional standing, or member of Engineering Guest Students
Repeatable for Credit: No
Last Taught: Spring 2016

BSE 460 — BIOREFINING: ENERGY AND PRODUCTS FROM RENEWABLE RESOURCES
3 credits.

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. Enroll Info: CHEM 109 or equiv; organic chem or equiv
Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Spring 2021

BSE 461 — FOOD AND BIOPROCESSING OPERATIONS
3 credits.

Principles of mechanics, fluid dynamics, and heat and mass transfer as applied to food and bioprocessing operations. Specific focus on unit operations and equipment associated with the products key to Wisconsin industries including pulp and paper, dairy products, ethanol, forage, and grain. Enroll Info: None
Requisites: (BSE 249 or CBE 250) and (CIV ENGR 310 or CBE 320 or ME 363) and declared in Bio Systems, Biomedical, Chemical, Civil, Computer, Electrical, Geological, Industrial, Mechanical, Nuclear, Engineering Physics, Engineering Mechanics, MSE, or grad standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2020

BSE 464 — HEAT AND MASS TRANSFER IN BIOLOGICAL SYSTEMS
3 credits.

Introduction to heat and mass transfer fundamentals, including transport mechanisms of conduction, convection, radiation, diffusion and evaporation. Development of governing equations and boundary conditions with application to living systems, controlled environments, water systems, and food processing. Introduction to, and application of, finite-difference and finitevolume methods, including computational fluid dynamics (CFD). Enroll Info: M E 361, CBE 310 or an equivalent Thermodynamics course; M E 363, CBE 320, CEE 310 or an equivalent Fluid Mechanics course
Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2021

BSE 472 — SEDIMENT AND BIO-NUTRIENT ENGINEERING AND MANAGEMENT
3 credits.

Hydrologic, biologic and engineering applications in the design and management of sediment and bio-nutrient control systems. Enroll Info: Jr st in Engr or cons inst
Requisites: None
Course Designation: Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Spring 2021
BSE 473 — WATER MANAGEMENT SYSTEMS
3 credits.
Engineering and management applications of soil-plant-water relationships applied to water management systems and efficient water use. Enroll Info: None
Requisites: MATH 217, 221, 275, or graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Fall 2020

BSE/M E 475 — ENGINEERING PRINCIPLES OF AGRICULTURAL MACHINERY
3 credits.
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. Enroll Info: None
Requisites: Declared in Biological Systems Engineering or Mechanical Engineering and (M E 240, E M A 202, PHYSICS 201, 207, or 247), graduate/professional standing, or member of Engineering Guest Students
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2020

BSE/M E 476 — ENGINEERING PRINCIPLES OF OFF-ROAD VEHICLES
3 credits.
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. Enroll Info: None
Requisites: (M E 361 or concurrent enrollment), (M E 240, E M A 202, PHYSICS 201, 207, or 247), and declared in Biological Systems Engineering or Mechanical Engineering or graduate/professional standing, or member of Engineering Guest Students
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2021

BSE/CIV ENGR 491 — LEGAL ASPECTS OF ENGINEERING
3 credits.
Legal principles and institutions germane to engineering practice; formation and performance of engineer-client and owner-contractor relationships; preparation of technical specifications; surety bonds and insurance; construction liens; contract administration; construction contract remedies; intellectual property of engineers; engineers’ obligations to society and their fellow engineers. Enroll Info: Sr st or cons inst
Requisites: None
Repeatable for Credit: No
Last Taught: Fall 2020

BSE 508 — BIOLOGICAL SYSTEMS ENGINEERING DESIGN PRACTICUM I
2 credits.
Overview of the engineering design process including problem identification, information retrieval, specification writing, development and analysis of alternative solutions, selection methodology, product safety, standardization, scheduling and cost estimating. Students develop design project proposals for real-world design problems. Enroll Info: Junior standing
Requisites: None
Course Designation: Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Summer 2021

BSE 509 — BIOLOGICAL SYSTEMS ENGINEERING DESIGN PRACTICUM II
3 credits.
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. Enroll Info: None
Requisites: Declared in Biological Systems Engineering program with Senior standing and BSE 508
Course Designation: Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Fall 2020

BSE/B M E/CBE 517 — BIOLOGY IN ENGINEERING SEMINAR
1 credit.
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. Enroll Info: None
Requisites: Junior standing and (ZOOLOGY/BIOLOGY 101 and 102, ZOOLOGY/BIOLOGY/BOTANY 151, ZOOLOGY 153, or BIOCORE 381), graduate/professional standing, or member of Engineering Guest Students
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Summer 2021

BSE 571 — SMALL WATERSHED ENGINEERING
3 credits.
Application of engineering principles to small, ungauged watershed analysis. Application of hydrologic and sedimentologic principles to upland watersheds for run-off and sediment control. Enroll Info: Sr in Engr or Grad st or cons inst
Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2021
BSE/FOOD SCI 642 — FOOD AND PHARMACEUTICAL SEPARATIONS
2-3 credits.

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. Enroll Info: None

Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

BSE 671 — TOPICS IN NATURAL RESOURCES ENGINEERING
1-3 credits.

Advanced topics in natural resource engineering. Enroll Info: St or Grad st
Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2013

BSE 681 — SENIOR HONORS THESIS
2-4 credits.

Enroll Info: Hon candidacy
Requisites: Consent of instructor
Course Designation: Honors - Honors Only Courses (H)
Repeatable for Credit: Yes, unlimited number of completions

BSE 682 — SENIOR HONORS THESIS
2-4 credits.

Continuation of 681. Enroll Info: Honors program candidacy BSE 681
Requisites: Consent of instructor
Course Designation: Honors - Honors Only Courses (H)
Repeatable for Credit: No

BSE 691 — SENIOR THESIS
2 credits.

Enroll Info: Sr st cons inst
Requisites: Consent of instructor
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2017

BSE 692 — SENIOR THESIS
2 credits.

Enroll Info: None
Requisites: Consent of instructor
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2018

BSE 699 — SPECIAL PROBLEMS
1-4 credits.

Enroll Info: Sr st cons inst
Requisites: Consent of instructor
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2021

BSE 799 — PRACTICUM IN AGRICULTURAL ENGINEERING TEACHING
1-3 credits.

Enroll Info: None
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2021

BSE 875 — SPECIAL TOPICS
1-4 credits.

Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2017

BSE 900 — SEMINAR
1 credit.

Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2020

BSE 901 — GRADUATE RESEARCH SEMINAR
1 credit.

Presentation and evaluation of graduate student thesis and non-thesis research. Enroll Info: BSE 900
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2021

BSE 990 — RESEARCH
1-12 credits.

Enroll Info: None
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Summer 2021
BSE 999 — SPECIAL PROBLEMS
1-3 credits.

Enroll Info: None

Requisites: Consent of instructor

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2017