Required Courses for the Biochemical Engineering Degree, 2022-2023

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

Undergraduate Advising: ech-advising@ucdavis.edu To make an advising appointment: 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 at https://catalog.ucdavis.edu/departments-programs-degrees/chemical-engineering/

Writing Requirements

Lower Division Composition (4 units)		
Select ONE of the following courses:		
	UWP 1, 1V, or 1Y	Expository Writing
	ENL 3	Introduction to Literature
	COM 1	Bks of West Civ/Ancient World
	COM 2	Bks of West Civ/MidAge-English
	COM 3	Bks of West Civ/Modern Crisis
	COM 4	Bks of Contemporary World
	NAS 5	Intro to Native American Lit.

Courses must be completed with a C- or better. A 4 or 5 on your AP English exam will also satisfy this requirement.

Upper Division Composition (0 to 4 units)		
Select ONE of the following courses:		
	UWP 102E or 102F	Writing in Disciplines
	UWP 104A, 104E, or 104T	Writing in Professions

Courses must be completed with a C- or better. This requirement can also be satisfied by passing the Upper Division Composition Exam

General Education Requirement

This requirement is partially satisfied with coursework completed for the Biochemical Engineering degree.
A detailed GE checklist can be found here.

Lower Division Major Requirements

Math, Physics, Chemistry, and Biology (57-59 units)

Course		Description	Units	Quarter			Prerequisites
	MAT 21A	Calculus	4	F	W	S	35+ on Mathematics Placement Requirement w/ 3+ on Trigonometry Score
	MAT 21B	Calculus	4	F	W	S	C- or better in MAT 21A or MAT 21AH
	MAT 21C	Calculus	4	F	W	S	C- or better in MAT 21B or MAT 21BH
	MAT 21D	Vector Analysis	4	F	W	S	C- or better in MAT 21C or MAT 21CH
	MAT 22A or MAT 27A	Linear Algebra	3 4	F	W	S	C- or better in MAT 21C or MAT 21CH, ENG 6, EME 5, ECH 60, or MAT 22AL ☺
	MAT 22B or MAT 27B	Differential Equations	3 4	F	W	S	C- or better in MAT 22A or MAT 67
	PHY 9A	Classical Physics	5	F		S	MAT 21B or 🕮
	PHY 9B	Classical Physics	5	F	W		PHY 9A; MAT 21C; MAT 21D ☺
	PHY 9C	Classical Physics	5		W	S	PHY 9B; MAT 212D; MAT 22A ☺
	CHE 2A or CHE 4A	General Chemistry Gen Che for Phys Sci & Eng	5	F	W		24+ on Chemistry Placement Exam; 28+ on Chemistry Placement Exam
	CHE 2B or CHE 4B	General Chemistry Gen Che for Phys Sci & Eng	5		W	S	C- or better in CHE 2A or CHE 2AH or CHE 4A
	CHE 2C or CHE 4C	General Chemistry Gen Che for Phys Sci & Eng	5	F		S	C- or better in CHE 2B or CHE 2BH or CHE 4B
	BIS 2A	Introductory Biology	5	F	W	S	None

Engineering (12 units)

Course		Descriptions	Units	Quarter			Prerequisites
	ECH 5	BioChem/Materials Analysis	3		W		MAT 21A, MAT 21B ☺
	ECH 51	Materials Balances	4	F			C- or better in MAT 21C; MAT 21D ☺
	ECH 60	Computational Methods	4			S	MAT 21C
	ECH 80	Chemical Engineering Professionals *(SS GEE credit)*	1	F			None

Upper Division Major Requirements

Chemistry and Biological Science (20 units)

Course		Descriptions	Units	Quarter			Prerequisites
	CHE 128A	Organic Chemistry	3	F	W	S	C or better in CHE 2C or CHE 2CH
	CHE 129A	Organic Chemistry	2	F	W		C or better in CHE 2C; CHE 128A☺
	CHE 128B	Organic Chemistry	3		W	S	CHE 128A or 🕮
	CHE 110A	Quantum Mechanics	4	F		S	PHY 9C or PHY 9HC; CHE 2C or CHE 2CH; Complete of MAT 21D, MAT 22A, MAT 22Al, and PHY 9C or PHY 9HC strongly recommended
	BIS 102	Struc & Func Biomolecules	3	F	W	S SS	BIS 1A or 2A; CHE 8B, CHE 118B, or CHE 128B
	MIC 102	Intro Microbiology	3	F	W	S	BIS 1A or BIS 2A; CHE 2B☺
	MIC 103L	Intro Microbiology	2	F	W	S	C- or better in MIC 102; CHE 2B

Engineering core courses (60 units)

Course		Descriptions	Units	Quarter			Prerequisites
	ECH 140	Mathematical Methods	4	F			MAT 22B; ECH 60, ENG 6, or equivalent
	ECH 141	Fluid Mechanics	4	F			C- or better in ECH 51 ☺; ECH 140 ☺
	ECH 142	Heat Transfer	4		W		ECH 141
	ECH 143	Mass Transfer	4			S	ECH 141
	ECH 145A	Chemical Engineering Thermodynamics Lab	3		W		ECH 152A, ECH 152B ☺
	ECH 145B	Chemical Engineering Transport Lab	3			S	ECH 141, ECH 145A
	ECH 148A	Chemical Kinetics and Reaction Engineering	3	F			ECH 143, ECH 152B
	ECH 152A	Thermodynamics	3		W		ECH 60, ENG 6, or equivalent. No credit given for students who have completed ENG 105
	ECH 152B	Thermodynamic	4			S	ECH 152A
	ECH 157	Process Dynamics	4	F			ECH 140
	ECH 158A	Process Economics and Green Design *(SS GE3 credit)*	4	F			ECH 142, ECH 143
	ECH 158C	Plan Design Project *(SS GE3 credit)*	4			S	ECH 158B or ECH 161C
	ECH 161A	BiochemE Fundamentals	4		W		ECH 148A
	ECH 161B	Bioseparations	4		W		ECH 143
	ECH 161C	Biotech Facility Design *(SS GE3 credit)*	4		W		ECH 161A ☺ and ECH 161B ☺; or MCB 263 ☺
	ECH 161L	Bioprocess Engineering Lab	4			S	(ECH 161A & B, and ECH 145B) or VEN 186, or {Bis 103 & MCB 120L}

Biochemical Engineering Electives continue on next page…

☺ *May be taken concurrently*
🕮 *May be taken with consent of instructor*
* *Not offered regularly*
** *Offered in alternate years*

Biochemical Engineering Electives (8 units)

	Choose at least **1** laboratory course form the Laboratory Elective list. Research (190C, 198, or 199) does not replace the required lab elective.
	At least **3** units must be completed in any upper division engineering course(s) (BIM-Biomedical Engineering, EAE-Aerospace Science & Engineering, EBS-Biological Systems Engineering, ECH- Chemical Engineering, ECI- Civil & Environmental Engineering, ECS- Computer Science Engineering, EEC- Electrical & Computer Engineering, EME- Mechanical Engineering, EMS- Materials Science & Engineering, ENG-Engineering) not numbered 190C, 192, 198, and 199 (independent study, research, seminar, or internship).
	Remainder of units, for a total of **8** units, may be completed in any upper division engineering and/or science course(s)* excluding courses numbered 190 and 198 with the exception for ECH 198. You may receive biochemical engineering elective credit up to a maximum of 4 units of an internship (192) and/or independent study (199). *Acceptable science courses must carry one of the following subject designations: BIS-Biological Sciences, BIT-Biotechnology, FST-Food Science & Technology, MIC-Microbiology, MCB-Molecular & Cellular Biology, NPB-Neurobiology, Physiology, & Behavior; PLB-Plant Biology, STA-Statistics, VEN-Viticulture & Enology CHE 130A & CHE 130B may also be used to satisfy this elective requirement.

List of laboratory courses:

	*BIM 161L**	*Biomolecular Engineering Lab*	3				BIM 161A or BIS 101	
	BIT 161A	Genetics & Biotechnology Lab	6		W		PLS 152 or BIS 101; and 🕮	
	BIT 161B	Plant Genetics & Biotechnology Lab	4			S	PLS 152 or BIS 101; and 🕮	
	FST 102B	Practical Malting and Brewing	4		W		FST 102A; CHE 2C; Open to seniors only in Fermentation Science or Food Science and Technology	
	FST 104L	Food Microbiology Lab	4			S	BIS 2A; BIS 103; FST 104	
	FST 123L	Enzymology Lab	2			S	BIS 103, FST 123 (required concurrent)	
	MCB 120L	Biochemistry Lab	3	F	W	S	BIS 102 or 🕮	
	MCB 160L	Principles of Genetics Lab	5	F	W	S	BIS 101	
	NPB 101L	Systemic Physiology Lab	3	F	W	S	NPB 101 or NPB 100C	
	*NPB 104L**	*Cellular Physiology/Neurobio Lab*	4				NPB 101L; BIS 103 or 105	
	VEN 123L	Analysis of Musts & Wines Lab	2	F			CHE 2C; PLS 21;(CHE 8b or 118B or 128B); and VEN 123 ☺; restricted to upper division and grad students in VEN major; 🕮	
	VEN 124L	Wine Production Lab	3	F			VEN 124 ☺, Restricted to undergraduates in fermentation science, viticulture & enology, biotechnology, microbiology, food science and applied plant biology majors; open to graduate students in food science agriculture and environmental chemistry and horticulture	

List your course for Biochemical Engineering Electives below

	Course (Ex: CHE 168)	# of Units
	_____	Units

College of Engineering Course Tips

- BIM-Biomedical Engineering – Most require BIS 2A or BIS 2B
- EAE-Aerospace Science & Engineering – Most courses require upper-division ENG courses
- EBS-Biological Systems Engineering – Most require EBS 75 and upper-division ENG courses
- ECH-Chemical Engineering – Most non-required ECH courses will have their pre-reqs already satisfied
- ECI-Civil & Environmental Engineering – Most upper-division courses require ENG 35
- ECS-Computer Science Engineering – Most require a programming course/series &/or ENG 17
- EEC-Electrical & Computer Engineering – Most upper-division courses require ENG 17
- EME-Mechanical Engineering – Most upper-division courses require upper-division ENG courses.
- EMS-Materials Science & Engineering – most upper-division courses require ENG 45
- ENG-Engineering– Most upper-division courses require ENG 35