



**Oregon State**  
University

# School of Chemical, Biological, and Environmental Engineering (CBEE)

**College of Engineering**  
cbee.oregonstate.edu

## Undergraduate Advising Guide **Bioengineering (BIOE)**

Revised 3/20/19

Bioengineering is an interdisciplinary field that applies engineering principles and quantitative methods to the advancement of knowledge at the molecular and cellular levels through the ecosystem level, and to the development of new and novel biologics, materials, devices, and processes. In practice, bioengineers address issues in the broad areas of bioenvironmental, biomedical and bioprocess technology.

At many universities, life sciences and engineering are more or less parallel cultures, reflected in two almost completely disparate disciplines, where students in one have trouble taking courses in the other. At OSU, bioengineers are trained to work at the interface between these disciplines. Activities in bioengineering are inextricably linked to issues relevant to public health and confidence. Perhaps more than in any other engineering discipline, bioengineers must maintain an awareness of ethical issues in their field, and the patterns of thought that lead to moral judgment and decision-making. Further, the ability to communicate effectively with people from disparate disciplines, both inside and outside of science, is essential to bioengineers.

General questions? Email [cbee.advising@oregonstate.edu](mailto:cbee.advising@oregonstate.edu)

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# CBEE Curriculum & Advising

This advising guide is intended to give an overview of the requirements for the B.S. Bioengineering degree in the School of Chemical, Biological, and Environmental Engineering (CBEE) at OSU. This major requires 192 credits for graduation and generally takes 4-5 years to complete.

This guide includes information about course prerequisites and sample term-by-term plans to graduate within 4 years. To create an individualized curriculum plan, log in to MyDegrees through MyOSU and utilize the Planner. As of AY 2018-19, the use of Planner will be required for all College of Engineering students.

## **Advising Appointments:**

Please check your MyDegrees to determine your assigned advisor. If an advisor is not listed on MyDegrees, please email us at [cbee.advising@oregonstate.edu](mailto:cbee.advising@oregonstate.edu).

Advising appointments are required once per term for all CBEE undergraduate students to obtain their PIN number for registration for the following term. Please schedule your appointment through the links above. You should schedule your advising appointment online at [cbee.oregonstate.edu/undergraduate-advising](http://cbee.oregonstate.edu/undergraduate-advising).

## **Walk-In Advising:**

CBEE Advisors provide one walk-in time daily, from 3:30-4pm. These times are intended for students with quick 1-10 minute questions. No PINs will be distributed during walk-in advising.

## **Late policy:**

If you arrive to a scheduled advising appointment 5 minutes or more late, you may be asked to reschedule. If you arrive 10 minutes or more late, you must reschedule. When we reserve time for you, we require all of that time to provide you with the best quality work possible. When you are late it decreases the advisors ability to accomplish this.

We strive to see every student as close to their appointment time as possible. It is your responsibility to remember your appointment and to be on time. We understand that true emergencies happen. We ask that you please be courteous of your advisors valuable time and attention. The Advisors, Faculty and Staff thank you.

## **No show policy:**

No penalty for the first time you do not come to a scheduled appointment. If you no show on a 2nd appointment or more, we will not give you your PIN for registration until the final day of Phase I registration. If you schedule an appointment and need to cancel, please contact your advisor.

## **General Questions:**

We have a Frequently Asked Questions page (<https://cbee.oregonstate.edu/undergraduate-advising/FAQs>) where we aggregate common student questions. If you don't see the question you need on this page, please email us your questions at [cbee.advising@oregonstate.edu](mailto:cbee.advising@oregonstate.edu).

## Bioengineering (192 Credits)

Revised 3/20/19

Credits	First Year			Second Year			Third Year			Fourth Year									
	Fall	Winter	Spring	Fall	Winter	Spring	Fall	Winter	Spring	Fall	Winter	Spring							
1	Chemistry CH 231 (4FW)	Chemistry CH 232 (4WS)	Chemistry CH 233 (4FS)	Organic Chemistry CH 331 (4FW)	Organic Chemistry CH 332 (4WS)	EE Fund. ENGR 201 (3FWS)	Biochemistry BB 450 (4FWS)	Biochemistry BB 451 (3FWS)	Biomedical Engr. Principles BIOE 340 (3S)	Bioengr. Prod. Design BIOE 491 (4F)	Bioengr. Prod. Design BIOE 492 (4W)	Bioengr. Proc. Design BIOE 490 (4S)							
2													3	4	Process Analysis CBEE 213 (4S)	Transport II CHE 332 (3W)	Transport III CHE 333 (3WS)		
5						6		7	Material Balances CBEE 211 (3F)				Energy Balances CBEE 212 (3W)	Transport I CHE 331 (4F)				Social Justice & Ethics BIOE 420 (3W)	Biomat. & Biointerfaces BIOE 351 (3S)
8						9		Physics w/ Calculus PH 212 (4FWS)							Physics w/ Calculus PH 213 (4FWS)	Statics ENGR 211 (3FWS)	Thermo CHE 311 (3F)		
10	11	Physics w/ Calculus PH 211 (4FWS)	Anatomy & Physiology BI 231 (3F)	Differential Equations MTH 256 (4FWS)	Matrices MTH 264 (2)	Engineering Ethics CBEE 320 (3F)	BIOE Elective (3-4FWS)		Process Laboratory CBEE 414 (3F)	BIOE Elective (3-4FWS)	Synthesis (3FWS)								
12	13							English Composition WR 121 (3FWS)				COMM 111/114 (3FWS)	HHS 231 (2FWS)	Series MTH 265 (2)	Engineering Elective (3-4FWS)	DPD (3FWS)	Biological Science Elective (3-4FWS)	Perspective (3FWS)	Synthesis (3FWS)
14	15	PAC (1FWS)	BI 241 (2F) or MB 230 (4FWS)	Perspective (3FWS)	Anatomy & Physiology BI 233 (3S)	Perspective (3FWS)													
16	17							18											

	Pre-requisites for upper division coursework
	Electives (6 credits bioengineering, 3 credits bioscience, and 6 credits restricted engineering electives)
	Baccalaureate Core course not covered by major requirements (S/U grading allowed)

This advising guide is intended for scheduling only. Course offerings and requirements are subject to change. Please reference the OSU Online catalog for a complete list of degree requirements.

# Bioengineering Major

## Required Courses

### Math

Course #	Credit Hours	Description	Prerequisites	Terms Offered
MTH 251	4	Differential Calculus	MTH 112	FWS
MTH 252	4	Integral Calculus	MTH 251	FWS
MTH 254	4	Vector Calculus I	MTH 252	FWS
MTH 256	4	Differential Equations	MTH 254	FWS
MTH 264	2	Introduction to Matrix Algebra	MTH 252	FWS
MTH 265	2	Introduction to Series	MTH 252	FWS

### Science

Course #	Credit Hours	Description	Prerequisites	Terms Offered
BI 241 or MB 230	2 or 4	Anatomy & Physiology Lab (BI 241) or Introduction Microbiology (MB 230)	BI 241: BI 231 (co), MB 230: none	BI 241:F MB 230: FWS
BI 231	3	Human Anatomy & Physiology	none	F
BI 233	3	Human Anatomy & Physiology	BI 231	S
BB 450	4	General Biochemistry	CH 332 or 336	FWS
BB 451	3	General Biochemistry	BB 450	FWS
BB 493	3	Biochemistry Lab I	BB 451 or 492	F
CH 231/261	5	General Chemistry + Lab	MTH 111	FW
CH 232/262	5	General Chemistry + Lab	CH 231	WS
CH 233/263	5	General Chemistry + Lab	CH 232	FS
CH 331	4	Organic Chemistry (CH334/5/6 can substitute)	CH 233	FW
CH 332	4	Organic Chemistry (CH334/5/6 can substitute)	CH 331	WS
PH 211	4	General Physics with Calculus	MTH 251, MTH 252 (co)	FWS
PH 212	4	General Physics with Calculus	PH 211, MTH 252	FWS
PH 213	4	General Physics with Calculus	PH 212, MTH 254	WS

### Engineering

Course #	Credit Hours	Description	Prerequisites	Terms Offered
BIOE 340	3	Biomedical Engineering Principles	CHE 332, BI 233 (co), CHE 333 (co)	S
BIOE 351	3	Biomaterials & Biointerfaces	BB 451 (co), CHE 333 (co)	S
BIOE 415	3	Bioengineering Laboratory	CBEE 414	W
BIOE 420	3	Social Justice, Ethics, & Engineering	-	W
BIOE 457	3	Bioreactors	BB 451, CHE 333	F
BIOE 462	3	Bioseparations	BB 451, CHE 332	W
BIOE 490	4	Bioengineering Process Design	BIOE 457 (co), CHE 333	S
BIOE 491	4	Bioengineering Product Design	BIOE 490	F
BIOE 492	4	Bioengineering Capstone Design	BIOE 491	W
CBEE 101	3	Chemical, Biological and Environmental Engineering Orientation	-	F
CBEE 102	3	Engineering Problem Solving and Computation	MTH 112	W
CBEE 211	3	Material Balances and Stoichiometry	MTH 252, 2nd year engr standing	F
CBEE 212	3	Energy Balances	CBEE 211, MTH 256 (co)	W
CBEE 213	4	Process Data Analysis	CBEE 212	S
CBEE 320	3	Professionalism and Engineering Ethics	-	F
CBEE 414	3	Process Engineering Laboratory	CBEE 213 (co), CHE 311, CHE 333	F
CHE 311	3	Thermodynamics	CBEE 212, MTH 256, CH 233/263	F
CHE 331	4	Transport Phenomena I: Fluids	CBEE 212, MTH 256	F
CHE 332	3	Transport Phenomena II: Heat	CHE 311 and 331	W
CHE 333	3	Transport Phenomena III: Mass	CHE 331 and 332 (co)	S
ENGR 201	3	Electrical Engineering Fundamentals I	MTH 252	FWS
ENGR 211	3	Statics	MTH 252, 2nd year engr standing	FWS

## Elective Courses

BIOE majors are required to take 6 credits of bioengineering electives, 3 credits of upper division biological science electives, and 6 credits restricted engineering electives. Students may substitute an additional bioengineering elective for the biological science requirement.

### Bioengineering Electives (6 credit minimum)

Course #	Credit Hours	Description	Prerequisites	Terms Offered
BIOE 440	3	Bioconjugation	BB 450	S*
BIOE 445	3	Surface Analysis	BIOE 351	S*
BIOE 459	3	Cell Engineering	BB 451, CHE 333	W

### Upper Division Biological Science Elective (3 credit minimum)

Course #	Credit Hours	Description	Prerequisites	Terms Offered
BB 314	4	Cell and Molecular Biology	BI 213, CH 331	FWS
BB 360	3	Introduction to Neuroscience	BI 213, CH 233, CH 263	W
BB 481	3	Macromolecular Structure	BB 450	F
BHS 316	3	Principles of Immunology	BI 213, MB 230	S
BHS 329	3	Mechanisms of Disease: Introduction to General Pathology	BI 212	S
BI 311	4	Genetics	BI 213	FWS
MB 302	3	General Microbiology	BI 213, CH 332	FWS
MB 416	3	Immunology	BB 450	F
MB 434	3	Virology	BB 451	S
MB 479	3	Fermentation Microbiology	BI 212, CH 332, BB 450, MB 302	S

### Restricted Engineering Electives (6 credit minimum)

Course #	Credit Hours	Description	Prerequisites	Terms Offered
BEE 320	4	Biosystems Analysis and Modeling	BEE 320	F
BEE 468	3	Bioremediation Engineering	-	W
BIOE 440	3	Bioconjugation	BB 450	S*
BIOE 445	3	Surface Analysis	BIOE 351	S*
BIOE 459	3	Cell Engineering	BB 451, CHE 333	W
CBEE 416	3	CBEE Laboratory II	CHE 415 or BIOE 415 or ENVE 415	S
CHE 312	3	Chemical Engineering Thermodynamics	CHE 311	W
CHE 334	2	Transport Phenomena Laboratory	CBEE 213, CHE 333 (co)	S
CHE 361	3	Chemical Process Dynamics & Simulation	MTH 256, CHE 331 (co)	W
CHE 445	4	Polymer Engineering & Science	CH 336, MTH 256	FS
CHE 450	3	Conventional & Alternative Energy Systems	none	W
CHE 451	3	Solar Energy Technologies	CHE 311	F
CHE 461	3	Process Control	CHE 331, CHE 332 (co)	S
CS 446	3	Networks in Computational Biology	CS 261, CS 325 (co)	F
ENGR 212	3	Dynamics	ENGR 211, PH 211	FWS
ENGR 213	3	Strength of Materials	ENGR 211	FWS
ENGR 248	3	Engineering Graphics & 3D Modeling	-	FWS
ENVE 322	4	Fundamentals of Environmental Engineering	CH 232, MTH 256	W
ENVE 421	4	Water and Wastewater Characterization	ENVE 321 or ENVE 322	F
ENVE 422	4	Environmental Engineering Design	ENVE 421	W
ENVE 425	3	Air Pollution Control	ENVE 321 or ENVE 322	S
ENVE 431	3	Fate & Transport of Chemicals in Environmental Systems	CH 440 or CHE 331, ENVE 421	W

\*Courses not offered every year.

## Baccalaureate Core

OSU requires completion of a set of Baccalaureate Core ("Bacc Core") courses, divided into 4 categories- Skills, Perspectives, Synthesis, and Difference, Power, and Discrimination (DPD). Some of these course requirements are met by technical courses within your major. Those Bacc Core requirements not fulfilled through technical course requirements are outlined below.

### Skills (12 credits)

Course #	Credit Hours	Description	S/U Allowed
WR 121	3	English Composition	No
WR 327	3	Technical Writing	No
COMM 111 or 114	3	Public Speaking (COMM 111) or Argument and Critical Discourse COMM (114)	No
HHS 231	2	Lifetime Fitness for Health	Yes
HHS 24x or PAC	1	Lifetime Fitness or Physical Activity Courses	Yes

### Perspectives (16 credits)

Course Categories	Credit Hours	S/U Allowed
Biological Science w/ Lab	4	No
Cultural Diversity	3	Yes
Literature & Arts	3	Yes
Social Processes & Institutions	3	Yes
Western Culture	3	Yes

### Synthesis (6 credits)

Course Categories	Credit Hours	S/U Allowed
Contemporary Global Issues	3	Yes
Science, Technology, and Society	3	Yes

**Difference, Power, & Discrimination (3 credits)- No S/U grading**

# Difference, Power, & Discrimination (DPD) Courses

All OSU undergraduate students are required to take a DPD course before graduation. Below is a condensed list of course offerings in DPD for BIOE students. BIOE students must take one of these DPD courses. Other university DPD courses that do not appear on this list will not be accepted towards the BIOE DPD requirement.

<b>AG 301</b>	Ecosystem science of Pacific NW Indians	3 credits
<b>ANTH 251</b>	Language in the USA	3 credits
<b>ANTH 345</b>	Biological and cultural constructions of race	3 credits
<b>ANTH 451</b>	Sociolinguistics	3 credits
<b>ECON 383</b>	The economics of discrimination	4 credits
<b>ED 216</b>	Purpose, Structure & Function of Education in a Democracy	3 credits
<b>ENG 420</b>	Studies in difference, power, and discrimination	3 credits
<b>ES 212</b>	Survey of Chicano/a-Latino/a studies III	3 credits
<b>ES 213</b>	Contemporary Latino/a culture and issues	3 credits
<b>ES 216</b>	Las presencia Mexicana en los Estados Unidos	3 credits
<b>ES 221</b>	Survey of African American studies I	3 credits
<b>ES 223</b>	Survey of African American studies III	3 credits
<b>ES 233</b>	Asian American Studies II: Activism & Empowerment	3 credits
<b>ES 243</b>	Native American experience in the 20th century U.S.	3 credits
<b>ES 351</b>	Ethnic minorities in Oregon	3 credits
<b>ES 452</b>	Ethnicity in film	3 credits
<b>FW 340</b>	Multicultural perspectives in natural resources	3 credits
<b>H 465</b>	Public health and women: social and policy issues	3 credits
<b>HST 210</b>	Religion in the United States	4 credits
<b>HST 368</b>	Lesbian and gay movements in modern America	3 credits
<b>LING 251</b>	Languages of Oregon	3 credits
<b>MB 330</b>	Disease and society	3 credits
<b>PHL 280</b>	Ethics of diversity	4 credits
<b>PHL 380</b>	The body, medicine and culture	3 credits
<b>PS 363</b>	Gender and race in American political thought	4 credits
<b>PS 375</b>	The civil rights movement and policies	4 credits
<b>SOC 312</b>	Sociology of the family	3 credits
<b>SOC 426</b>	Social inequality	3 credits
<b>TA 360</b>	Multicultural American Theatre	3 credits
<b>TCS 200</b>	Twentieth century realities: the U.S.	3 credits
<b>WGSS 262</b>	Introduction to Queer Studies	3 credits
<b>WGSS 325</b>	Disney: Gender, Race, Empire	3 credits
<b>WGSS 414</b>	Systems of oppression in women's lives	3 credits
<b>WGSS 420</b>	Hate, resistance, and reconciliation	3 credits

# Important Links

## CBEE Resources

**CBEE Advising:** <http://cbee.oregonstate.edu/undergraduate-advising>

Go to this site to book an appointment with your advisor! This page also contains general advising information and the latest copy of the advising guide.

**CBEE Advising FAQs:** <https://cbee.oregonstate.edu/undergraduate-advising/FAQs>

Frequently asked questions by CBEE students. Covers a range of topics from advising appointments to GPA requirements.

**Research, Internships, and Careers:** <http://cbee.oregonstate.edu/careers>.

Practical work experience in a research laboratory or in industry is essential to your future employment and educational goals. CBEE students have a variety of opportunities to develop laboratory skills and obtain career advice from faculty and peer mentors.

## College of Engineering Resources

**College of Engineering (COE):** <http://engineering.oregonstate.edu/>

College of Engineering home page.

**MY COE:** <http://engineering.oregonstate.edu/my-coe>

Page with information about COE procedures and links to other OSU websites that are relevant to COE students.

## OSU Resources

**Student Online Services:** <https://myosu.oregonstate.edu>

In your online account, you can register for classes, access MyDegrees, view & order transcripts, view account holds, and pay your student fees & tuition.

**Catalog:** <https://catalog.oregonstate.edu/>

The general OSU catalog contains information about all of the different major and minor programs at OSU, including course requirements and prerequisites.

**OSU Schedule of Classes Searcher:** <https://classes.oregonstate.edu/>

Use this tool to search for class availability sorted by term, requirement, subject, or campus.

**Transfer Credits:** <http://registrar.oregonstate.edu/transfer-credits>

General guide to transferring credits to OSU.

**Transfer Course Search:**

[https://adminfo.ucsadm.oregonstate.edu/prod/OSU\\_ADMTAM.P\\_tcs\\_splash\\_page](https://adminfo.ucsadm.oregonstate.edu/prod/OSU_ADMTAM.P_tcs_splash_page)

This tool allows you to search course equivalencies by the institution and course subject/number.

**Registrar Forms:** <http://registrar.oregonstate.edu/forms>

Forms relating to registration, grading, student records, veterans benefits, and graduation.