2023-2024 Biomolecular Engineering and Bioinformatics: Biomolecular

Mathematics

•MATH 3 or math placement of 400 or higher
MATH 19A
Calculus I
[F/W/Sp/Su]

•MATH 19A
MATH 19B
Calculus II
[F/W/Sp/Su]

•MATH 3 or math placement of 400 or higher
AM 10^
Mathematical Methods of Engineers I
[F/W/Sp]

•MATH 19B and AM 10
AM 20^
Mathematical Methods of Engineers II
[W/Sp]

•MATH 19B
STAT 131
Intro to Probability Theory
[F/W/Sp]

•STAT 131
STAT 132
Classical and Bayesian Inference
[W/Sp]

OR

•STAT 131 and permission from instructor
STAT 206
Applied Bayesian Statistics
[W]

Chemistry
Select one of the following General Chemistry series:
Chem 1 series for students who started in Fall 2022 or earlier.

CHEM 1A	CHEM 1B/M	CHEM 1C/N

•Math 2 or math placement of 200 or higher
CHEM 3A
General Chemistry
[F/W]

•Chem 3A
CHEM 3B/BL
General Chemistry
[W/Sp]

•Chem 3B
CHEM 3C/CL
General Chemistry
[Sp]

•Chem 4 Prep ALEKS module. Math 3 or math placement score of 300 or higher.
CHEM 4A/AL
Advanced General Chemistry
[F]

•Chem 4A
CHEM 4B/BL
Advanced General Chemistry
[W]

Laboratory Courses

•CHEM 1M or 3BL or 4BL
BME 21L
Intro. To Basic Laboratory Techniques
[F/W]

•BME 21L
BME 22L
Foundations of Design in Molecular Biology I
[W/Sp]

•BME 22L
BME 23L
Foundations of Design in Molecular Biology II
[F/Sp]

Physics

•MATH 19A, corequisite of Phys 5L, Math 19B
PHYS 5A/L
Introduction to Physics I
[F/W]

•PHYS 5A/L, corequisite of MATH 19B
PHYS 5B/M
Introduction to Physics II
[Sp]

Biology, Organic Chemistry, and Biochemistry

•CHEM 1A, CHEM 3A, or CHEM 4A
BIOL 20A
Cell and Molecular Biology
[F/W/Sp/Su]

•BIOL 20A
BME 105
(Strongly Recommended)
Genetics in the Genomics Era
[Sp]

OR

•BIOL 20A and BIOE 20B
BIOL 105
Genetics
[F/W/Sp/Su]

•CHEM 1B and 1C, or CHEM 3C or CHEM 4B
CHEM 8A
Organic Chemistry
[F/W/Su]

•CHEM 8A
CHEM 8B
Organic Chemistry
[W/Sp/Su]

•CHEM 8B and BIOL 20A
BIOC 100A
Biochemistry and Molecular Biology
[F]

•BIOC 100A
BIOC 100B
Biochemistry and Molecular Biology
[W]

Bioinformatics and Bioethics

•BME 105 or BIOL 105 or BIOC 100A or declared BMEB majors
BME 110
Computational Biology Tools
[F/W/Sp]

•BIOL 20A
BME 160 (6 units)^Ω
Research Programming in the Life Sciences
[W/Sp]

•BME 160 or BME 205
BME 163 (3 units)
Applied Visualization and Analysis of Scientific Data
[Sp]

BME 80G
Bioethics in the 21st Century: Science, Business, and Society
[Sp]

•ELWR and BIOL 20A
(Strongly Recommended)
BME 185
Technical Writing for Biomolecular Engineers
[F/W/Sp]

OR

•ELWR and CSE 12 or CSE 15 or CSE 30 or BME 160
CSE 185E
Technical Writing for Computer Engineers
[F/W/Sp]

Modeling & Design Sequence
Choose one of the following sequences

•BIOL 20A
BME 177
Engineering Stem Cells
[Sp]
&
•BME 21L, 22L, and 23L: previous or concurrent enrollment in BME 177
BME 177L (2 units)
Engineering Stem Cell Lab
[Sp]

• BIOL 20A and BIOC 100A
BME 128
Protein Engineering
[W]
&
•BME 128 and BME 21L
BME 128L (2 units)
Protein Engineering Lab
[Sp]

•STAT 131 and AM 20
AM 115
Stochastic Modeling in Biology
[Sp]

Elective: *One of the following (course used as an Elective cannot be used to satisfy other major requirements)*

AM 147, BIOL 115*, METX 100, METX 140, BIOC 100C, BME 118, BME 122H, BME 128, BME 128L, BME 130, BME 132, BME 140, BME 175, BME 177, BME 177L, BME 178, ECE 104, or any 5-credit biomolecular engineering graduate course

Biomolecular Capstone*: Students must complete one of the following:*

Bioinformatics Capstone#	iGEM	Senior Design	Senior Thesis^α
•BME 160, STAT 131, and prev. or conc. enrollment in BIOC 100A **BME 205** Bioinformatics Models and Algorithms [F]	•prev or conc. enrollment in BME 185 or CSE 185E **BME 180(2 units)** Professional Practice in Bioengineering [W]	•BIOC 100A and BME 23L and previous or concurrent enrollment in BME 185 or CSE 185E **BME 129A** Biomolecular Engineering Project I [F]	**BME 195 (5 units)** Senior Thesis Research [F]
	•BME 180 and instructor permission **BME 188A(2 units)** Synthetic Biology – Mentored Research A [Sp]	•BME 129A **BME 129B** Biomolecular Engineering Project II [W]	**BME 195F (5 units)** Senior Thesis Research [W]
•BME 205 **BME 230A** Introduction to Computational Genomics and Systems Biology [W]	•BME 188A **BME 188B** Synthetic Biology – Mentored Research B [Su] •BME 188B **BME 188C** Synthetic Biology – Mentored Research C [Su]	•BME 129A and BME 129B **BME 129C** Biomolecular Engineering Project III [Sp]	**BME 195 (5 units)** Senior Thesis Research [Sp]

Fall _____	Winter _____	Spring _____	Summer _____

Fall _____	Winter _____	Spring _____	Summer _____

Fall _____	Winter _____	Spring _____	Summer _____

Fall _____	Winter _____	Spring _____	Summer _____

Legend

Ω Students with no prior programming experience are advised to take CSE 20 prior to BME 160

The Bioinformatics capstone is <u>programming heavy</u>. Students interested in this capstone are advised to take additional programming classes.

α The thesis option consists of 15 credits of Independent Study (BME 198), Field Study (BME 193), or Senior Thesis Research (BME 195) in Biomolecular Engineering. Students pursuing the senior thesis option must write a two-page thesis proposal and seek approval of their project from the undergraduate director in the quarter preceding the independent study courses, typically spring quarter of the third year. Students spend three or more quarters working on their thesis projects. BME 123T is no longer required and students should plan on 15 units of BME 195 split over 3 quarters.

^ Students may petition to substitute Math 21 for AM 10, and Math 24 for AM 20, if they can show MATLAB proficiency at the level of students in the AM classes they are replacing. Matlab Training: https://its.ucsc.edu/software/matlab.html

Double majors with other biology-related majors are permitted for the bioinformatics concentration, <u>but not</u> for the biomolecular engineering concentration. Cannot be combined with a Bioinformatics minor.

Exit Requirements

Students are required to submit a portfolio, exit survey, and attend an exit interview. The portfolios must be turned in by the last day of the quarter of graduation, and will be reviewed quarterly by the undergraduate director. Exit interviews are scheduled during the last week of the quarter by Baskin Engineering advising office, generally as small group interviews. Additional information can be found in the program catalog statement.

1. Portfolio
2. Exit Survey
3. Exit Interview

Student Name: