

Required Courses for Biochemical Engineering Degree – 2017-2018

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

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To make advising appointments, please visit: appointments.ucdavis.edu

Note: Curriculum and course offerings are subject to change. You must fulfill the degree requirements stated in the catalog of the year you graduate or the year immediately prior. For additional detail on courses, please visit the course supplement located at <http://catalog.ucdavis.edu/index.html>

Writing and General Education 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-Enligh.
COM 3	Bks of West Civ/Modern Crisis
COM 4	Bks of Contemporary World
NAS 5	Intro to Native American Lit.

[Course must be completed with a C- or better.](#)

Upper Division Composition (0 or 4 units)

Select ONE of the following courses:

UWP 102E or 102F	Writing in the Disciplines
UWP 104A, 104E, or 104T	Writing in the Professions

[Course must be completed with a C- or better.](#)

[Alternatively, you may satisfy the upper division English requirement by passing the Upper Division Composition Exam](#)

General Education Requirement: This requirement will vary depending on the year you entered UC Davis. Please refer to your [specific GE Requirements](#)

Lower Division Major Requirements

Math, Physics, Chemistry and Biology (57 units)

Course Number	Description	Units	Qrt Offered			Prerequisites
MAT 21A	Calculus	4	F	W	S	Score of 35 or more on Mathematics Placement test
MAT 21B	Calculus	4	F	W	S	C- or better in MAT 21A or 21AH
MAT 21C	Calculus	4	F	W	S	MAT 21B or 21BH
MAT 21D	Vector Analysis	4	F	W	S	MAT 21C or 21CH
MAT 22A	Linear Algebra	3	F	W	S	9 units of college math and ENG 6, or MAT 22AL ☺, or experience on MATLAB
MAT 22B	Differential Equations	3	F	W	S	MAT 22A or MAT 67 with a C- or above
PHY 9A	Classical Physics	5	F		S	MAT 21B
PHY 9B	Classical Physics	5	F	W		PHY 9A, MAT 21C, MAT 21D ☺
PHY 9C	Classical Physics	5		W	S	PHY 9B, MAT 21D, MAT 22A ☺
CHE 2A	General Chemistry	5	F	W		Score of 24 or more on Chemistry Placement test
CHE 2B	General Chemistry	5		W	S	C- or better in CHE 2A or 2AH
CHE 2C	General Chemistry	5	F		S	C- or better in CHE 2B or 2BH
BIS 2A	Introductory Biology	5	F	W	S	None

Engineering (12 units)

ECH 5	BioChem/Materials Analysis	3		W		MAT 21A, MAT 21B ☺
ECH 60	Computational Methods	4			S	MAT 21C
ECH 51	Material Balances	4	F			C- or better in MAT 21C; MAT 21D ☺
ECH 80	Chemical Engineering Professionalism (SS GE3 credit)	1	F			None

Upper Division Major Requirements

Chemistry and Biological Science (20 units)

Course Number	Description	Units	Qrt Offered		Prerequisites
CHE 128A	Organic Chemistry	3	F	W	C or better in CHE 2C
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 ☞, 129A strongly recommended
CHE 110A	Quantum Mechanics	4	F		S CHE 2C, MAT 21C, 1 yr college physics
BIS 102	Struc & Func Biomolecules	3	F	W	S SS BIS 2A; CHE 8B or CHE 118B or CHE 128B
MIC 102	Intro Microbiology	3	F	W	S BIS 2A, CHE 2B ☺
MIC 103L	Intro Microbiology Lab	2	F	W	S C- or better in MIC 102; CHE 2B

Engineering core courses (60 units)

Course Number	Description	Units	Qrt Offered		Prerequisites
ECH 140	Mathematical Methods	4	F		MAT 22B; ECH 60 or equivalent
ECH 141	Fluid Mechanics	4		W	ECH 140, ECH 51
ECH 142	Heat Transfer	4			S C- or better in ECH 51; ECH 141
ECH 143	Mass Transfer	4			S C- or better in ECH 51; 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 No credit given for students who have taken ECH 146
ECH 152A	Thermodynamics	3	F		ECH 60 ☺
ECH 152B	Thermodynamics	4		W	ECH 152A, no credit given for students who have taken ENG 105.
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	Plant Design Project (SS GE3 credit)	4			S ECH 158B or ECH 161C
ECH 161A	BiochemE Fundamentals	4		W	ECH148A
ECH 161B	Bioprocess Engineering	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, or VEN 186, or BIS 103 & MCB 120L

Biochemical Engineering Electives (9 units)

Choose *at least one* laboratory course from the Laboratory Elective list; additional courses may be chosen from either list. You may receive biochemical engineering elective credit up to a maximum of two units of an internship (192) or independent study (199), or Biotechnology 189L with the approval of a petition, provided that the course is a laboratory-based experimental project, related to the biological and/or biochemical engineering sciences, and the student submits a written report that demonstrates proficiency in laboratory skills, techniques, or method. Research does not replace the required lab elective.

Course Number	Description	Units	Qrt Offered		Prerequisites
BIS 2B	Introductory Biology	5	F	W	S C- or better in BIS 1A or 2A
BIS 2C	Introductory Biology	5	F	W	S SS C- or better in BIS 1B or 2B
BIS 101	Genes & Gene Expression	4	F	W	S BIS 2A and 2B; CHE 8A or 118A or 128A; STA 13 or 100 (recommended) or STA 102 or 130A.
BIS 103	Bioenergetics & Metabolism	3	F	W	S SS BIS 102
BIS 104	Cell Biology	3	F	W	S BIS 101; BIS 102 or BIS 105
BIM 102	Quantitative Cell Biology	4	F		BIS 2A; CHE 8B; only open to College of Engineering students
BIM 107*	Mathematical Methods for Biological Systems	4			C- or better in ENG 6; BIM 20; MAT 22B. Restricted to Biomedical Engineering majors only.
BIM 109	Biomaterials	4			S BIS 2A; CHE 2C; BIM 106, restricted to upper division engineering majors
BIM 117**	Molecular and Cellular Networks	4	F		C- or better in BIS 2A and MAT 22A, upper division standing
BIM 140**	Protein Engineering	4			S BIS 2A

	<i>BIM 161A**</i>	<i>Biomolecular Engineering</i>	4	F		BIS 2A; CHE 8B; upper division standing
	BIM 162	Biophysics of Molecules and Cells	4	F		C- or better in MAT 22B and PHY 9C
	BIT 160	Principles of Plant Biotechnology	3		W	BIS 1A or 2A; BIS 101 or PLS 152
	BIT 188	Undergraduate Research: Proposal	3			S Upper division standing (BIT 188 usually taken with 189L)
	CHE 130A	Pharmaceutical Chemistry	3		W	CHE 118C or 128C
	CHE 130B	Pharmaceutical Chemistry	3			S CHE 130A
	EBS 165	Bioinstruments and Control	4	F		ENG 100
	<i>ECH 144*</i>	<i>Rheology and Polymer Processing</i>	3			S ECH 141
	ECH 166	Catalysis	3			S ECH 148A 📖
	<i>ECH 170*</i>	<i>Introduction to Colloid and Surface Phenomena</i>	3			S CHE 110A
	FST 102A	Malting and Brewing Science	4	F		BIS 102; 103; senior standing recommended
	FST 104	Food Microbiology	3		W	BIS 2A, 103, MIC 102, MIC 103L
	FST 123	Intro. to Enzymology	3			S FST 123L ☺
	<i>MIC 140*</i>	<i>Bacterial Physiology</i>	3	F		BIS 101, 102, 103 ☺ or BIS 101, 105; MIC 102 rec
	MIC 150	<i>Genomes of Pathogenic Bacteria</i>	3			S MIC 102; BIS 101
	MCB 123	Behavior and Analysis Enzymes and Receptor Systems	3	F		S BIS 103
	NPB 101	Systemic Physiology	4	F		S BIS 1A or 2A, CHE 2B; PHY 1B or 7C strongly recommended.
	NPB 107	Cell Signaling in Health and Disease	3		W	S BIS 102 or 105
	PLB 112	Plant Growth & Development	3		W	BIS 2A, 2B, and 2C; CHE 8B or 118B; BIS 101
	PLS 100A	Metabolic Processes of Cultivated Plants	3	F		PLS 2 or BIS 1C or 📖
	PLS 152	Plant Genetics	4	F		BIS 1A or 2A or 📖
	<i>STA 120*</i>	<i>Probability and Random Variables for Engineers</i>	4			MAT 21A, B, C, and D
	STA 130A	Mathematical Statistics: Brief Course	4	F		MAT 16B or 17C or 21B
	STA 131A	Introduction to Probability Theory	4	F		S MAT 21B, 21C, 22A
	VEN 123	Analysis of Musts and Wines	2	F		CHE 2C and CHE 8B or equivalent, AMR21 or equivalent
	VEN 124	Wine Production	2	F		VEN 3, VEN 123 ☺, BIS 102

Lab Electives

	<i>BIM 161L*</i>	<i>Biomolecular Engineering Lab</i>	3			BIM 161A or BIS 101
	BIT 161A	Genetics & Biotechnology Lab	6		W	PLS 152 or BIS 101; 📖
	BIT 161B	Plant Genetics & Biotechnology Lab	4			S PLS 152 or BIS 101; 📖
	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 and BIS 103
	FST 123L	Enzymology Lab	2			S BIS 103, FST 123 ☺
	MCB 120L	Biochemistry Lab	6	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
	<i>NPB 104L*</i>	<i>Cellular Physiology/Neurobio Lab</i>	4			NPB 101 and 101L; BIS 103 or 105
	VEN 123L	Analysis of Musts & Wines Lab	2	F		CHE 2C and 8B or equivalent, ARE 21 and VEN 123 ☺; restricted to upper division and grad students in VEN major
	VEN 124L	Wine Production Lab	3	F		VEN 124 ☺

☺ *May be taken concurrently*

📖 *May be taken with consent of instructor*

**Not offered regularly*

***Offered in alternate years*

Revised: 8/10/17

Notes: