

Biological Systems Engineering (EBSE) B.S. Degree Requirements, 2024-2025

This program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>

Undergrad Advising: BAEadvising@ucdavis.edu. To make an advising appointment: <http://www.appointments.ucdavis.edu>

Note: Curriculum and courses offerings are subject to change. You must fulfil the degree requirements stated in the catalog of the year you graduate or the year immediately prior. For additional detail on courses and requirements, please visit the course supplement located in [the UC Davis Catalog](#).

General Education Requirement

This requirement is partially satisfied with coursework completed for the Biological Systems Engineering degree. A detailed GE checklist can be found [here](#).

Biological Systems Engineering — Lower Division Requirements

Units	Course	Course Title	Prerequisites: (*C- or better required); (MTC = May Take Concurrently)	Quarters Offered	Suggested Quarter
ENGLISH COMPOSITION - Select ONE of the following courses:					
4	UWP 1, 1Y, 1V	Introduction to Academic Literacies	ELWR Satisfied	F W S	1
4	ENL 3, 3V	Introduction to Literature	ELWR Satisfied	F W S	1
4	COM 1	Major Works of the Ancient World	ELWR Satisfied	F W S	1
4	COM 2	Major Works: Med & Early Mod Wrld	ELWR Satisfied	F W S	1
4	COM 3	Major Works of the Modern World	ELWR Satisfied	F W S	1
4	COM 4	Major Works of the Contemp World	ELWR Satisfied	F W S	1
4	NAS 5	Intro to Native American Lit	ELWR Satisfied	F W S	1
MATHEMATICS					
4	MAT 21A	Calculus	Math Placement Score: Total: 35+, Trig: 3+	F W S	1
4	MAT 21B	Calculus	MAT 21A*	F W S	2
4	MAT 21C	Calculus	MAT 21B*	F W S	3
4	MAT 21D	Vector Analysis	MAT 21C*	F W S	4
3 4	MAT 22A OR MAT 27A	Linear Algebra <i>Linear Algebra w/ Apps to Biology</i>	MAT 21C*; ENG 6 or MAT 22AL (MTC) MAT 21C*	F W S W	5
3 4	MAT 22B OR MAT 27B	Differential Equations <i>Differential Equations w/ Apps to Bio</i>	MAT 22A* or MAT 27A* MAT 27A* or MAT 22A*; ENG 6* or ECS 32A*	F W S S	6
GENERAL CHEMISTRY					
5	CHE 2A	General Chemistry	Chemistry Placement Exam Score: 24+	F W	2
5	CHE 2B	General Chemistry	CHE 2A*	W S	3
PHYSICS					
5	PHY 9A	Classical Physics	MAT 21B	F	S 3
5	PHY 9B	Classical Physics	MAT 21C, MAT 21D (MTC), PHY 9A	F W	4
5	PHY 9C	Classical Physics	MAT 21D, (MAT 22A or MAT 27A (MTC)), PHY 9B	W S	5
BIOLOGICAL SCIENCES					
5	BIS 2A	Intro to Bio: Essentials of Life on Earth	CHE 2A (recommended)	F W S	4
ENGINEERING SCIENCE					
4	EBS 1	Foundations of Biological Systems Eng	Restricted to EBS Majors	F	1
4 4	ENG 6 OR ECS 32A	Engineering Problem Solving <i>Introduction to Programming</i>	MAT 21A*, MAT 21B* (MTC)	F W S F W S	2
4	ENG 35	Statics	PHY 9A*, MAT 21D* (MTC)	F W S	4
4	EBS 75	Properties of Materials in Bio Systems	BIS 2A, PHY 9B (MTC)	W	5
4	ENG 17/17V	Circuits I	MAT 21C*	F W S	6
ORAL COMMUNICATION - Select ONE of the following courses:					
4 4	CMN 1 OR ENG 3/3Y	Intro. to Public Speaking <i>Introduction to Engineering Design</i>	ELWR Satisfied ELWR Satisfied	F W S F W S	6
ORGANIC CHEMISTRY					
2 4	CHE 8A OR CHE 118A	Organic Chemistry: Brief Course <i>Organic Chem for Health & Life Sci</i>	CHE 2B*	F F W	S 7
4 4	CHE 8B CHE 118B	Organic Chemistry <i>Organic Chem for Health & Life Sci</i>	CHE 8A or CHE 118A CHE 118A	F F W	S 8

Biological Systems Engineering — Upper Division Requirements

Units	Course	Course Title	Prerequisites: (*C- or better required); (MTC = May Take Concurrently)	Quarters Offered			Suggested Quarter
STATISTICS							
4	STA 100	Applied Stats for Biol Scientists	MAT 21B*	F	W	S	7
ENGINEERING TOPICS							
3	ENG 100	Electronic Circuits & Systems	ENG 17/17V (C- or better recommended)	F	W	S	8
4	ENG 102	Dynamics	(MAT 22B or MAT 27B)*, ENG 35*	F	W	S	7
4	ENG 103	Fluid Mechanics	(MAT 22B or MAT 27B)*, ENG 35*, PHY 9B*	F	W	S	8
4	ENG 104	Mechanics of Materials	(MAT 22B or MAT 27B)*, ENG 35*	F	W	S	9
4	ENG 105	Thermodynamics	(MAT 22B or MAT 27B)*, PHY 9B*	F	W	S	7
4	ENG 106	Engineering Economics	Upper Division Standing in ENG		W		11
4	EBS 125	Heat Transfer in Biological Systems	EBS 75, BIS 2A, ENG 103, ENG 105			S	9
4	EBS 127	Mass Transfer & Kinetics in Bio Sys	EBS 125	F			10
4	EBS 130	Modeling of Dyn Procs in Bio Sys	(MAT 22B or MAT 27B)*, (ENG 6 or ECS 32A), EBS 75		W		8
4	EBS 165	Bioinstrumentation and Control	ENG 100	F			10
3	EBS 170A	Engineering Design & Prof Resp	EBS 1, ENG 102, ENG 104	F			10
2 1	EBS 170B & EBS 17BL	Engineering Projects: Design Engineering Projects: Design Lab	EBS 170A; concurrent enrollment in EBS 170BL		W		11
2 1	EBS 170C & EBS 170CL	Engineering Projects: Design Eval Engineering Projects: Design Eval	EBS 170B; concurrent enrollment in EBS 170CL			S	12
BIOLOGICAL SYSTEMS ENGINEERING ELECTIVE (EBS) – Minimum of 4 units							
Select FOUR units from any upper division EBS courses not otherwise required for the major, EXCEPT EBS 189-199.							
ENGINEERING ELECTIVES – Minimum of 8 units							
Select EIGHT units from any upper division courses within the College of Engineering EXCEPT ECI 123, 188; ENG 160; courses numbered 190-197, 199 (ENG 190 may only be taken for 2 units of engineering elective credit).							
<p>Acceptable subject codes: ENG, EBS, BIM, ECH, EMS, ECI, ECS, EEC, EME, EAE</p> <p>College of Engineering Elective Course Tips:</p> <p><i>BIM-Biomedical Engineering – Most require BIS 2A or BIS 2B</i></p> <p><i>EAE-Aerospace Science & Engineering – Most courses require upper-division ENG courses</i></p> <p><i>ECH-Chemical Engineering – Most non-required ECH courses will have their pre-reqs already satisfied</i></p> <p><i>ECI-Civil & Environmental Engineering – Most upper-division courses require ENG 35</i></p> <p><i>ECS-Computer Science Engineering – Most require a programming course/series &/or ENG 17</i></p> <p><i>EEC-Electrical & Computer Engineering – Most upper-division courses require ENG 17</i></p> <p><i>EME-Mechanical Engineering – Most upper-division courses require upper-division ENG courses.</i></p> <p><i>EMS-Materials Science & Engineering – most upper-division courses require ENG 45</i></p> <p><i>ENG-Engineering – Most upper-division courses require ENG 35</i></p>							
BIOLOGICAL SCIENCE ELECTIVES – Minimum of 9 units							
Select NINE units from any upper division course with the College of Biological Sciences EXCEPT BIS 132; EVE 175; EXB 102, 112, 115, 120, 121, 124, 125, 148; and all courses number 190-199.							
The following courses may also be taken as biological sciences electives: BIS 2B, BIS 2C; ABT 161; ANS 118, 143, 144, 146; ATM 133; AVS 100; BIS 2B, 2C; CHA 101, 101L; ENT 100; ENH 102; ESM 120; ESP 100, 110, 155; ETX 101, 131; FST 102A, 104L, 119, 128, 159; IDI 141; SSC 100; WFC 121.							
<p>Acceptable subject codes: BIS, MCB, EVE, EXB, MIC, NPB, PLB</p> <p>Students may choose other upper division courses with substantial biological content offered by the College of Agricultural and Environmental Sciences; <i>email BAEAdvising@ucdavis.edu with a syllabus and short explanation about why the course should be considered for biological science elective credit for approval before registering.</i></p>							
Upper Division English Composition (must pass course with C- or higher) – Select one (1) of the following courses:							
4	UWP 101	Advanced Composition	Lower Div Comp; Upper Div Standing	F	W	S	8-10
4	UWP 102E	Writing in Engineering	Lower Div Comp; Upper Div Standing	F	W	S	8-10
4	UWP 104A	Business Reports & Technical Com	Lower Div Comp; Upper Div Standing	F	W	S	8-10
4	UWP 104T	Technical Writing	Lower Div Comp; Upper Div Standing	F	W	S	8-10
4	UWP 104E	Writing in the Professions: Science	Lower Div Comp; Upper Div Standing	F	W	S	8-10
4	UWP 104F	Writing in the Health Profession	Lower Div Comp; Upper Div Standing	F	W	S	8-10

The following combinations of courses are suggested quarter schedules that allow the student to complete their major degree program in a four-year span. The arrangement of courses is based on which quarters the course is offered, the classification and the prerequisites or co-requisites required for successful completion of the course. The 4-Year Sample Schedule should be used with the EBSE Major Checklist and Academic Advising. **Remember, this is only a guide and circumstances may change the plan.**

	Fall	Winter	Spring
YEAR 1	MAT 21A	MAT 21B	MAT 21C
	EBS 1	CHE 2A	PHY 9A
	Lower Division Comp	ENG 6 OR ECS 032A	CHE 2B
	GE (SS or AH; AGCH, DD, or WC)	ENG 3 OR GE (SS)	GE (SS or AH; AGCH, DD, or WC)
	Total Units	16	17
YEAR 2	MAT 21D	MAT 22A OR MAT 27A	MAT 22B OR MAT 27B
	PHY 9B	PHY 9C	ENG 17
	BIS 2A	EBS 75	ENG 35
	GE (SS or AH; AGCH, DD, or WC)	GE (SS or AH)	ENG 3 OR GE (SS)
	Total Units	18	15
YEAR 3	CHE 8A OR CHE 118A	CHE 8B OR CHE 118B	EBS 125
	ENG 102	EBS 130	ENG 104
	ENG 105	ENG 103	Elective (Units: 4 EBS; 8 ENG; 9 BIS)
	STA 100	ENG 100	GE (SS or AH)
	Total Units	14	16
YEAR 4	Fall Year 4	Winter Year 4	Spring Year 4
	EBS 170A	EBS 170B	EBS 170C
	EBS 127	EBS 170BL	EBS 170CL
	EBS 165	ENG 106	Elective (Units: 4 EBS; 8 ENG; 9 BIS)
	Upper Division Comp	Elective (Units: 4 EBS; 8 ENG; 9 BIS)	Elective (Units: 4 EBS; 8 ENG; 9 BIS)
Total Units	15	12	

Recommended Electives for EBS Areas of Specialization:

<u>Biotechnology Engineering</u>	<u>Agricultural and Natural Resources Engineering</u>	<u>Food Engineering</u>
BIS: BIS 101, 102, 103; MIC 102; MCB 120L; PLB 113 EBS: EBS 161 ENG: ECH 161B, 161C, 161L; ECI 149, 150, 153; ENG 180; EME 161, 163	BIS: BIS 102; PLB 111; ENT 100; ANS 143, 144, 146; PLS 101, 114; MIC 120; NPB 101; ABT 163; SSC 100; WFC 120; ETX 101; ESP 100; HYD 124 EBS: EBS 128 ENG: BIM 109, 116; ECI 141, 142, 144, 145, 148A, 171; ENG 111, 180	BIS: BIS 101, 102, 103; ESP 110; ETX 101, FST 104, 104L, 119, 128; PLS 172 EBS: EBS 161 ENG: ECH 157; EME 171, 172