

BIOLOGICAL SYSTEMS ENGINEERING, B.S.

REQUIREMENTS

UNIVERSITY GENERAL EDUCATION REQUIREMENTS

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements (<http://guide.wisc.edu/undergraduate/#requirementsforundergraduatestudytext>) section of the *Guide*.

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| General Education | <ul style="list-style-type: none"> • Breadth–Humanities/Literature/Arts: 6 credits • Breadth–Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits • Breadth–Social Studies: 3 credits • Communication Part A & Part B * • Ethnic Studies * • Quantitative Reasoning Part A & Part B * |
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* The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.

COLLEGE OF AGRICULTURAL AND LIFE SCIENCES REQUIREMENTS

In addition to the University General Education Requirements, all undergraduate students in CALS must satisfy a set of college and major requirements. Courses may not double count within university requirements (General Education and Breadth) or within college requirements (First-Year Seminar, International Studies, Science, and Capstone), but courses counted toward university requirements may also be used to satisfy a college and/or a major requirement; similarly, courses counted toward college requirements may also be used to satisfy a university and/or a major requirement.

COLLEGE REQUIREMENTS FOR ALL CALS B.S. DEGREE PROGRAMS

Code	Title	Credits
Quality of Work: Students must maintain a minimum cumulative grade point average of 2.000 to remain in good standing and be eligible for graduation.		

Residency: Students must complete 30 degree credits in residence at UW–Madison after earning 86 credits toward their undergraduate degree.		
First Year Seminar (http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#CALSThirdYearSeminarCourses)		1
International Studies (http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#CALSIInternationalStudiesCourses)		3
Physical Science Fundamentals		4-5
CHEM 103	General Chemistry I	
or CHEM 108	Chemistry in Our World	
or CHEM 109	Advanced General Chemistry	
Biological Science		5
Additional Science (Biological, Physical, or Natural)		3
Science Breadth (Biological, Physical, Natural, or Social)		3
CALC Capstone Learning Experience: included in the requirements for each CALS major (see "Major Requirements") (http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#CALSCapstoneRequirement)		

NAMED OPTIONS WITHIN THE MAJOR

Students may complete the Biological Systems Engineering General Program or select a Named Option. The course requirements on this page represent the general program. Students are encouraged to consider one of the Named Options (Food and Bioprocess Engineering; Machinery Systems Engineering; or Natural Resources and Environmental Engineering). Links to learn more about these options, including the course requirements, are included below.

View as list | View as grid

- BIOLOGICAL SYSTEMS ENGINEERING: FOOD AND BIOPROCESS ENGINEERING (HTTP://GUIDE.WISC.EDU/UNDERGRADUATE/AGRICULTURAL-LIFE-SCIENCES/BIOLOGICAL-SYSTEMS-ENGINEERING/BIOLOGICAL-SYSTEMS-ENGINEERING-BS/BIOLOGICAL-SYSTEMS-ENGINEERING-FOOD-BIOPROCESS-ENGINEERING-BS/)
- BIOLOGICAL SYSTEMS ENGINEERING: MACHINERY SYSTEMS ENGINEERING (HTTP://GUIDE.WISC.EDU/UNDERGRADUATE/AGRICULTURAL-LIFE-SCIENCES/BIOLOGICAL-SYSTEMS-ENGINEERING/BIOLOGICAL-SYSTEMS-ENGINEERING-BS/BIOLOGICAL-SYSTEMS-ENGINEERING-MACHINERY-SYSTEMS-ENGINEERING-BS/)
- BIOLOGICAL SYSTEMS ENGINEERING: NATURAL RESOURCES AND ENVIRONMENTAL ENGINEERING (HTTP://GUIDE.WISC.EDU/UNDERGRADUATE/AGRICULTURAL-LIFE-SCIENCES/BIOLOGICAL-SYSTEMS-ENGINEERING/BIOLOGICAL-SYSTEMS-ENGINEERING-BS/BIOLOGICAL-SYSTEMS-ENGINEERING-NATURAL-RESOURCES-ENVIRONMENTAL-ENGINEERING-BS/)

MAJOR REQUIREMENTS

Code	Title	Credits
Major Requirements		
Common Requirements		53
General Program Classes and Technical Electives		43
Capstone		5
Total Credits		101

COMMON REQUIREMENTS

Code	Title	Credits
The Biological Systems Engineering program requires completion of a minimum of 125 credits to be eligible for graduation. Note that this is higher than the minimum for other CALS programs.		
Mathematics and Statistics		
MATH 221	Calculus and Analytic Geometry 1	5
MATH 222	Calculus and Analytic Geometry 2	4
MATH 234	Calculus--Functions of Several Variables	4
MATH 319	Techniques in Ordinary Differential Equations	3
or MATH 320	Linear Algebra and Differential Equations	

STAT 324	Introductory Applied Statistics for Engineers	3
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Chemistry

Select one of the following: 5-9

CHEM 109	Advanced General Chemistry (Recommended)	
CHEM 103 & CHEM 104	General Chemistry I and General Chemistry II ¹	

Biology

BSE 349	Quantitative Techniques for Biological Systems	3
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One additional Biological Science breadth Course; the following courses are preferred choices:² 2-5

BIOLOGY/ BOTANY/ ZOOLOGY 151	Introductory Biology	
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ZOOLOGY 153	Introductory Biology	
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BIOLOGY/ BOTANY 130	General Botany	
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BIOLOGY/ ZOOLOGY 101	Animal Biology	
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AN SCI/ DY SCI 101	Introduction to Animal Sciences ²	
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AGRONOMY 100	Principles and Practices in Crop Production ²	
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MICROBIO 101	General Microbiology ³	
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MICROBIO 303	Biology of Microorganisms ³	
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Physics

E M A 201	Statics ⁴	3
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PHYSICS 202	General Physics	5
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Foundation

BSE 270	Introduction to Computer Aided Design	3
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BSE 380	Introductory Data Science for the Agricultural and Life Sciences (preferred)	3
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or COMP SCI 310	Problem Solving Using Computers	
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BSE 310	Project Economics & Decision Analysis (preferred)	3
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or I SY E 313	Engineering Economic Analysis	
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Core

BSE 249	Engineering Principles for Biological Systems ⁵	3
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or CBE 250	Process Synthesis	
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BSE 365	Measurements and Instrumentation for Biological Systems	3
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BSE 308	Career Management for Engineers	1
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Total Credits 53-60

¹ Taking the combination of CHEM 103 and CHEM 104 instead of CHEM 109 may increase the total minimum number of credits required to complete the program.

2

Machinery Systems students may select AN SCI/DY SCI 101 or AGRONOMY 100 to also satisfy the Production Agriculture requirement. Any biological science course of 2 or more credits is accepted. Additional courses taken may be counted as Technical Electives.

3

MICROBIO 101 or MICROBIO 303 required for Food & Bioprocess Engineering specialization.

4

E M A 201 Statics is an acceptable prerequisite for PHYSICS 202 General Physics.

5

Students selecting the Food & Bioprocess Engineering option who plan to enroll in CBE 310 Chemical Process Thermodynamics and CBE 320 Introductory Transport Phenomena must take CBE 250 here as a prerequisite. Students selecting the Food & Bioprocess Engineering option who plan to enroll in M E 361 Thermodynamics and M E 363 Fluid Dynamics are recommended to take BSE 249 here.

GENERAL PROGRAM REQUIREMENTS

Code	Title	Credits
M E 361 or CBE 310	Thermodynamics ¹ Chemical Process Thermodynamics	3
Select one of the following: ¹		3-4
M E 363	Fluid Dynamics	
CIV ENGR 310	Fluid Mechanics	
CBE 320	Introductory Transport Phenomena	
BSE 464	Heat and Mass Transfer in Biological Systems	3
E M A 303 or M E 306	Mechanics of Materials Mechanics of Materials	3
Select a minimum of three of the following:		6-9
BSE 301	Land Information Management	
BSE 364	Engineering Properties of Food and Biological Materials	
BSE/ ENVIR ST 367	Renewable Energy Systems	
BSE/CIV ENGR/ SOIL SCI 372	On-Site Waste Water Treatment and Dispersal	
BSE 405	Intelligence and Automation in Agriculture	
BSE 460	Biorefining: Energy and Products from Renewable Resources	
BSE 461	Food and Bioprocessing Operations	
BSE 472	Sediment and Bio-Nutrient Engineering and Management	
BSE 473	Water Management Systems	
BSE/M E 475	Engineering Principles of Agricultural Machinery	
BSE/M E 476	Engineering Principles of Off-Road Vehicles	
BSE 571	Small Watershed Engineering	

Select a minimum of 9 credits of 300 level or above non-BSE engineering courses 9

Total Credits **27-31**

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Take BSE 249 and M E 361 and M E 363, or take CBE 250 and CBE 310 and CBE 320.

TECHNICAL ELECTIVES

Select courses from one or more of the following four technical elective categories to bring the total number of credits in the General Program Area or in the selected specialization area to 43. See the BSE Undergraduate Student Handbook for a list of recommended technical electives for various areas of specialization.

A. INTRODUCTION TO ENGINEERING COURSES (FRESHMEN ONLY)

Code	Title	Credits
INTEREGR 170	Design Practicum	3
BSE 170	Product Design Practicum	2

B. INDEPENDENT STUDY/INSTRUCTION COURSES

CALS or CoE courses with a 001, 299, 399, or 699 course number. No more than 3 credits of coursework in this category can be used to meet technical elective requirements.

C. UPPER-LEVEL COURSES

Part 1. Upper-Level Engineering Courses

This includes BSE courses not taken to meet other curricular requirements. This does not include independent study/instruction courses.

Code	Title	Credits
Any Engineering course numbered 300 or above		
E M A 202 or M E 240	Dynamics Dynamics	3

Part 2. Upper-Level Science Courses

This includes BSE courses not taken to meet other curricular requirements. This does not include independent study/instruction courses.

Code	Title	Credits
Advanced biological, natural, and physical science courses (i.e., courses with a B, N, or P designation)		
CHEM 341	Elementary Organic Chemistry	3
CHEM 342	Elementary Organic Chemistry Laboratory	1
CHEM 343	Organic Chemistry I	3
CHEM 344	Introductory Organic Chemistry Laboratory	2
CHEM 345	Organic Chemistry II	3
CHEM/M S & E 421	Polymeric Materials	3
AGRONOMY/ATM OCN/SOIL SCI 532	Environmental Biophysics	3

D. LOWER-LEVEL SCIENCE AND ENGINEERING COURSES, BREADTH COURSES

Elementary and intermediate biological, natural and physical science courses except elementary and intermediate math courses; College of Engineering courses with a 100 or 200 level designation; College of Agricultural and Life Sciences courses, Institute of Environmental Studies courses, and/or School of Business courses. Independent study/instruction courses cannot be counted in this category. No more than 12 credits of coursework in this category can be used to meet technical elective requirements.

CAPSTONE

Code	Title	Credits
BSE 508	Biological Systems Engineering Design Practicum I	2
BSE 509	Biological Systems Engineering Design Practicum II ¹	3

Fundamentals of Engineering Exam ¹

1

Grades for BSE 509 will not be posted until proof of examination is presented.

UNIVERSITY DEGREE REQUIREMENTS

Total Degree To receive a bachelor's degree from UW-Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.

Residency Degree candidates are required to earn a minimum of 30 credits in residence at UW-Madison. "In residence" means on the UW-Madison campus with an undergraduate degree classification. "In residence" credit also includes UW-Madison courses offered in distance or online formats and credits earned in UW-Madison Study Abroad/Study Away programs.

Quality of Work Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.