

BIOMEDICAL ENGINEERING, COMPREHENSIVE MAJOR

(Code 252-001)

University Requirements

GRADUATION REQUIREMENTS FOR BACCALAUREATE DEGREE

Credit Requirements	
Minimum total for graduation ¹	120
Upper division credits (courses numbered 300 and higher)	39
Liberal Education Core (http://catalog.uwec.edu/undergraduate/graduation-requirements/#header1)	36
Academic Concentrations (http://catalog.uwec.edu/undergraduate/graduation-requirements/#header16)	
Grade Point Requirements (http://catalog.uwec.edu/undergraduate/graduation-requirements/#header14) ²	
Total	2.00 average
Resident	2.00 average
Major	2.00 average
Minor	2.00 average
Certificate	2.00 average
University Residency Requirements (http://catalog.uwec.edu/undergraduate/graduation-requirements/#header15)	
Minimum total	30
Senior year	23
Major, Standard, upper division in residence	12
Major, Comprehensive, upper division in residence	21
Certificate	25 percent of credits

Procedures Required for Graduation

- Obtain admission to the degree program and/or the College offering it.
- Apply for graduation on CampS.

¹ Certain programs exceed this minimum.
² See special requirements in each College.

Applicability of Credits Toward Graduation

Junior College or Two-Year College Credits. A maximum of 72 semester credits earned in a junior college or two-year college will be accepted as degree credits at UW-Eau Claire.

Extension Credits. Credits earned in credit outreach courses offered by UW-Eau Claire are treated as resident credits. Credits earned in extension courses offered by other units of the University of Wisconsin System are treated as transfer credits. All other (non-UW) extension and correspondence credits are normally limited to one-fourth of the total required for graduation from any curriculum.

WTCS Credits. A maximum of 72 semester credits earned in college parallel programs at Madison Area Technical College, Milwaukee Area Technical College, Nicolet Area Technical College, or Chippewa Valley Technical

College may be accepted as degree credits at UW-Eau Claire. A set number of general education courses will be accepted from other technical schools. Occupational and technical courses may also be considered for transfer if the quality and content of the course work from the technical college is judged to be comparable to course work at UW-Eau Claire. Refer to the Transfer Credit Wizard (https://my.uwec.edu/psp/PUBLIC/EMPLOYEE/HRMS/c/EAU_SS_CUSTOM.EAU_TRNCRDWZ.GBL) or contact the UW-Eau Claire Admissions Office for information about the current transfer policy.

USAFI Credit. UW-Eau Claire will accept up to 32 semester credits for work done through the United States Armed Forces Institute, under the provision for non-UW correspondence credit (see Extension Credits above).

Activity Credit (band, chorus, drama, KINS 100-184 courses) Students may count toward graduation no more than one credit of KINS 110-184 courses. Students may count toward graduation no more than four credits earned in any single activity course and no more than 12 credits resulting from any combination of activity courses (excluding KINS 110-184 courses).

Other Restricted Credits. For other University restrictions, see the following: Cooperative Education; Credit by Examination; Satisfactory/Unsatisfactory Registration; Transfer of Credits. College or departmental restrictions may also be placed on Independent Study (399-499 courses), Directed Study (395-495), and other types of credits.

APPLICABILITY OF CREDITS TOWARD GRADUATION		Credit Restrictions
Satisfactory/Unsatisfactory		
Total degree credit		maximum 12
Major, Standard		maximum 1 course
Major, Comprehensive		maximum 2 courses
Minor		maximum 1 course
Credit by Examination		
Total degree credit		maximum ¼ of total
Major or minor		maximum ½ of total
Two-Year College Credits		
Total degree credit		maximum 72 credits
Activity credit (band, chorus, drama, KINS 100-184)		
Total KINS 100-184		maximum 1 credit
Total Band, chorus, drama		maximum 12 credits
Single course band, chorus, drama		maximum 4 credits
Extension credits		
UW-System		no maximum
Other extension/correspondence		maximum ¼ of total
USAFI		
USAFI		maximum 32 credits

Liberal Education Core

The University of Wisconsin-Eau Claire measures learning outcomes to ensure that its graduates have achieved a liberal education and prepared themselves to contribute to a complex society. Upon graduation, each undergraduate will have met the five learning goals of our liberal education core and the 12 learning outcomes they comprise.

LIBERAL EDUCATION CORE REQUIREMENTS		a minimum of 36 credits
Knowledge Goal		
Knowledge Outcome 1 (K1): Natural Sciences (http://catalog.uwec.edu/undergraduate/attribute-k1/)	Two (2) learning experiences	
One experience in laboratory science must be selected from either K1 or K2.		
Knowledge Outcome 2 (K2): Social Sciences (http://catalog.uwec.edu/undergraduate/attribute-k2/)	Two (2) learning experiences	
One experience in laboratory science must be selected from either K1 or K2.		
Knowledge Outcome 3 (K3): Humanities (http://catalog.uwec.edu/undergraduate/attribute-k3/)	Two (2) learning experiences	
Knowledge Outcome 4 (K4): Fine Arts (http://catalog.uwec.edu/undergraduate/attribute-k4/)	One (1) learning experience	
Skills Goal		
Skills Outcome 1 (S1): Written and Oral Communication (http://catalog.uwec.edu/undergraduate/attribute-S1/)	Two (2) learning experiences	
One S1 must meet the University Writing Requirement (http://catalog.uwec.edu/undergraduate/graduation-requirements/#header10)		
Skills Outcome 2 (S2): Mathematics (http://catalog.uwec.edu/undergraduate/attribute-S2/)	One (1) learning experience	
One S2 to meet the University Mathematics Requirement (http://catalog.uwec.edu/undergraduate/graduation-requirements/#header11)		
Skills Outcome 3 (S3): Creativity (http://catalog.uwec.edu/undergraduate/attribute-S3/)	One (1) learning experience	
Responsibility Goal		
Responsibility Outcome 1 (R1): Equity, Diversity, and Inclusivity (http://catalog.uwec.edu/undergraduate/attribute-R1/)	Two (2) learning experiences	
One R1 must satisfy Design for Diversity (http://catalog.uwec.edu/undergraduate/attribute-DDIV/#header13)		
Responsibility Outcome 2 (R2): Global Perspectives (http://catalog.uwec.edu/undergraduate/attribute-R2/)	One (1) learning experience	
Responsibility Outcome 3 (R3): Civic and Environmental Issues (http://catalog.uwec.edu/undergraduate/attribute-R3/)	One (1) learning experience	
Integration Goal		

Integration Outcome 1 (I1): Integration (<http://catalog.uwec.edu/undergraduate/attribute-I1/>) Two (2) learning experiences

Service-Learning Goal	
Service-Learning (http://catalog.uwec.edu/undergraduate/attribute-SL/#header13)	30 hours

College Degree Requirements
Bachelor of Science Degree (B.S.)

University Graduation Requirements. All candidates for degrees must fulfill the requirements for credits, curriculum, GPA, and University residency as specified in the section of this catalog titled University Graduation Requirements (<http://catalog.uwec.edu/undergraduate/graduation-requirements/>).

College Graduation Requirements: Grade Point Averages. All candidates for degrees in the College of Arts and Sciences must earn minimum resident and total GPAs of 2.00 in the major, the minor, and the certificate. The resident and total GPAs for the major are computed using all attempted credits applicable to the major including those offered by departments other than the major department. The resident and total GPAs for the minor and the certificate are computed similarly.

Major-Minor and Major-Certificate Requirements. A standard major (a minimum of 36 credits) must be supplemented by a minor (a minimum of 24 credits) or by a certificate (12 to 18 credits) to meet graduation requirements for completing a first and second degree program. No minor or certificate is required with a Comprehensive Major (60 or more credits) or with two majors of 36 or more credits each.

Certain degree programs which include Comprehensive Majors may require more than the minimum of 120 credits for graduation.

Acceptable academic program combinations are determined at the college level. A major and a minor or a major and certificate or two majors (if available) may not be elected in the same department or program, except in the approved combinations listed here (<http://catalog.uwec.edu/undergraduate/arts-sciences/#academicprogramstext>).

College Credits. Earn at least 90 credits in courses offered by the College of Arts and Sciences.

Bachelor of Science Degree in the College of Arts and Sciences (B.S.)

Fulfillment of all University Graduation Requirements (which includes the Liberal Education Core); all College-level degree requirements (major and minor/certificate emphases, GPAs, earning at least 90 credits in Arts and Sciences course work); mathematics competency at the MATH 111, MATH 112 or MATH 113 level. Mathematics competency can be met in one of three ways: (1) Achieve a score on the mathematics placement test that qualifies the student to enter MATH 114. (2) Earn a grade of at least C (not C-) or a mark of S in MATH 111, MATH 112, or MATH 113. (3) Achieve a satisfactory score on the MATH 112 competency test. This test may be attempted no more than two times.

Major Requirements
(Code 252-001)

The Bachelor's of Science in Biomedical Engineering is a traditional engineering major that uses engineering principles and design concepts applied to medicine with a focus on health care. Biomedical Engineering consists of a

diverse range of disciplines that are broadly focused on improving diagnosis, care and treatment of patients.

A minimum of 92 credits is required for the major and a minimum of 128 credits for the degree. In addition to core courses, students must complete 7 credits of biomedical engineering electives, 3 credits of engineering electives and 3 credits of technical electives.

Code	Title	Credits
Required Courses		
BIOMEDICAL ENGINEERING		
BME 201	Introduction to Biomedical Engineering	2
BME 301	3D Printing in Medicine	3
BME 320	Clinical Problems in Biomedical Engineering	3
BME 330	Biomedical Engineering Instruments and Measurements w/lab	4
BME 340	Biomaterials	3
BME 370	Medical Imaging	3
BME 450	Medical and Implantable Devices w/ lab	5
BME 486	BME Capstone I	2
BME 487	BME Capstone II	2
BIOLOGY		
BIOL 214	Human Anatomy and Physiology I	4
BIOL 314	Human Anatomy and Physiology II	4
BIOL 221	Foundations of Biology I	4
CHEMISTRY		
CHEM 115	Chemical Principles	6
Or		
CHEM 105 & CHEM 106 & CHEM 109	General Chemistry I Lecture and General Chemistry I Laboratory and General Chemistry II with Lab ¹	
MATERIALS SCIENCE AND ENGINEERING		
MSE 120	Introduction to Engineering	2
MSE 256	Introduction to Computer Aided Design	1
MSE 286	Engineering Sophomore Seminar	1
MSE 307	Engineering Statistics	4
MSE 386	Engineering Junior Seminar	1
MATHEMATICS		
MATH 114	Calculus I	4
MATH 215	Calculus II	4
MATH 312	Differential Equations and Linear Algebra	4
PHYSICS		
PHYS 231	University Physics I	5
PHYS 232	University Physics II	5
PHYS 240	Computational Physics	3
Elective Courses		
Biomedical Engineering Electives		7
BME 425	Biomechanics	
BME 430	Cell and Tissue Engineering w/lab	
BME 460	Biological Systems Analysis	

Engineering Electives ²		3
MSE 221	Living in a Materials World	
MSE 315	Materials Characterization	
MSE 334	Soft Materials	
MSE 372	Transport Phenomena	
MSE 475	Nanomaterials	
PHYS 255	Statics	
PHYS 350	Electric and Electronic Circuits	
PHYS 360	Electronics	
Technical Electives ²		3
BIOL 250	Microbiology	
BME 289	Research Experience - BME	
BME 291	Special Topics in Biomedical Engineering	
BME 395	Directed Studies	
BME 399	Independent Study - Juniors	
BME 493	Collaborative Internship	
BME 494	Off-campus Biomedical Engineering Internship	
BME 499	Independent Study - Seniors	
CHEM 213	Quantitative Analysis	
CHEM 325	Organic Chemistry I with Laboratory	
CHEM 326	Organic Chemistry II with Laboratory	
CHEM 352	Fundamentals of Biochemistry	
CS 145 or CS 148	Programming for New Programmers Programming for Experienced Programmers	
CS 163	Introduction to Programming in C++	
CS 170	Computing for the Sciences and Mathematics	
CS 245	Advanced Programming and Data Structures	
CS 252	Computer Systems	
CS 330	Programming Languages	
MSE 363	Microelectronic Materials Processing Lab	
MATH 216	Calculus III	
MATH 313	Digital Signal Processing	
MATH 314	Discrete Mathematics	
MATH 315	Advanced Calculus I	
MATH 316	Introduction to Real Analysis	
MATH 317	Introduction to Real Analysis II	
MATH 318	Introduction to Complex Variables	
MATH 324	Linear Algebra	
MATH 351	Numerical Analysis I	
MATH 354	Introduction to Mathematical Modeling	
MATH 440	Digital Image Processing	
MATH 441	Linear Regression Analysis, with Time Series	
MATH 443	Experimental Design and Analysis	
PHYS 255	Statics	
PHYS 340	Optics	
PHYS 350	Electric and Electronic Circuits	

PHYS 356	Dynamics
PHYS 360	Electronics
PHYS 361	LabVIEW Basics
PHYS 362	LabVIEW Applications

¹ Only 6 credits from the CHEM 105, CHEM 106 and CHEM 109 sequence can count toward the major.

² Cannot count a course in both engineering electives and technical electives categories. Courses from the engineering elective list not used to satisfy the engineering elective can be used to satisfy the technical elective. Courses from the Biomedical Engineering elective list not used to satisfy the Biomedical Engineering elective can be used to satisfy the technical elective.

Program Learning Outcomes

Students completing this program will be expected to meet the following learning outcomes:

- Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- Communicate effectively with a range of audiences.
- Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- Acquire and apply new knowledge as needed, using appropriate learning strategies.