



This course plan is a recommended sequence for this major. Courses designated as critical (!) may have a deadline for completion and/or affect time to graduation. Please see the Program Notes section for details regarding "critical courses" for this particular Program of Study.

| !                                       | Course Subject and Title  | Credit Hours | Min. Grade <sup>1</sup> | Program GPA <sup>2</sup> | Code             | Prerequisites  | Notes |
|---|---|--------------|-------------------------|--------------------------|------------------|--|-------|
| <b>Semester One (16 Credit Hours)</b>   |   |              |                         |                          |                  |  |       |
|   | ENGL 101 Critical Reading and Composition   | 3            | C                       |                          | CC-CMW           |  |       |
| !                                       | MATH 141 Calculus I <sup>3</sup>  | 4            | C                       |                          | CC-ARP           | C or better in MATH 112/115/116 or Math placement test score   |       |
| !                                       | CHEM 111 General Chemistry I  | 3            | C                       |                          | CC-SCI           | C or better in MATH 111/115/122/141 or higher math or Math placement test;<br>Coreq: CHEM 111L                               |       |
| !                                       | CHEM 111L General Chemistry I Lab   | 1            | C                       |                          | CC-SCI           | MATH 111 or 115; Prereq or Coreq: CHEM 111   |       |
| !                                       | BIOL 101 Biological Principles I  | 3            | C                       |                          | CC-SCI           | Coreq: BIOL 101L   |       |
| !                                       | BIOL 101L Biological Principles I Lab   | 1            | C                       |                          | CC-SCI           | Prereq or coreq: BIOL 101  |       |
|   | BMEN 101 Intro. to Biomedical Engr. <i>fall only</i>  | 1            |                         | *                        | MR               | Coreq or prereq: MATH 141  |       |
| <b>Semester Two (18 Credit Hours)</b>   |   |              |                         |                          |                  |  |       |
|   | ENGL 102 Rhetoric and Composition   | 3            |                         |                          | CC-CMW<br>CC-INF | C or better in ENGL 101  |       |
| !                                       | MATH 142 Calculus II  | 4            | C                       |                          | CC-ARP           | C or better in MATH 141  |       |
| !                                       | BMEN 212 Fundamentals of Biomedical Systems   | 3            | C                       | *                        | MR               | C or better in CHEM 111 or 141 & MATH 141  |       |
| !                                       | CHEM 112 General Chemistry II   | 3            | C                       |                          | PR               | C or better in CHEM 111, MATH 111/115/122/141 or higher math;<br>Coreq: CHEM 112L  |       |
| !                                       | CHEM 112L General Chemistry II Lab  | 1            | C                       |                          | PR               | C or better in CHEM 111/111L/141<br>Prereq or Coreq: CHEM 112  |       |
| !                                       | PHYS 211 Essentials of Physics I  | 3            | C                       |                          | CC-SCI           | C or better in MATH 141; Coreq: PHYS 211L  |       |
| !                                       | PHYS 211L Essentials of Physics I Lab   | 1            | C                       |                          | CC-SCI           | Prereq or Coreq: C or better in PHYS 211   |       |
| <b>Semester Three (17 Credit Hours)</b> |   |              |                         |                          |                  |  |       |
| !                                       | MATH 241 Vector Calculus  | 3            | C                       |                          | PR               | C or better in MATH 142  |       |
| !                                       | PHYS 212 Essentials of Physics II   | 3            |                         |                          | PR               | C or better PHYS 211 <i>and</i> MATH 142;<br>Coreq: PHYS 212L  |       |
| !                                       | PHYS 212L Essentials of Physics II Laboratory   | 1            |                         |                          | PR               | Prereq or Coreq: C or better in PHYS 212   |       |
| !                                       | CHEM 333 Organic Chemistry I  | 3            | C                       |                          | PR               | C or higher in CHEM 112 or 142   |       |
| !                                       | BMEN 240 Cellular & Molecular Biol. with Engr. Applications <i>fall only</i>                    | 4            | C                       | *                        | MR               | C or better in BIOL 101, CHEM 112 or 142, & MATH 142   |       |
|   | Carolina Core GSS <sup>4</sup>  | 3            |                         |                          | CC-GSS           |  |       |
| <b>Semester Four (15 Credit Hours)</b>  |   |              |                         |                          |                  |  |       |
| !                                       | BMEN 263 Introduction to Biomechanics <i>spring only</i>  | 3            | C                       | *                        | MR               | C or better in BMEN 212, MATH 241 & PHYS 211   |       |
| !                                       | BMEN 290 Thermodynamics of Biomol. Sys. <i>spring only</i>                                      | 3            | C                       | *                        | MR               | C or better in BMEN 240, MATH 241, & PHYS 211  |       |
| !                                       | MATH 242 Elem. Differential Equations   | 3            | C                       |                          | PR               | C or better in MATH 142  |       |
| !                                       | CHEM 334 Organic Chemistry II   | 3            | C                       |                          | PR               | C or better in CHEM 333  |       |
| !                                       | STAT 509 Statistics for Engineers   | 3            |                         |                          | PR               | MATH 142 or equivalent   |       |
| <b>Semester Five (17 Credit Hours)</b>  |   |              |                         |                          |                  |  |       |
| !                                       | BMEN 271 Introduction to Biomaterials <i>fall only</i>  | 3            |                         | *                        | MR               | D or better in CHEM 333; C or better in BMEN 240; C or better in BMEN 263 or ECHE 456; & C or better in BMEN 290 or ECHE 311 |       |
| !                                       | BMEN 321 Biomonitoring & Electrophysiology <i>fall only</i>                                     | 3            |                         | *                        | MR               | D or better in PHYS 212, & C or better in BMEN 212, BMEN 240, & MATH 242   |       |
| !                                       | BMEN 381 Biomedical Engineering Lab I <i>fall only</i>  | 2            |                         | *                        | MR               | D or better in BMEN 263, STAT 509; Prereq or coreq: D or better in BMEN 271  |       |
| !                                       | ECHE 320 Chemical Engr. Fluid Mechanics or ENCP 360 Fluid Mechanics or EMCH 360 Fluid Mechanics | 3            |                         | *                        | PR               | See Bulletin listing.  |       |
|   | CHEM 550 Biochemistry ( <i>cross-listed: BIOL 541</i> )   | 3            |                         |                          | PR               | C or better in CHEM 334  |       |
|   | Carolina Core AIU <sup>4</sup>  | 3            |                         |                          | CC-AIU           |  |       |
| <b>Semester Six (17 Credit Hours)</b>   |   |              |                         |                          |                  |  |       |
|   | BMEN 302 Prof. Dev. & Ethics in BMEN <i>spring only</i>   | 2            |                         | *                        | MR               | D or better in BMEN 101  |       |
| !                                       | BMEN 345 Human Anat. & Phys. for BMEN <i>spring only</i>  | 4            |                         | *                        | MR               | D or better in BMEN 271 & C or better in BMEN 240  |       |
| !                                       | BMEN 354 Biotransport <i>spring only</i>  | 3            |                         | *                        | MR               | D or better in ECHE 320 or EMCH/ENCP 360, & C or better in MATH 242  |       |
| !                                       | BMEN 363 Biomed. Instrumentation <i>spring only</i>   | 3            |                         | *                        | MR               | D or better in BMEN 321  |       |
| !                                       | BMEN 382 Biomed. Engineering Lab II <i>spring only</i>  | 2            |                         | *                        | MR               | D or better in BMEN 321 & 381; Prereq or coreq: D or better in BMEN 363  |       |
|   | Carolina Core VSR <sup>4</sup>  | 3            |                         |                          | CC-VSR           |  |       |

| Semester Seven (15 Credit Hours)            |   |     |  |   |              |  |  |
|---|---|-----|--|---|--------------|--|--|
| !   | BMEN 427 Senior BMEN Design I <i>fall only</i>                          | 3   |  | * | MR<br>CC-INT | D or better in BMEN 271, 345, 354, 363, & BMEN 381 <i>or</i> 382   |  |
|   | BMEN 411 Modeling and Simulation of Biomedical Systems <i>fall only</i> | 3   |  | * | MR           | D or better in BMEN 263, 271, & 354  |  |
|   | BMEN 391 Kinetics in Biomolecular Systems <i>fall only</i>              | 3   |  | * | MR           | D or better in CHEM 550 <i>or</i> BIOL 541; C or better in BMEN 290 <i>or</i> ECHE 311 & C or better in MATH 242 |  |
|   | Biomedical Engineering Elective <sup>5</sup>                            | 3   |  | * | PR           | See Bulletin listing.  |  |
|   | Technical Elective <sup>7</sup>   | 3   |  |   | PR           | See Bulletin listing.  |  |
| Semester Eight (15 Credit Hours)            |   |     |  |   |              |  |  |
|   | BMEN 428 Senior BMEN Design II <i>spring only</i>                       | 3   |  | * | MR           | D or better in BMEN 427  |  |
|   | Biomedical Engineering Elective <sup>5</sup>                            | 3   |  | * | PR           | See Bulletin listing.  |  |
|   | Engineering Elective <sup>6</sup>                                       | 3   |  | * | PR           | See Bulletin listing.  |  |
|   | Technical Elective <sup>7</sup>   | 3   |  |   | PR           | See Bulletin listing.  |  |
|   | Carolina Core GHS <sup>4</sup>  | 3   |  |   | CC-GHS       |  |  |
| Take during any semester (0-9 Credit Hours) |   |     |  |   |              |  |  |
|   | Carolina Core CMS <sup>4</sup>  | 0-3 |  |   | CC-CMS       |  |  |
|   | Carolina Core GFL <sup>4</sup>  | 0-6 |  |   | CC-GFL       |  |  |

### Graduation Requirements Summary

| Minimum Total Hours | Minimum Major Requirements Hours | College & Program Requirements Hours | Minimum Carolina Core Hours | Minimum Institutional GPA |
|---------------------|----------------------------------|--------------------------------------|-----------------------------|---------------------------|
| 130                 | 48                               | 48                                   | 34                          | 2.00                      |

- Regardless of individual course grades, students must maintain a minimum 2.00 cumulative GPA.
- Some colleges require a minimum GPA for major courses. Courses indicated in this column are included in the BMEN program GPA of 2.00.
- Students who place into MATH 115 will be required to successfully complete it before taking MATH 141.
- The [Carolina Core](#) provides the common core of knowledge, skill and academic experience for all Carolina undergraduate students. Students in the College of Engineering & Computing are required to demonstrate proficiency in one foreign language equivalent to the 121 course by 1) a score of two or better on the foreign language placement test; or 2) completion of the 109 & 110 courses in FREN, GERM, LATN, or SPAN or completion of the 121 course in another foreign language. Students who do not place out of the GFL requirement may need to take additional hours to meet this requirement.
- Biomedical Engineering Electives (6 hours):** BMEN 342, 346, 389, 392, 499, 532, 537, 546, 547, 548, 565, 572, 575, 589, **ECHE** 430; **EMCH** 580, **EXSC** 335. At most 3 credit hours may come from BMEN 499. In addition, BMEN courses numbered 700 and above may be used to satisfy this requirement, provided the student is admitted to an Accelerated Bachelor's/Graduate Program.
- Engineering Electives (3 hours):** The Engineering Elective may be satisfied by any CSCE course at a 200 level and above, as well as any ECHE, ELCT, or EMCH course at a 300 level and above with the following exceptions: CSCE 205, ECHE 310, ECHE 320, and EMCH 360.
- Technical Electives (6 hours):** Technical Electives include all Biomedical Engineering Electives, all Engineering Electives, and the following: **BIOL** 102, 102L, 250, 250L, 270, 270L, 301, 302L, 303, 415, 460, 505, 530, 531 (or ENHS 661/EPID 661), 534, 541L (or CHEM 550L), 553, 610, 612, 620, 635, 653, 655, 656, 662, 665, 667, 690; **CHEM** 321 or 322, 321L or 322L, 331L (or CHEM 333L), 332L (or CHEM 333L), 340, 541, 542, 545, 550L; **EXSC** 330, 562; **MATH** 344 (or MATH 526), 374, 520, 524, 544, 546, 547, 550, 552; **PHYS** 514, 515, 516, 517, 521; **STAT** 516, 518, 519, 520 (or MGSC 520), 523, 525 (or MGSC 525), 528, 530, 582 (or CSCE 582), **EMCH** 111, **CSCE** 145, **MGMT** 371.

### Program Notes:

- Courses identified as "critical" must be completed by the semester in which they are listed in order to ensure a timely graduation due to prerequisite requirements for subsequent required courses.
- All undergraduate students must take a 3-credit course or its equivalent with a passing grade that covers the founding documents. This course may fulfill any requirement in the program of study. Courses that meet this requirement are listed in the academic bulletin.
- A student cannot repeat courses from the College of Engineering and Computing in which they earned a grade of C or better. In addition, a student cannot repeat any course from the College a second time. No more than four courses from the College of Engineering and Computing may be repeated in order to satisfy the requirements for any degree from the College, regardless of satisfactory work. For this purpose, withdrawal from a course with a grade of **W** is not regarded as enrollment in that course. A student that does not satisfactorily complete a degree-required College course within two attempts must change major or transfer out of the College of Engineering and Computing.
- The last 25% of a student's degree must be completed in residence at the University, and at least half of the hours in the student's major courses and in the student's minor courses (if applicable) must be taken at the University.
- Disclaimer: Prerequisites on courses are subject to change. Please refer to Bulletin.

**University Requirements:** Bachelor's degree-seeking students must meet Carolina Core (general education) requirements. For more information regarding these requirements, please visit the [Carolina Core](#) page on the University website.

| Codes:        |  |
|---------------|--|
| <b>CC</b>     | Carolina Core  |
| <b>CC-AIU</b> | Carolina Core-Aesthetic and Interpretive Understanding                             |
| <b>CC-ARP</b> | Carolina Core-Analytical Reasoning and Problem-Solving                             |
| <b>CC-CMS</b> | Carolina Core-Effective, Engaged, and Persuasive Communication: Spoken Component   |
| <b>CC-CMW</b> | Effective, Engaged, and Persuasive Communication: Written Component                |
| <b>CC-GFL</b> | Carolina Core-Global Citizenship and Multicultural Understanding: Foreign Language |
| <b>CC-GHS</b> | Carolina Core – Historical Thinking  |
| <b>CC-GSS</b> | Carolina Core – Social Sciences  |
| <b>CC-INF</b> | Carolina Core – Information Literacy   |
| <b>CC-INT</b> | Carolina Core – Integrative Course   |
| <b>CC-SCI</b> | Carolina Core – Scientific Literacy  |
| <b>CC-VSR</b> | Carolina Core – Values, Ethics, and Social Responsibility                          |
| <b>CR</b>     | College Requirement  |
| <b>MR</b>     | Major Requirement  |
| <b>PR</b>     | Program Requirement  |

Disclaimer: Major maps are only a suggested or recommended sequence of courses required in a program of study. Please contact your academic advisor for assistance in the application of specific coursework to a program of study and course selection and planning for upcoming semesters.