Required Courses for the Biochemical Engineering Degree, 2023-2024

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 (16 units)

Course		Descriptions	Units	Quarter			Prerequisites
	ECH 5	BioChem/Materials Analysis	3		W		None
	ECH 51	Materials Balances	4	F			C- or better in MAT 21B
	ECH 60 or ECS 32A	Computational Methods Introduction to Programming	4	F	W	S S	MAT 21C None
	ECH 80	Chemical Engineering Professionals *(SS GEE credit)*	1	F			None

Choose One of the following:

	ENG 17	Circuits I	4	F	W	S	MAT 21C (C- or better recommended)
	ENG 35	Statics	4	F	W	S	C- or better in PHY 9A or PHY 9AH; C- or better in MAT 21D ☺
	ENG 45	Properties of Materials	4	F	W	S SS	C- or better in all of the following: MAT 21C, CHE 2A, PHY 9A; ENG 45Y is an online course only offered in Summer Session

Upper Division Major Requirements

Chemistry and Biological Science (16 units)

Course		Descriptions	Units	Quarter			Prerequisites
	CHE 128A	Organic Chemistry	3	F	W	S	C or better in CHE 2C or CHE 4C
	CHE 129A	Organic Chemistry	2	F	W		C or better in CHE 2C or CHE 4C; CHE 128A☺
	CHE 128B	Organic Chemistry	3		W	S	CHE 128A or 🕮
	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 or ECS 32A, 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 142
	ECH 145A	Chemical Engineering Thermodynamics Lab	3		W		ECH 152A ☺, UWP 102E ☺
	ECH 145B	Chemical Engineering Transport Lab	3			S	ECH 142, ECH 145A, UWP 102E
	ECH 148A	Chemical Kinetics and Reaction Engineering	3	F			ECH 143, ECH 152B
	ECH 152A	Thermodynamics	3		W		ECH 51; MAT 21C
	ECH 152B	Thermodynamic	4			S	ECH 152A
	ECH 157	Process Dynamics	4	F			ECH 140
	ECH 158BN	Process Economics and Green Design *(SS GE3 credit)*	4		W		ECH 142, ECH 143
	ECH 158C	Plant Design Project *(SS GE3 credit)*	4			S	ECH 158B or ECH 161C
	ECH 161AN	Bioseparations	4	F			ECH 143
	ECH 161BN	BiochemE Fundamentals	4		W		ECH 148A
	ECH 161C	Biotech Facility Design *(SS GE3 credit)*	4		W		(ECH 161A or ECH 161AN ☺; ECH 161B or ECH 161BN ☺; ECH 158A or ECH 158B☺) or DEB 263 ☺
	ECH 161L	Bioprocess Engineering Lab	4			S	(ECH 161A or ECH 161AN & 161B, or 161BN and ECH 145B) or VEN 186, or {Bis 103 & MCB 120L}

Biochemical Engineering Technical 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 Technical Electives (8 units)

	1. Choose at least **1** laboratory course form the Laboratory Elective list. Research (190C, 198, or 199) does not replace the required lab elective.
	2. 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 and/or 198. Note ECH 192 or 199 can be used to satisfy this area.
	3. 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 of ECH 198. *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
	a. You may receive biochemical engineering elective credit up to a maximum of 4 units of an internship (192) and/or independent study (199).
	b. Credit for independent studies (199s) or internships (192s) completed outside of the department must be approved by the department's Undergraduate Affairs Committee. Additionally, students applying for these credits must submit an essay of at least 4 pages and no more than 10 pages detailing the engineering and/or science aspects of their work, results or outcomes (figures and graphs may be included), and how the experience relates to their educational program and objectives. The report must be submitted in pdf format and use 1.5 line spacing, 1" margins, and 12pt Times New Roman font. No intellectual property should be contained in the report. Applications must also include a written evaluation of the students' performance by the student's supervisor or faculty advisor.
	4. Courses used to satisfy other major requirements cannot be used to satisfy the technical elective requirements.

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 Technical Electives below

	Course (Ex: ECH 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

Sample Academic Plans - Biochemical Engineering Major

Sample Four Year Schedule

Fall Quarter		*Winter Quarter*		*Spring Quarter*	
MAT 21A	4	MAT 21B	4	MAT 21C	4
CHE 2A or 4A^	5	CHE 2B or 4B^	5	CHE 2C or 4C^	5
ECH 80	1	ECH 5	3	PHY 9A	5
Lower Division Composition	4	GE	4		
Total units	***14***	***Total units***	***16***	***Total units***	***14***
MAT 21D	4	MAT 22A	3	MAT 22B	3
CHE 128A	3	CHE 128B	3	BIS 2A	5
ECH 51	4	CHE 129A	2	ECH 60 or ECS 32A	4
PHY 9B	5	PHY 9C	5	ECH 152B	4
		ECH 152A	3		
Total units	***16***	***Total units***	***16***	***Total units***	***16***
ECH 140	4	ECH 142	4	ECH 143	4
ECH 141	4	ECH 145A	3	ECH 145B	3
BIS 102	3	ENG 17, 35, 45	4	MIC 102	3
UWP 102E (or exam	4	GE	4	GE	4
Total units	***15***	***Total units***	***15***	***Total units***	***14***
ECH 148A	3	ECH 158BN	4	ECH 158C	4
ECH 157	4	ECH 161BN	4	ECH 161L	4
ECH 161AN	4	ECH 161C	4	Tech. Elective	4
MIC 103L	2	Tech. Elective	4	GE	3
GE	4				
Total units	***17***	***Total units***	***16***	***Total units***	***15***

This is only one example of several possible combinations

^ CHE 4 series recommended

Sample Two Year Transfer Schedule

Fall Quarter		*Winter Quarter*		*Spring Quarter*	
ECH 51	4	ECH 142	4	ECH 143	4
ECH 80	1	ECH 145A	3	ECH 145B	3
ECH 140	4	ECH 152A	3	ECH 152B	4
ECH 141	4	BIS 102	3	MIC 102	3
UWP 102E	4				
Total units	17	***Total units***	13	***Total units***	14
ECH 148A	3	ECH 158BN	4	ECH 158C	4
ECH 157	4	ECH 161BN	4	ECH 161L	4
ECH 161AN	4	ECH 161C	4	Tech. Elective	4
MIC 103L	2	Tech. Elective	4	GE	4
*ENG 17, 35, 45**	4				
Total units	17	***Total units***	16	***Total units***	16

This is only one example of several possible combinations

**** ENG 17, 35, or 45 will not be required if course work was completed prior to transfer***

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