

University of Wisconsin – Milwaukee
College of Engineering and Applied Science
BIOMEDICAL ENGINEERING CURRICULUM

The minimum number of credits required to complete the Bachelor of Science in Engineering with a major in Biomedical Engineering is **120** credits. Students who need background preparation courses may need additional credits. See information below regarding placement examinations.

| Engineering Core Courses (26 credits) | | Credits | Prerequisite |
|--|--|----------------|---|
| BME 101 | Fundamentals of Biomedical Engineering | 3 | Math 221 (C) or Math 231(C) |
| Civ Eng 201 | Statics | 3 | Math 232 |
| Civ Eng 202 | Dynamics | 3 | Civ Eng 201, Math 233(C) |
| EAS 200 | Professional Seminar | 1 | None |
| ElecEng 301 | Electrical Circuits I | 3 | Physics 210(C) |
| ElecEng 305 | Electrical Circuits II | 4 | ElecEng 234, 301 |
| MatlEng 201 | Engineering Materials | 4 | Math 231 (C), Chem 100* or score 1 on chem placement test |
| MechEng 101 | Computational Tools for Engineers | 2 | Math 221(C) or 231(C) |
| MechEng 301 | Basic Engineering Thermodynamics | 3 | Math 233, Physics 209 |

| ^Biomedical Engineering Major (38 credits) | | | |
|---|---|---|---|
| Bio Sci 202 | Anatomy & Physiology I | 4 | None |
| Bio Sci 203 | Anatomy & Physiology II | 4 | Bio Sci 202* or 315* |
| Bio Sci 465 | Biostatistics | 3 | Jr St, Bio Sci 150, Math 105 |
| or | | | |
| IndEng 367 | Intro. Statistics for Physical Science & Engineering Students | 3 | B- or better Math 211 or 213; C or better Math 221 or 231 |
| BME 302 | Analysis and Modeling of Dynamic Systems | 4 | MechEng 101, ElecEng 234, Physics 210 |
| BME 305 | Introduction to Engineering Biomechanics | 3 | BioSci 203, BME 302 |
| BME 320 | Engineering of Biomedical Devices I | 4 | BME 101, 302 |
| BME 325 | Engineering of Biomedical Devices II | 3 | BioSci 203, BME 320 |
| BME 385 | Introduction to Biomaterials | 3 | Jr St, MatlEng 201 |
| BME 495 | Biomedical Instrumentation Lab/Senior Lab | 3 | BME 325 (C), BME 305 (C) or MechEng 469 (C) |
| BME 595 | Capstone Design Project | 4 | BME 495 |
| ElecEng 310 | Signals & Systems | 3 | ElecEng 305(C) |

| ^^Mathematics (14-16 credits) | | (16 credits typical: Math 231,232,233, ElecEng 234) | |
|---|--|--|---|
| One of the following Calculus sequences must be completed: | | | |
| Math 231-232-233 | | 12 | Math placement score, or previous course with at least "C" grade. |
| Or Math 221- 222 (Honors) | | 10 | |
| And ElecEng 234 Analytical Methods in Engineering | | 4 | Math 232* |

| Physics (10 credits) | | | |
|--|--|----|---|
| Physics 209 & 214 (Lab), and Physics 210 & 215 (Lab) | | 10 | Physics 209: Math 232(C) Physics 210: Math 233(C), C- or better in Physics 209 |

| General Education Requirements | | | |
|---|---|---|--------------------|
| <i>Distribution Requirements (15 credits)</i> | | | |
| Art | | 3 | |
| Humanities | | 3 | |
| Social Science | | 6 | |
| English 310 | Writing, Speaking & Technoscience in the 21 st Century | 3 | English Competency |

Cultural Diversity - One of the arts, humanities, or social science courses selected must also meet the UWM cultural diversity requirement.

Competency Requirements

^^English Composition (0-6 credits)

The English Composition requirement is satisfied by:

1. Earning a satisfactory score on the English placement test, **or**
2. Earning a grade of C or higher in English 102
3. Transferring a grade of C or better in a course equivalent to English 102 or higher level expository writing course

Foreign Language (0-8 credits) (for new freshman starting fall 1999)

The foreign language requirement can be completed with one of these options:

1. Two years of a single foreign language in high school
2. Two semesters of a single foreign language in college
3. Demonstrate ability by examination

***C or better in prerequisite** **(C) Concurrent Enrollment in Designated Course**

^Admission to Major: 1. Complete Math 231 (or 221) with C or better grade. 2. Complete the English composition requirement (OWCA) 3. Complete Chem 100 with C or better grade or satisfactory placement score. 4. Obtain a minimum GPA as set by the department. A 3.00 GPA guarantees admission to any CEAS major. Courses may be repeated only once. No more than two courses may be repeated.
The program may impose major status as a prerequisite for courses numbered 200 or above.

^^Placement Examinations: Students without previous college level credits in Math, Chemistry or English may be required to take placement exams. The results of these tests determine the appropriate course in which to register. Background prerequisite courses may be required in addition to the courses listed above.

Technical Electives – Biomedical Engineering Major

The Biomedical Engineering program requires a total of 15 credits of technical electives, chosen from the following list:

| | | | |
|---|---|--------|--|
| All non-required Biomedical Engineering courses numbered 400-699 are Technical Electives. | | | |
| Bio Sci 150 | Foundations of Biological Sciences I | 4 | Chem 100 or 102 or Conc Reg |
| Bio Sci 152 | Foundations of Biological Sciences II | 4 | C- or better in Bio Sci 150 |
| Bio Sci 354 | Introduction to Neuroscience I | 3 | Bio Sci 315* or Psych 254* |
| Bio Sci 355 | Introduction to Neuroscience II | 3 | Bio Sci 152, 315(C), or Psych 254 |
| BME 585 | Advanced Biomaterials | 3 | Sr St or G |
| BME 599 | Senior Thesis | 1-3 | Sr St, cons. Instr. |
| BME 690 | Topics in Biomedical Engineering | 3 | Jr St |
| BME 699 | Independent Study | 1-3 cr | Jr St, cons instr & CEAS Assoc Dean |
| BusAdm 447 | Entrepreneurship | 3 | Jr St, BusAdm 350 |
| Chem 102 | General Chemistry | 5 | Chemistry Plmt or Chem 100*; Math Plmt or Math 105* |
| Chem 104 | General Chemistry & Quantitative Analysis | 5 | Chem 102* |
| Chem 343 | Organic Chemistry | 3 | Chem 104* |
| Chem 344 | Organic Chemistry Laboratory | 2 | Chem 343*, 345(C)(R) |
| Chem 345 | Organic Chemistry | 3 | Chem 343*, Chem 344(C) |
| Civ Eng 303 | Strength of Materials | 4 | Civ Eng 201, Math 233(C) |
| CompSci 250 | Introductory Computer Programming | 3 | Math 116 or 211 |
| EAS 001 | Co-op Work Period | 3 | Prior Cons Co-Op Dir |
| EAS 497 | Study Abroad | 3 | Acceptance to Study Abroad Program |
| ElecEng 361 | Electromagnetic Fields | 3 | ElecEng 234, Math 233*, Physics 210 |
| ElecEng 410 | Principles of Discrete Systems & Digital Signal Processing | 3 | Jr St, ElecEng310 |
| ElecEng 436 | Introduction of Medical Instrumentation | 3 | Jr St, ElecEng 305 |
| ElecEng 437 | Introduction to Biomedical Imaging | 3 | Sr St, ElecEng 310 |
| ElecEng 438 | Bioanalytics & Biomedical Diagnostics | 3 | Sr St, ElecEng 310, 330 |
| ElecEng 537 | Fundamentals of Neuroimaging Technology | 3 | Sr St, ElecEng 437 |
| ElecEng 539 | Introduction to Magnetic Resonance Imaging | 3 | Jr St, ElecEng 310 and 361 |
| Ind Eng 360 | Engineering Economic Analysis | 3 | Jr St |
| Ind Eng 584 | Biodynamics of Human Motion | 3 | Jr St, Civ Eng 202(C), ElecEng 234 |
| MechEng 320 | Introduction to Fluid Mechanics | 3 | Civ Eng 202, ElecEng 234, MechEng 301(C) |
| MechEng 370 | Computer Aided Engineering Laboratory | 2 | Civ Eng 202, 303, ElecEng 234, MechEng 101, 111 |
| MechEng 474 | Introduction to Control Systems | 4 | Sr St, Civ Eng 202*, Elec Eng 234*, 301 |
| OccThpy 593 | Introduction to Biomedical and Rehabilitation Instrumentation | 3 | Jr St or Cons Instr |
| OccThpy 620 | Introduction to Assistive and Rehabilitation Technology | 3 | OccThpy 401(P) or Cons Instr |
| OccThpy 625 | Design and Disability | 3 | Jr St or Cons Instr |
| Physics 305 | Medical Physics | 3 | B+ in Physics 209; Physics 210(C) strongly recommended |
| Physics 306 | Introduction to Biophysics | 3 | Chem 104 or 105, Physics 122 or 201 |
| Psych 254 | Physiological Psychology | 3 | Psych 101 |

Pre-Medicine Suggested Courses: Students considering medical school should consult with the pre-medical advisor early in their undergraduate career for help in planning a program. The courses listed below are suggested for pre-medical students.

| Science Courses | | | |
|---|---|---|------------------------------|
| Bio Sci 150 | Foundations of Biological Sciences I | 4 | (Technical Elective for BME) |
| Bio Sci 152 | Foundations of Biological Sciences II | 4 | (Technical Elective for BME) |
| One Advanced course in Bio Sci with lab | | 5 | |
| Chem 102 | General Chemistry | 5 | (Technical Elective for BME) |
| Chem 104 | General Chemistry & Quantitative Analysis | 5 | (Technical Elective for BME) |
| Chem 343 | Organic Chemistry | 3 | (Technical Elective for BME) |
| Chem 344 | Organic Chemistry Laboratory | 2 | (Technical Elective for BME) |
| Chem 345 | Organic Chemistry | 3 | (Technical Elective for BME) |
| Chem 501 | Introduction to Biochemistry | 3 | |
| Math – a semester of calculus | | 4 | (Required for BME) |
| Physics 209 | General Physics I | 4 | (Required for BME) |
| Physics 210 | General Physics II | 4 | (Required for BME) |
| Physics 214 | Lab Physics I | 1 | (Required for BME) |
| Physics 215 | Lab Physics II | 1 | (Required for BME) |
| Statistics – Any statistics course | | 3 | (Required for BME) |
| General Education Courses | | | |
| Psych 101 | Introduction to Psychology | 3 | (UWM Social Science GER) |
| Sociol 101 | Introduction to Sociology | 3 | (UWM Social Science GER) |
| PH 101 | Introduction to Public Health | 3 | (UWM Social Science GER) |

*C or better in prerequisite

(C) Concurrent Enrollment in Designated Course

Degree Requirements: Students must maintain an average GPA of at least 2.0 on all work attempted at the University and in all courses offered by the College. Students majoring in Biomedical Engineering must maintain an average GPA of at least 2.0 in all 300-level required major courses. Transferable courses will be included as appropriate. Advancement to major status is required for graduation.

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