

**Vanderbilt University
School of Engineering**

**Biomedical Engineering
Undergraduate Curriculum Guide**



**VANDERBILT
UNIVERSITY**

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Contact Information

Department of Biomedical Engineering
 Vanderbilt University School of Engineering
 5824 Stevenson Center
 Box 351631 - B
 Nashville, TN 37235-1631

Tel. (615) 322-3521
 Fax. (615) 343-7919
 URL: <http://engineering.vanderbilt.edu/bme/>

Faculty

| | | |
|--|------------------------------------|-------------------------------|
| Nicholas Adams, Ph.D. Research Assistant Professor | n.adams@vanderbilt.edu | (615) 322-2266 |
| Adam Anderson, Ph.D. Associate Professor | adam.anderson@vanderbilt.edu | (615) 322-8174 or 322-8353 |
| Justin Baba, Ph. D. Adjoint Associate Professor | justin.s.baba@vanderbilt.edu | --- |
| Franz Baudenbacher, Ph.D. Associate Professor | f.baudenbacher@vanderbilt.edu | (615) 322-6361 |
| Leon Bellan, Ph. D. Assistant Professor | leon.bellan@vanderbilt.edu | (615) 343-6214 |
| Brett Byram, Ph.D. Assistant Professor | brett.c.byram@vanderbilt.edu | (615) 343-2327 |
| Cyndi Clark, Ph.D. Research Assistant Professor | cyndi.clark@vanderbilt.edu | (615) 322-2207 |
| Bruce Damon, Ph.D. Associate Professor | bruce.damon@vanderbilt.edu | (615) 322-8355 |
| Benoit Dawant, Ph.D. Professor | benoit.dawant@vanderbilt.edu | (615) 322-7923 |
| Zhaohua Ding, Ph.D. Assistant Professor | zhaohua.ding@vanderbilt.edu | (615) 322-7889 |
| Mark Does, Ph.D. Professor | mark.does@vanderbilt.edu | (615) 322-8176 or 322-8352 |
| Craig L. Duvall, Ph.D. Assistant Professor | craig.duvall@vanderbilt.edu | (615) 322-3598 |
| Daniel France, Ph.D. Research Associate Professor | dan.france@vanderbilt.edu | (615) 322-1407 |
| Todd D. Giorgio, Ph.D. Professor | todd.d.giorgio@vanderbilt.edu | (615) 322-3756 |
| John C. Gore, Ph.D. University Professor | john.gore@vanderbilt.edu | (615) 322-8357 |
| William Grissom, Ph.D. Assistant Professor | will.grissom@vanderbilt.edu | (615) 322-3521 |
| Scott Guelcher, Ph.D. Professor | scott.guelcher@vanderbilt.edu | (615) 322-9097 |
| Valerie Guent, Ph.D. Adjunct Assistant Professor | valerie.j.abernathy@vanderbilt.edu | (615) 322-3521 |
| Mukesh Gupta, Ph.D. Research Assistant Professor | mukesh.k.gupta@vanderbilt.edu | (615) 343-5942 |
| Kevin Harkins, Ph.D. Research Assistant Professor | kevin.harkins@vanderbilt.edu | (615) 322-0219 |
| Paul Harris, Ph.D. Research Professor | paul.a.harris@vanderbilt.edu | (615) 322-6292 |
| Frederick R. Haselton, Ph.D. Professor | rick.haselton@vanderbilt.edu | (615) 322-6622 |
| E. Duco Jansen, Ph.D. Professor | duco.jansen@vanderbilt.edu | (615) 343-1911 |
| Michael King, Ph. D. Professor and Chair | mike.king@vanderbilt.edu | (615) 322-3521 |
| Stacy S. Klein-Gardner, Ph.D. Adjoint Associate Professor | stacy.klein-gardner@vanderbilt.edu | (615) 322-6085 |
| Bennett Landman, Ph.D. Associate Professor | bennett.landman@vanderbilt.edu | (615) 322-2338 |
| Judy T. Lewis, Ph.D. Adjunct Assistant Professor | judy.lewis@vanderbilt.edu | (615) 322-6986 |
| Amanda Lowery, Ph.D. Assistant Professor of the Practice | amanda.r.lowery@vanderbilt.edu | (615) 343-4218 |

| | | |
|---|---------------------------------------|-------------------------------|
| Christina Marasco, Ph.D. Assistant Professor of the Practice | chrissy.marasco@vanderbilt.edu | (615) 343-2245 |
| Anita Mahadevan-Jansen, Ph.D. Professor; Director of Undergraduate Studies | anita.mahadevan-jansen@vanderbilt.edu | (615) 343-4787 |
| Dmitry Markov, Ph.D. Research Assistant Professor | d.markov@vanderbilt.edu | (615) 343-8169 |
| W. David Merryman, Ph.D. Associate Professor | david.merryman@vanderbilt.edu | (615) 322-7219 or 343-0009 |
| Michael I. Miga, Ph.D. Professor | michael.i.miga@vanderbilt.edu | (615) 343-8336 |
| Victoria Morgan, Ph.D. Assistant Professor | victoria.morgan@vanderbilt.edu | (615) 343-5720 |
| Gregor Neuert, Ph.D. Assistant Professor | gregor.neuert@vanderbilt.edu | (615) 343-6404 |
| Jeffry Nyman, Ph.D. Research Assistant Professor | jeffry.s.nyman@vanderbilt.edu | (615) 936-6296 |
| Reed Omary, M.D. Professor | reed.omary@vanderbilt.edu | (615) 343-1187 |
| K. Arthur Overholser, Ph.D. Professor; Sr. Assoc. Dean | k.a.overholser@vanderbilt.edu | (615) 343-3773 |
| Cynthia B. Paschal, Ph.D. Associate Professor | cynthia.paschal@vanderbilt.edu | (615) 322-2029 |
| Cynthia Reinhart-King, Ph. D. Professor | cynthia.reinhart-king@vanderbilt.edu | (615) 874-8309 |
| Wellington Pham, Ph.D. Associate Professor | wellington.pham@vanderbilt.edu | (615) 936-7621 |
| Patricia Russ, Ph.D. Research Assistant Professor | tricia.russ@vanderbilt.edu | (615) 343-3026 |
| Veniamin Sidorov, Ph.D. Research Assistant Professor | v.sidorov@vanderbilt.edu | (615) 322-4419 |
| Yuankai (Kenny) Tao, Ph. D. Assistant Professor | yuankai.tao@vanderbilt.edu | --- |
| Hak-Joon Sung, Ph.D. Assistant Professor | hak-joon.sung@vanderbilt.edu | (615) 322-6986 |
| Matthew Walker III, Ph.D. Associate Professor of the Practice | matthew.walker.iii@vanderbilt.edu | (615) 322-3899 |
| Jared Weis, Ph.D. Research Assistant Professor | jared.a.weis@vanderbilt.edu | (615) 322-6205 |
| John P. Wikswo, Jr., Ph.D. University Professor | john.wikswo@vanderbilt.edu | (615) 343-4124 |
| John Wilson, Ph. D. Assistant Professor | john.t.wilson@vanderbilt.edu | (615) 322-6406 |
| Karl Zelik, Ph.D. Assistant Professor | karl.zelik@vanderbilt.edu | (615) 875-1506 |

Staff

| | | |
|--|-------------------------------|----------------|
| Jean M. Alley Program Coordinator | jean.m.alley@vanderbilt.edu | (615) 343-2766 |
| Denise Anthony Office Assistant IV | denise.anthony@vanderbilt.edu | (615) 322-3521 |
| John Dunbar Facilities Manager | john.j.dunbar@vanderbilt.edu | (615) 322-6245 |
| Mary Judd Administrative Assistant III, BME | mary.judd@vanderbilt.edu | (615) 322-4229 |
| Amanda King Administrative Assistant I, BME | amanda.d.king@vanderbilt.edu | (615) 343-2981 |
| Tina Shaw Administrative Assistant II, BME | tina.shaw@vanderbilt.edu | (615) 343-1099 |

Welcome to the study of biomedical engineering at Vanderbilt University. The mission of our department encompasses that of the Vanderbilt School of Engineering, which is to provide a high quality education in selected areas of engineering, balanced with broad learning opportunities from other fields, and integrated to provide intellectual richness and flexibility. Expanding upon this, it is the mission of the Vanderbilt Department of Biomedical Engineering to

- Enlighten our students with the engineering, mathematics and basic sciences that advance health care and biotechnology;
- Develop the reasoning faculties of our students, enlarge their minds and instill in them precepts of accuracy, ethics and enterprise; and
- Form the engineers, physicians, scientists and industrialists upon whose leadership continued progress in scientific understanding, health and industry depend.

The objectives of the Vanderbilt undergraduate program in biomedical engineering are the following:

- To provide an educational program focused at the interface of engineering and biology that enables graduates to solve technological problems and contribute to human health through the practice of biomedical engineering or related fields.
- To provide an educational program with breadth sufficient to instill in graduates knowledge of their professional and ethical responsibilities, knowledge in liberal arts, and skills in effective communication that they will carry into their post-baccalaureate endeavors.
- To prepare students for programs of advanced study in engineering, the sciences or medicine, or placement in the health-care, biomedical device, and biotechnology industries or as practitioners in related fields.

To achieve these objectives, the BME faculty has designed the curriculum described in this guide. If you follow this curriculum, the objectives above will be met for you specifically and you will be prepared for the next stage of your life as a biomedical engineer. In particular, this curriculum is designed to provide you with the following outcomes:

- An ability to apply knowledge of mathematics, science, and engineering at the interface of engineering and biology.
- An ability to design and conduct experiments, including experiments on living systems.
- An ability to analyze and interpret data, including data from measurements on living systems.
- An ability to design a system, component, or process to meet desired needs, including systems involving the interaction of living and non-living states, within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- An ability to function on multi-disciplinary teams.
- An ability to identify, formulate, and solve engineering problems, including problems at the interface of engineering and biology.

- An understanding of professional and ethical responsibility.
- An ability to communicate effectively, in writing and speech
- The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- A recognition of the need for and an ability to engage in life-long learning.
- A knowledge of contemporary issues.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice and be prepared for further education in engineering, medicine, or biomedical science.

As is the case for most things worth learning, biomedical engineering as a field is too broad to cover in its entirety in an undergraduate curriculum. BME spans a wide range of particular interests from devices that allow us to see inside the body without opening it to systems of equations that provide insight into how the circulatory system responds to changes in cardiac function; from the observation and determination of how microscopic cells and groups of cells control macroscopic events to management of the information flow in a medical center. While you may choose to focus on a particular part of BME, a working knowledge of other material is essential. Consequently, our curriculum will provide you the broad fundamentals of biomedical engineering and then allow you the flexibility to concentrate on your particular area of interest in your junior and senior years. Rather than being forced to choose from fixed specialty tracks, the curriculum gives you the opportunity to build on required core knowledge and explore and define your own area(s) of concentration for higher level study.

This guide, along with more information about our faculty and programs, can be found at our web site, engineering.vanderbilt.edu/bme. The roster of faculty, basic curriculum and descriptions of all classes are found in the Undergraduate Catalog, also known as The Bulletin, published annually by the University in hard copy and online at <http://www.vanderbilt.edu/catalogs/undergrad/>.

Please note that our curriculum is not static. Consult with your academic adviser regarding changes to the curriculum and how they apply to you.

General Guidelines

1. **Student Responsibility.** The student, not his or her adviser, is responsible for seeing that he or she has fulfilled all the requirements for graduation. The adviser's role is as a co-conspirator in the success of the student.
2. The **Undergraduate Catalog** (also known as “The Bulletin of Vanderbilt University”) contains all official information related to degree requirements. It is available in hard copy and online at <http://www.vanderbilt.edu/catalogs/undergrad/index.html>. In case of any conflict between the Catalog and this guide, the Undergraduate Catalog shall prevail.
3. **Credit Hours.** BME majors need credit hours as allocated in the table below to graduate.

| | Credit Hours |
|--|---------------------|
| Mathematics | 15 |
| Basic Sciences | 20 |
| Introductory engineering & computing | 6 |
| Electrical engineering | 7 |
| BME core | 31 |
| BME electives | 12 |
| Technical (science, engineering, math) electives | 12 |
| Liberal Arts Core | 18 |
| Open electives | 6 |
| | |
| Total hours | 127 |

4. **Core Curriculum.** The required courses that comprise the core curriculum are shown as explicitly listed courses in the detailed curricula on Page 10 and, for premed and (BME/CBE and BME/EE) double majors, on Pages 12-14. While there is some flexibility, the course sequence is laid out to ensure that students will have the necessary prerequisites for each course and will not encounter scheduling conflicts for required courses. Should you, by choice or by necessity, find yourself using a different sequence for completing these courses, pay careful attention to prerequisites, corequisites, and feasibility of scheduling.
5. **Basic Sciences.** The core curriculum includes a basic science requirement (20 hours) consisting of Chemistry 1601-1602 (102a–b), 1601L-1602L (104a-b), Physics 1601-1602 (116a-b), 1601L-1602L (118a-b), and Biological Sciences 1510/1510L (110a/111a; for convenience, course numbers used prior to Fall 2015 are included in parentheses).
6. **Program Electives.** Twenty four hours of program electives are required. Of these, at least 12 hours must be BME electives with no more than a total of 3 credit hours from BME 3860-3861 (240). The remaining 12 hours may be selected from either BME or Technical electives listed on page 11. Both semesters of organic chemistry count as Technical electives. Courses taken to fulfill the program elective requirement may not be taken pass/fail.

7. Liberal Arts Core.

Current Requirement (Applied to Class of 2020 and subsequent classes)

Students must take 18 credit hours of liberal arts electives to satisfy the Liberal Arts Core (LAC) requirement.

1. At least 3 hours selected from courses classified in the AXLE Curriculum Course Distribution of the College of Arts and Science as Humanities and Creative Arts (HCA) with the exception of CMST 1500, 2100, 2110, and 2120, and
2. At least 3 hours selected from courses classified in the AXLE Curriculum Course Distribution of the College of Arts and Science as Social and Behavioral Sciences (SBS)
3. Remaining hours selected from the following:
 - a. Courses classified in the AXLE Curriculum Course Distribution of the College of Arts and Science as Humanities and Creative Arts (HCA), International Cultures (INT), History and Culture of the United States (US), Social and Behavioral Sciences (SBS), and Perspectives (P)
 - b. CS 1151 and ENGM 2440
 - c. Arabic 1101, Chinese 1011, 1012, 1101, English 1100, French 1101, German 1101, Greek 1101, Hebrew 1101, Italian 1101, Japanese 1011, 1012, 1101, Latin 1101, Portuguese 1101, Russian 1101, and Spanish 1100, 1101
 - d. Peabody College courses in Psychology and Human Development numbered 1205, 1207, 1250, 2200, 2250, 2300, 2400, 2500, 2550, 2600, and 3150, and in Human and Organizational Development numbered 1250, 1300, 2100, 2260, 2400, 2500, 2700, and 3232
 - e. All MUSC, MUSE, MUSO, COMP, MREP, MUTH, and performance courses in the Blair School of Music, except MUSO 1001

Previous Requirement (can be applied to Class of 2017, 2018, and 2019):*

Students must take 18 credit hours of liberal arts electives to satisfy the Liberal Arts Core (LAC) requirement. Courses should be selected from the five categories designated in the AXLE Curriculum Course Distribution of the College of Arts and Science:

- a) Humanities and the Creative Arts, including English 1100 (100)
 - b) International Cultures, including Arabic 1101 (210A), Chinese 1011-1012 (200A/B), 1101 (201), French 1101 (101A), German 1101 (101), Greek 1101 (201), Hebrew 1101 (111a), Italian 1101 (101a), Japanese 1011-1012 (200ab) and 1101 (201), Latin 1101 (101), Russian 1101 (101), Spanish 1100 (100) and 1101 (101)
 - c) History and Culture of the United States
 - d) Social and Behavioral Sciences, including Engineering Management 2440 (244)
 - e) Perspectives, including Computer Science 1151 (151)
- and two additional distribution categories (not in Arts and Science):
- f) Music Composition and Performance. All MUSC, MUSE, MUSO, COMP, MREP, MUTH and performance courses in the Blair School of Music, except MUSO 1001
 - g) Cognition and Development. Peabody College courses in Psychology and Human Development numbered 1205, 1207, 1250, 2200, 2250, 2300, 2400, 2500, 2550, 2600, and 3150, and in Human and Organizational Development numbered 1250 (1000), 1300 (1100), 2100 (1200), 2260, 2400, 2500, 2700, and 3232.

Within the 18-hour requirement, the student must meet the following distribution requirements:

1. At least 3 credit hours in each of at least three different categories
2. At least 6 credit hours in one category

*Students may follow the rules as they were when they entered Vanderbilt or as they will be when they graduate but may not do a hybrid of the two (i.e., Class of 2020 onward will follow new requirement, but Class of 2017, 2018, and 2019 may choose which requirement they wish to fulfill).

8. **Open Electives.** These credit hours allow students to explore an area of interest that may or may not be related to BME. Freshmen engineering seminars carry 1 hour of Open elective credit and are recommended, as are additional courses in engineering. Many courses excluded from the liberal arts core listings may be counted only as Open electives. All officer education courses designated as eligible for credit (see the Undergraduate Catalog, Special Programs for Undergraduates) may be taken as Open electives. In addition, officer education courses in history and political science carry AXLE designations and may be taken as part of the Liberal Arts Core. AFROTC students may count 6 hours of military courses as Open electives.
9. **Study Abroad.** Students interested in study abroad during the academic year (rather than a summer program) should begin planning early to deal with the challenges presented by sequences of courses that are not offered every semester. For more information, go to the School of Engineering Study Abroad website (<http://engineering.vanderbilt.edu/academics/Undergraduate/StudyAbroad/>), the Global Education Office (<http://www.vanderbilt.edu/geo/>) or contact Associate Dean Cynthia Paschal (cynthia.paschal@vanderbilt.edu).
10. **AP, IB, and Transfer Credits.** Advanced Placement, International Baccalaureate, and transfer credits can be applied toward certain requirements for your BME degree if the specific credits are found to be acceptable by the faculty and the VUSE Academic Counselor, Mr. Adam McKeever-Burgett, in the School of Engineering's Office of Student Services. Requests for transfer credit for non-Vanderbilt courses commencing after matriculation at Vanderbilt require pre-approval by your adviser. Transfer credit is not accepted for BME courses except in the case of study abroad. In that case, the Global Education Office and BME faculty members will work to help you find courses equivalent to our BME courses in advance of your time abroad.
11. **Graduate School Preparation / Professional Preparation.** The BME curriculum should prepare you for graduate school or professional practice. Consult with your adviser to plan your electives to suit your career goals. Students planning to take the Graduate Record Examination (GRE) in anticipation of applying to graduate school are encouraged to strengthen verbal skills by taking courses with significant non-technical reading, by reading for pleasure and by studying vocabulary frequently.

12. **Medical School Preparation.** If you are considering medical school, please note the following:
- a) Premeds take organic chemistry with lab (Chem 2221-2222/2221L-2222L (219a-b/220a-b)) as eight of their Technical Elective hours.
 - b) Premeds planning to take the medical college admission test (MCAT) in 2015 or later need to take biochemistry (BSCI 2520 (220)) as three of their Technical Elective hours.
 - c) We recommend that premeds consider deferring BME 3000 (210) until their senior year if taking biochemistry in the junior year. We strongly recommend that premeds not pursue a double major.
 - d) Premeds should take English courses as two of their six LAC courses. Writing (“W”) courses are encouraged. On some medical school applications, it may be possible to count BME 4900W (255W) as one of the “English” courses.
 - e) Premeds should also include courses in Psychology and Sociology as two of their six LAC courses.
 - f) Premeds should plan to take one year (8 credit hours) of Biology. BSCI 1510/1510L (110/111a) is required for the BME major, leaving students to select four more credit hours of Biology among their electives. Some medical schools require a year of Biology and lab, in which case BSCI 1511/1511L (110/111b) can be used to satisfy this requirement. In any case, these courses can be taken as Technical or Open electives.
 - g) The Health Professions Advising Office (HPAO) offers additional guidance and support to students preparing for medical school and should be contacted early in the degree program.
 - h) While AP credits are generally accepted toward the undergraduate degree, many medical schools do not accept AP credits when evaluating applicants’ credentials. So, while for example you may have four hours of AP credit for Chem 1601/1601L (102a/104a), you may need to take four additional credit hours of chemistry in order to be considered for a particular medical school.
 - i) Our curriculum will prepare students to apply to nearly all medical schools. However, students should be aware that some medical schools have additional requirements. Check with the HPAO (<http://as.vanderbilt.edu/hpao/>) regarding any unique requirements.
13. **Honors.** With approval of the Honors Program Director, Prof. Anita Mahadevan-Jansen, juniors and seniors in biomedical engineering who have achieved a minimum quality point ratio of 3.5 may be accepted into the undergraduate honors program. Honors students take at least six credit hours of 5000-level (for graduate credit) or higher BME courses, which can be counted toward the undergraduate degree requirements as BME electives or which can be taken for graduate school credit. Honors students must make a quality point ratio of 3.0 in these classes and maintain an overall 3.5 GPA to be designated as an honors graduate. The diploma designation is Honors in Biomedical Engineering. Students in the honors program must also complete a two semester-long research project and present a research report; this is accomplished through the [BME 3860 and 3861](#) (240a and 240b) Undergraduate Research elective courses. The report is due in manuscript form to the Honors Program Director the same day as it is due to the research course director and project preceptor.

To apply, fill out the [Honors Program Application Form](#) detailing how you plan to meet the requirements for the honors program, complete your [Four Year Curriculum Spreadsheet](#), and meet with your academic advisor to obtain their approval before the start of your senior year. Once these steps have been completed, your advisor will fill out an online approval form

which will be sent to the Honors Program Director (anita.mahadevan-jansen@vanderbilt.edu) for approval.

14. **Internships.** The experience of working as an intern in a biomedical engineering firm or research laboratory can be an invaluable component of your education and preparation for future employment. Such an experience strengthens the understanding of concepts learned in the classroom, teaches valuable workplace skills, and provides insight into future career options. Summer internships are strongly encouraged, especially for rising juniors and seniors. Please see your academic adviser and the Center for Student Professional Development for guidance no later than January of the year in which you wish to participate in an internship.
15. **Double majors.** At present, there are two formal double majors within the School of Engineering, one with chemical engineering and another with electrical engineering. Students interested in the BME/ChE double major should consult with Prof. Anita Mahadevan-Jansen regarding requirements and details of scheduling—a sample curriculum is given on page 13 of this guide. The double major with electrical engineering is detailed on page 14; students considering the BME/EE double major are urged to consult with the BME/EE double major adviser, Prof. Benoit Dawant. Occasionally students choose a double major with a program in the College of Arts and Science, Peabody College, or in the Blair School of Music. In such cases, students must meet the requirements of both programs, which generally requires advanced placement credits, summer study, and/or extra semester(s). Students must declare their intention to double major by completing the appropriate form available in the School of Engineering Office of Academic Services.
16. **Minors.** There are seven approved minors in the School of Engineering: Computer Science, Energy and Environmental Systems, Engineering Management, Environmental Engineering, Materials Science, Nanoscience and Nanotechnology, and Scientific Computing. Students wishing to pursue these minors can spend their allotted hours of Technical and Open electives towards these minors. Please see the Undergraduate Catalog for sequences. Other minors outside the School of Engineering are possible and students are encouraged to consult the Undergraduate Catalog and faculty in the program of interest for minor requirements. Students must declare their intention to add a minor by completing the appropriate form available in the School of Engineering Office of Academic Services.
17. **Integrated five-year Bachelor's/Master's of Engineering degree program.** Advanced students with a passion for research may be able to complete the requirements for both the bachelor's degree (127 credit hours) and master's degree (24 credit hours + thesis) in BME within five years. The first step is to talk with your academic adviser in the sophomore or early junior year about the appropriateness and feasibility of a combined BE/ME program for your career goals. Interested students should then proceed by discussing program details, including application timing, with the BME Director of Graduate Studies, Prof. Mark Does.

Biomedical Engineering Sample Curriculum

| First Year - Fall | | Cr Hrs | First Year - Spring | | Cr Hrs |
|--------------------|----------------------|-----------|----------------------|---------------------|-----------|
| Chem 1601/1601L | General Chemistry | 4 | Chem 1602/1602L | General Chemistry | 4 |
| ES 1401-1403 | Intro to Engineering | 3 | CS 1101/1103 | Programming | 3 |
| Math 1300 | Calculus | 4 | Math 1301 | Calculus | 4 |
| LAC Elective | Vanderbilt Visions | 0 | Physics 1601/1601L | General Physics | 4 |
| Total Hours | | 14 | Total Hours | | 15 |
| | | | | | |
| Second Year - Fall | | Cr Hrs | Second Year - Spring | | Cr Hrs |
| BME 2100 | Biomechanics | 3 | BME 2200 | Biomaterials | 3 |
| BSCI 1510/1510L | Intro Bio Science | 4 | EECE 2112 | Circuits I | 3 |
| Math 2300 | Calculus | 3 | Math 2400 | Diff Eqn/Linear Alg | 4 |
| Physics 1602/1602L | General Physics | 4 | Tech Elective | | 3 |
| LAC Elective | | 3 | LAC Elective | | 3 |
| Total Hours | | 17 | Total Hours | | 16 |
| | | | | | |
| Third Year - Fall | | Cr Hrs | Third Year - Spring | | Cr Hrs |
| BME 3000 | Physiol Transport | 3 | BME 3101 | Systems Physiology | 3 |
| BME 3100 | Systems Physiology | 3 | BME 3200 | Analysis of Data | 3 |
| EECE 2213/2213 L | Circuits II | 4 | BME 3300 | Med Instrumentation | 4 |
| BME Elective | | 3 | BME Elective | | 3 |
| Open Elective | | 3 | LAC Elective | | 3 |
| Total Hours | | 16 | Total Hours | | 16 |
| | | | | | |
| Fourth Year - Fall | | Cr Hrs | Fourth Year - Spring | | Cr Hrs |
| BME 4900W | BME Laboratory | 3 | BME 4951 | Design of Dev & Sys | 3 |
| BME 4950/4959 | Design of Dev & Sys | 3 | BME Elective | | 3 |
| BME Elective | | 3 | Tech Elective | | 3 |
| Tech Elective | | 3 | Tech Elective | | 3 |
| LAC Elective | | 3 | LAC Elective | | 3 |
| Open Elective | | 3 | | | |
| Total Hours | | 18 | Total Hours | | 15 |

Hours required to graduate = 127

Notes:

- Students with an interest in advanced computer science should consider taking CS 1101 (101) rather than CS 1103 (103). However, these students will be responsible for learning the MATLAB skills (taught in CS 1103) needed in later BME courses.
- Students may take BME 3200 (260; Analysis of Biomedical Data) in the spring of their second year. This option could be especially attractive to students planning to study abroad in the spring of their third year.
- Math 2400 (196) is the required course, though a combination of BOTH Math 2420 (198) and either Math 2410 (194) or 2600 (204) may be substituted, with the extra math hours counting as Technical electives.
- BME students take at least 12 credit hours of BME program electives and 12 credit hours of Technical (science, engineering, or math) electives. See following pages for elective options.
- For transfer students, ES 1401-1403 can be replaced with any technical course (3 hours) in engineering (e.g., Engineering Management and engineering ethics courses do not fulfill this requirement).

Program Electives

BME ELECTIVES

A total of 12 BME elective hours must be taken. BME Electives are elective courses taught within the BME department and carrying a “BME” course code at the 2000-level and higher (e.g., BME 4100).

- Up to three credit hours (total) of Undergraduate Research, BME 3860/3861 (240A/B), generally taken junior spring semester or senior year, may count as a BME elective; an additional three hours of BME 3860/3861 may be used as a Technical elective.
- BME students may count (only) one of the following VUSE courses as BME electives: ChBE 4810 (282), 4500 (283), 4870 (287); EECE 3214 (214), 4353 (253), 4354 (254); ENVE 4610 (272); and ME 2220 (220). This option does not apply to BME/EE double majors.
- BME freshman seminars and BME 2201 Biomedical Ethics cannot count as BME electives.
- BME graduate courses, with the exception of BME 8991-8994, may be taken as electives provided the student has a 3.5 GPA and appropriate permissions.
- Note: BME elective credit hours in excess of 12 will be counted as Technical electives.

TECHNICAL ELECTIVES

A total of 12 hours of Technical (Science, Engineering, or Math) electives must be taken. Technical electives include the following:

- BME electives taken above the 12 credit hour minimum. Up to 3 hours of Undergraduate Research, BME 3860/3861 (240A/B), or other independent study courses in the School of Engineering may be taken as Technical electives.
- The following School of Engineering courses
 - Any course in Chemical and Biomolecular Engineering except ChBE 3300 (230)
 - Any course in Civil Engineering except CE 2200 (180)
 - Any course in Computer Science except CS 1151 (151)
 - Any course in Electrical and Computer Engineering
 - Any course in Engineering Management except ENGM 2440 (244)
 - Any course in Environmental Engineering
 - Any course in Materials Science
 - Any course in Mechanical Engineering except ME 2171 (171)
 - Any course in Nanoscience and Nanotechnology
 - Any course in Scientific Computing
- Courses numbered 2000 or higher in the mathematics and natural sciences (MNS) AXLE category in the College of Arts and Science except MATH 2600 (204), 2610 (208), 2810 (216), and 3000 (252).
- Biological Sciences BSCI 1511/1511L (110b/111b).
- Nursing NURS 1500 (150), NURS 5105 (225), and NURS 1601-1602 (231a-b).

BME Premed Sample Curriculum

| First Year - Fall | Cr Hrs | First Year - Spring | Cr Hrs |
|---------------------------|---------------|-----------------------------|---------------|
| Chem 1601/1601L | 4 | Chem 1602/1602L | 4 |
| ES 1401-1403 | 3 | CS 1101/1103 | 3 |
| Math 1300 | 4 | Math 1301 | 4 |
| LAC Elective | 3 | Physics 1601/1601L | 4 |
| Vanderbilt Visions | 0 | | |
| Total Hours | 14 | Total Hours | 15 |
| | | | |
| Second Year - Fall | | Second Year - Spring | |
| BME 2100 | 3 | BME 2200 | 3 |
| BSCI 1510/1510L | 4 | Math 2400 | 4 |
| Math 2300* | 3 | BSCI 1511/1511L | 4 |
| Physics 1602/1602L | 4 | EECE 2112 | 3 |
| Chem 2221/2221L | 4 | Chem 2222/2222L | 4 |
| Total Hours | 18 | Total Hours | 18 |
| | | | |
| Third Year - Fall | | Third Year - Spring | |
| BSCI 2520 (Biochem) | 3 | BME 3101 | 3 |
| BME 3100 | 3 | BME 3200 | 3 |
| EECE 2213/2213 L | 4 | BME 3300 | 4 |
| LAC Elective (Psych/Soc) | 3 | BME Elective | 3 |
| LAC Elective (Psych/Soc) | 3 | LAC Elective | 3 |
| Total Hours | 16 | Total Hours | 16 |
| | | | |
| Fourth Year - Fall | | Fourth Year - Spring | |
| BME 3000 | 3 | BME 4951 | 3 |
| BME 4900W | 3 | BME Elective | 3 |
| BME 4950/4959 | 3 | BME Elective | 3 |
| BME Elective | 3 | LAC Elective | 3 |
| LAC Elective | 3 | Open Elective | 3 |
| Total Hours | 15 | Total Hours | 15 |

* Students with advanced placement in math may wish to omit a math class in the third semester.

BME/ChE Sample Curriculum

| First Year - Fall | Cr Hrs | First Year - Spring | Cr Hrs |
|---------------------------|---------------|-----------------------------|---------------|
| Chem 1601/1601L | 4 | Chem 1602/1602L | 4 |
| ES 1401-1403 | 3 | CS 1101/1103 | 3 |
| LAC | 3 | Math 1301 | 4 |
| Math 1300 | 4 | Physics 1601/1601L | 4 |
| Vanderbilt Visions | 0 | LAC | 3 |
| Total Hours | 14 | Total Hours | 18 |
| | | | |
| Second Year - Fall | | Second Year - Spring | |
| BME 2100 | 3 | BME 2200 | 3 |
| ChBE 2100 | 3 | ChBE 2200 | 3 |
| Chem 2221/2221L | 4 | Chem 2222/2222L | 4 |
| Math 2300 | 3 | EECE 2112 | 3 |
| Physics 1602/1602L | 4 | Math 2400 | 4 |
| Total Hours | 17 | Total Hours | 17 |
| | | | |
| Third Year - Fall | | Third Year - Spring | |
| ChBE 3300 | 3 | BME 3101 | 3 |
| BME 3100 | 3 | BME 3300 | 4 |
| EECE 2213/2213L | 4 | ChBE 3250 | 3 |
| ChBE 3200 | 3 | ChBE 3900W | 4 |
| BSCI 1510/1510L | 4 | ChBE 3350 | 3 |
| Total Hours | 17 | Total Hours | 17 |
| | | | |
| Fourth Year - Fall | | Fourth Year - Spring | |
| BME 4900W | 3 | BME 4951 | 3 |
| BME 4950/4959 | 3 | LAC or ChBE Elective | 3 |
| ChBE 4950W | 4 | BME Elective | 3 |
| ChBE Elective or LAC | 3 | LAC | 3 |
| LAC | 3 | LAC | 3 |
| Total Hours | 16 | Total Hours | 15 |

Hours required to graduate = 131

Notes

1. **ChBE Elective:** one 3 hour ChBE elective (ChBE 4500, ChBE 4810, or ChBE 4820) is required. Students must be aware of course availability when planning the ChBE elective in their senior year. For example, ChBE 4810 is currently taught in the spring of odd numbered years (2015, 2017, etc.) and ChBE 4500 is fall only.

BME/EE Sample Curriculum

| First Year - Fall | Cr Hrs | First Year - Spring | Cr Hrs |
|---------------------------|---------------|-----------------------------|---------------|
| Chem 1601/1601L | 4 | Chem 1602/1602L | 4 |
| ES 1401-1403 | 3 | CS 1103 or 1101 | 3 |
| LAC | 3 | Math 1301 | 4 |
| Math 1300 | 4 | Physics 1601/1601L | 4 |
| Vanderbilt Visions | 0 | | |
| Total Hours | 14 | Total Hours | 15 |
| | | | |
| Second Year - Fall | | Second Year - Spring | |
| BME 2100 | 3 | BME 2200 | 3 |
| BSCI 1510/1510L | 4 | EECE 2116/2116L | 4 |
| EECE 2112 | 3 | EECE 2213/2213L | 4 |
| Math 2300 | 3 | Math 2400 | 4 |
| Physics 1602/1602L | 4 | LAC | 3 |
| Total Hours | 17 | Total Hours | 18 |
| | | | |
| Third Year - Fall | | Third Year - Spring | |
| BME 3000 | 3 | BME 3101 | 3 |
| BME 3100 | 3 | BME 3200 | 3 |
| EECE 3233 | 3 | BME 3300 | 4 |
| EECE 3235/3235L | 4 | EECE 3214 | 3 |
| LAC | 3 | EECE Elective | 3 |
| Total Hours | 16 | Total Hours | 16 |
| | | | |
| Fourth Year - Fall | | Fourth Year - Spring | |
| BME 4900W | 3 | BME 4951 | 3 |
| BME 4950/4959 | 3 | EECE Elective | 3 |
| BME Elective | 3 | EECE Elective | 3 |
| EECE Elective | 3 | LAC | 3 |
| EECE Elective | 3 | LAC | 3 |
| LAC | 3 | | |
| Total Hours | 18 | Total Hours | 15 |

Hours required to graduate = 129

Three hours of BME electives (offered in BME) and fifteen hours of EECE electives are required for the double major. Within these 15 hours of EECE electives, students must complete at least two courses from at least two concentration areas in EE. Presently, the electrical engineering program has five concentration areas: computer engineering, microelectronics, signal/ image processing, robotics, and networking & communications. A list of approved courses in these five concentration areas appears in the Undergraduate Catalog. Also, at least one of the elective courses must be an approved design domain expertise (“DE”) course. Note that BME 3300 (271) cannot be counted as an EECE elective for BME/EE double majors (it can be counted toward the Area of Concentration requirement in EE if the student takes an additional 3 hours of EE Major Electives).