

2024-2025 Biomolecular Engineering and Bioinformatics: Biomolecular

<p>Mathematics</p> <ul style="list-style-type: none"> •MATH 3 or math placement of 400 or higher MATH 19A Calculus I [F/W/Sp] •MATH 19A MATH 19B Calculus II [F/W/Sp] •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 [F/W/Sp] •MATH 19B STAT 131 Intro to Probability Theory [F/W/Sp] •STAT 131 STAT 132 Classical and Bayesian Inference [F/W/Sp] OR •STAT 131 and permission from instructor STAT 206 Applied Bayesian Statistics Not offered 24-25 	<p>Chemistry</p> <p>Select <u>one</u> of the following General Chemistry series:</p> <table border="1"> <tr> <td>•Math 2 or math placement of 200 or higher CHEM 3A General Chemistry [F/W]</td> <td>•Chem 3A CHEM 3B/BL General Chemistry [W/Sp]</td> <td>•Chem 3B CHEM 3C/CL General Chemistry [F/Sp]</td> </tr> </table> <p>OR</p> <table border="1"> <tr> <td>•Chem 4 Prep ALEKS module. Math 3 or math placement score of 300 or higher. CHEM 4A/AL Advanced General Chemistry</td> <td>•Chem 4A CHEM 4B/BL Advanced General Chemistry</td> </tr> </table> <p><i>Chem 4A/AL and 4B/BL not offered 2024-2025</i></p>	•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 [F/Sp]	•Chem 4 Prep ALEKS module. Math 3 or math placement score of 300 or higher. CHEM 4A/AL Advanced General Chemistry	•Chem 4A CHEM 4B/BL Advanced General Chemistry	<p>Biology, Organic Chemistry, and Biochemistry</p> <table border="1"> <tr> <td>•CHEM 3A, or CHEM 4A BIOL 20A Cell and Molecular Biology [F/W/Sp]</td> <td>•CHEM 3C or CHEM 4B CHEM 8A Organic Chemistry [F/W]</td> </tr> <tr> <td>•BIOL 20A BME 105 (Strongly Recommended) Genetics in the Genomics Era [Sp]</td> <td>•CHEM 8A CHEM 8B Organic Chemistry [W/Sp]</td> </tr> <tr> <td>OR</td> <td>•CHEM 8B and BIOL 20A BIOC 100A Biochemistry and Molecular Biology [F]</td> </tr> <tr> <td>•BIOL 20A and BIOE 20B BIOL 105 Genetics [F/W/Sp]</td> <td>•BIOC 100A BIOC 100B Biochemistry and Molecular Biology [W]</td> </tr> </table>	•CHEM 3A, or CHEM 4A BIOL 20A Cell and Molecular Biology [F/W/Sp]	•CHEM 3C or CHEM 4B CHEM 8A Organic Chemistry [F/W]	•BIOL 20A BME 105 (Strongly Recommended) Genetics in the Genomics Era [Sp]	•CHEM 8A CHEM 8B Organic Chemistry [W/Sp]	OR	•CHEM 8B and BIOL 20A BIOC 100A Biochemistry and Molecular Biology [F]	•BIOL 20A and BIOE 20B BIOL 105 Genetics [F/W/Sp]	•BIOC 100A BIOC 100B Biochemistry and Molecular Biology [W]
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	<p>Laboratory Courses</p> <table border="1"> <tr> <td>•CHEM 1M or 3BL or 4BL BME 21L Intro. To Basic Laboratory Techniques [F/W]</td> <td>•BME 21L BME 22L Foundations of Design in Molecular Biology I [W/Sp]</td> <td>•BME 22L BME 23L Foundations of Design in Molecular Biology II [W/Sp]</td> </tr> </table>	•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 [W/Sp]	<p>Bioinformatics and Bioethics</p> <table border="1"> <tr> <td>•BME 105 or BIOL 105 or BIOC 100A or declared BMEB majors BME 110 Computational Biology Tools [F/W/Sp]</td> <td>BME 80G Bioethics in the 21st Century: Science, Business, and Society [Sp]</td> </tr> <tr> <td>•BIOL 20A BME 160 (6 units)[□] Research Programming in the Life Sciences [W/Sp]</td> <td>•ELWR and BIOL 20A (Strongly Recommended) BME 185 Technical Writing for Biomolecular Engineers [F/W/Sp]</td> </tr> <tr> <td>•BME 160 BME 163 (3 units) Applied Visualization and Analysis of Scientific Data [Sp]</td> <td>OR •ELWR and CSE 12 or CSE 30 or BME 160 CSE 185E Technical Writing for Computer Engineers [F/W/Sp]</td> </tr> </table>	•BME 105 or BIOL 105 or BIOC 100A or declared BMEB majors BME 110 Computational Biology Tools [F/W/Sp]	BME 80G Bioethics in the 21 st Century: Science, Business, and Society [Sp]	•BIOL 20A BME 160 (6 units) [□] Research Programming in the Life Sciences [W/Sp]	•ELWR and BIOL 20A (Strongly Recommended) BME 185 Technical Writing for Biomolecular Engineers [F/W/Sp]	•BME 160 BME 163 (3 units) Applied Visualization and Analysis of Scientific Data [Sp]	OR •ELWR and CSE 12 or CSE 30 or BME 160 CSE 185E Technical Writing for Computer Engineers [F/W/Sp]				
•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 [W/Sp]													
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	<p>Physics</p> <table border="1"> <tr> <td>•MATH 19A, corequisite of Phys 5L AND Math 19B PHYS 5A/L Introduction to Physics I [F/W]</td> <td>•PHYS 5A/L and MATH 19B; concurrent enrollment in PHYS 5M PHYS 5B/M Introduction to Physics II [W/Sp]</td> </tr> </table>	•MATH 19A, corequisite of Phys 5L AND Math 19B PHYS 5A/L Introduction to Physics I [F/W]	•PHYS 5A/L and MATH 19B; concurrent enrollment in PHYS 5M PHYS 5B/M Introduction to Physics II [W/Sp]												
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Modeling & Design Sequence
Choose one of the following sequences

•BIOL 20A BME 177 Engineering Stem Cells [Sp]	•BIOL 20A and BIOC 100A BME 128 Protein Engineering [W]	•STAT 131 and AM 20 AM 115 Stochastic Modeling in Biology [Not offered 24-25]
&	&	
•BME 21L, 22L, and 23L; previous or concurrent enrollment in BME 177 BME 177L (2 units) Engineering Stem Cell Lab [Sp]	•BME 128 and BME 21L BME 128L (2 units) Protein Engineering Lab [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

*Courses have additional prerequisites not covered by the major requirements

Biomolecular Capstone: Students must complete one of the following:

Bioinformatics Capstone#	iGEM	Senior Design	Senior Thesis ^a
•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 and instructor permission BME 188B Synthetic Biology – Mentored Research B [Su]	•BME 129A and BME 129B BME 129C Biomolecular Engineering Project III [Sp]	BME 195 (5 units) Senior Thesis Research [Sp]
	•BME 188B and instructor permission BME 188C Synthetic Biology – Mentored Research C [Su]		

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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 programming heavy. 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. 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>

• Denotes prerequisites as listed in the UCSC general catalog as of August 15, 2024. Prerequisites listed on the chart are subject to change and students should refer to the catalog for the most up to date requirements.

Due to course overlap between the biomolecular engineering and bioinformatics (BMEB) B.S., and the bioinformatics minor, none of these double major or major/minor combinations will be considered. Other major/minor combinations are permitted and encouraged. Double majors with the biotechnology B.A. and majors in the Humanities, Social Sciences, and Arts Divisions are specifically encouraged.

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