

BIOMEDICAL ENGINEERING - BS

Program Requirements

The freshman year is identical for degrees in aerospace engineering, architectural engineering, civil engineering, computer engineering, computer science, electrical engineering, electronic systems engineering technology, environmental engineering, industrial distribution, industrial engineering, interdisciplinary engineering, manufacturing and mechanical engineering technology, mechanical engineering, multidisciplinary engineering technology, nuclear engineering, ocean engineering, and petroleum engineering (Note: not all programs listed are offered in Qatar). The freshman year is slightly different for chemical engineering, biomedical engineering and materials science and engineering degrees in that students take CHEM 119 or CHEM 107/CHEM 117 and CHEM 120.

Students pursuing degrees in biological and agricultural engineering should refer to the specific curriculum for this major. It is recognized that many students will change the sequence and number of courses taken in any semester. Deviations from the prescribed course sequence, however, should be made with care to ensure that prerequisites for all courses are met.

First Year

Fall		Semester Credit Hours
CHEM 107	General Chemistry for Engineering Students ^{1,4}	3
CHEM 117	General Chemistry for Engineering Students Laboratory ^{1,4}	1
ENGL 103 or ENGL 104	Introduction to Rhetoric and Composition ¹ or Composition and Rhetoric	3
ENGR 102	Engineering Lab I - Computation ¹	2
MATH 151	Engineering Mathematics I ^{1,2}	4
University Core Curriculum (http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) ³		3
Semester Credit Hours		16

Spring

ENGR 216/ PHYS 216	Experimental Physics and Engineering Lab II - Mechanics ¹	2
MATH 152	Engineering Mathematics II ¹	4
PHYS 206	Newtonian Mechanics for Engineering and Science ¹	3
University Core Curriculum (http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) ³		3
Select one of the following:		3-4
CHEM 120	Fundamentals of Chemistry II ^{1,4}	
University Core Curriculum (http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) ^{3,5}		
Semester Credit Hours		15-16
Total Semester Credit Hours		31-32

² Entering students will be given a math placement exam. Test results will be used in selecting the appropriate starting course which may be at a higher or lower level.

³ Of the 21 hours shown as University Core Curriculum electives, 3 must be from creative arts (see AREN curriculum for more information), 3 from social and behavioral sciences (see IDIS curriculum for more information), 3 from language, philosophy and culture (see CVEN, EVEN and PETE curriculum for more information), 6 from American history and 6 from government/political science. The required 3 hours of international and cultural diversity and 3 hours of cultural discourse may be met by courses satisfying the creative arts, social and behavioral sciences, language, philosophy and culture, and American history requirements if they are also on the approved list of international and cultural diversity (<http://catalog.tamu.edu/undergraduate/general-information/degree-information/international-cultural-diversity-requirements/>) courses and cultural discourse (<http://catalog.tamu.edu/undergraduate/general-information/degree-information/cultural-discourse-requirements/>) courses.

⁴ BMEN, CHEN and MSEN require 8 hours of fundamentals of chemistry which are satisfied with CHEM 119 or CHEM 107/CHEM 117 and CHEM 120; Students with an interest in BMEN, CHEN and MSEN can take CHEM 120 second semester freshman year. CHEM 120 will substitute for CHEM 107/CHEM 117.

⁵ For BS-PETE, allocate 3 hours to core communications course (ENGL 210, COMM 203, COMM 205, or COMM 243) and/or 3 hours to UCC elective. For BS-MEEN, allocate 3 hours to core communications course (ENGL 203, ENGL 210, or COMM 205) and/or 3 hours to UCC elective.

Second Year

Fall		Semester Credit Hours
BMEN 153	Pathways in Biomedical Engineering ^{1,6}	1
BMEN 207	Computing for Biomedical Engineering ¹	3
ENGR 217/ PHYS 217	Experimental Physics and Engineering Lab III - Electricity and Magnetism	2
MATH 251 or MATH 253	Engineering Mathematics III or Engineering Mathematics III	3
PHYS 207	Electricity and Magnetism for Engineering and Science	3
VTPP 434	Physiology for Bioengineers I	4
Semester Credit Hours		16
Spring		Semester Credit Hours
BMEN 211	Biomedical Applications of Signals and Systems ¹	3
BMEN 253	Discovering Biomedical Engineering Design Thinking ¹	1
CHEM 227	Organic Chemistry I	3
MATH 308	Differential Equations	3
VTPP 435	Physiology for Bioengineers II	4
Select one of the following:		3
COMM 203	Public Speaking	
COMM 205	Communication for Technical Professions	
ENGL 203	Writing about Literature	
ENGL 210	Technical and Professional Writing	
Semester Credit Hours		17

¹ A grade of C or better is required.

Third Year**Fall**

BMEN 305	Bioinstrumentation ¹	1
BMEN 321	Circuits, Signals, and Systems ¹	3
BMEN 341	Biotransport ¹	3
BMEN 343	Biomedical Engineering Materials ¹	3
BMEN 350	Statistics for Biomedical Engineering ¹	3
University Core Curriculum (http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) ^{1,3}		3
High Impact Experience ⁷		0
BMEN 399	Engineering Professional Development	
Semester Credit Hours		16

Spring

BMEN 344	Biological Interactions and Testing ¹	3
BMEN 345	Biomaterials Lab ¹	1
BMEN 353	Biomedical Engineering Design II ¹	1
BMEN 361	Biomedical Engineering Mechanics ¹	3
BMEN 420	Medical Imaging ¹	3
University Core Curriculum (http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) ³		6
Semester Credit Hours		17

Fourth Year**Fall**

BMEN 452	Mass and Energy Transfer in Biosystems ¹	3
BMEN 453	Analysis and Design Project I ¹	2
BMEN 465	Biomechanics Experiential Learning Lab ¹	1
University Core Curriculum (http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) ³		3
Technical electives ⁸		6
Semester Credit Hours		15

Spring

BMEN 450	Case Studies ^{1,6}	1
BMEN 454	Analysis and Design Project II ¹	2
University Core Curriculum (http://catalog.tamu.edu/undergraduate/general-information/university-core-curriculum/) ³		3
Technical electives ⁸		9
Semester Credit Hours		15
Total Semester Credit Hours		96

⁶ Writing intensive course.

⁷ All students are required to complete a high-impact experience in order to graduate. A list of possible high-impact experiences is available in the BMEN advising office.

⁸ Technical electives are to be selected from the course list below. Students must select one of the following tracks and take 15 hours from within that track: Bioinstrumentation, Biomaterials, Biomechanics, or Biomolecular and Cellular Engineering. Course selection should be done in consultation with student's advisor and track coordinator, may use up to 3 hours of BMEN 491. Please note ACCT 640 is for students pursuing the MSF program.

Total Program Hours 128

Code	Title	Semester Credit Hours
Bioinstrumentation		
Required courses		6
BMEN 322	Biosignal Analysis	
BMEN 401	Principles and Analysis of Biological Control Systems	
Select from the following:		6-9
BMEN 402	Biomedical Optics Laboratory	
BMEN 422	Bioelectromagnetism	
BMEN 425	Biophotonics	
BMEN 427	Magnetic Resonance Engineering	
or ECEN 462	Magnetic Resonance Engineering	
BMEN 428/	Embedded Systems for Medical	
CSC 461	Applications	
BMEN 491	Research	
BMEN 448	Healthcare Technology in the Developing World	
ECEN 411	Introduction to Magnetic Resonance Imaging and Magnetic Resonance Spectroscopy	
ECEN 412	Ultrasound Imaging	
ECEN 414	Biosensors	
ECEN 447	Digital Image Processing	
Biomaterials		
Select from the following:		6-15
BMEN 480	Biomedical Engineering of Tissues	
BMEN 482	Polymeric Biomaterials	
BMEN 483	Polymeric Biomaterial Synthesis	
BMEN 486	Biomedical Nanotechnology	
BMEN 487	Drug Delivery	
Select from the following:		0-9
BMEN 491	Research	
CHEM 466	Polymer Chemistry	
CHEN 451	Introduction to Polymer Engineering	
MEEN 458	Processing and Characterization of Polymers	
MSEN 410	Materials Processing	
MSEN 420	Polymer Science	
Biomechanics		
Select from the following:		12-15
BMEN 432	Molecular and Cellular Biomechanics	
BMEN 457	Orthopedic Biomechanics	
BMEN 458	Motion Biomechanics	
BMEN 461	Cardiac Mechanics	
BMEN 463	Soft Tissue Mechanics and Finite Element Methods	
BMEN 471	Numerical Methods in Biomedical Engineering	
BMEN 491	Research	

MEEN 363	Dynamics and Vibrations	
MEEN 368	Solid Mechanics in Mechanical Design	
MEEN 440	Bio-inspired Engineering Design	
MEEN 441	Design of Mechanical Components and Systems	
MEEN 442	Computer Aided Engineering	
MEEN 444	Finite Element Analysis in Mechanical Engineering	
Biomolecular and Cellular Engineering		
Required courses		6
BMEN 431	Biomolecular Engineering	
BMEN 433	Biomolecular and Cellular Engineering Laboratory	
Select from the following:		6-9
BMEN 471	Numerical Methods in Biomedical Engineering	
	or BIOL 350r Computational Genomics	
BMEN 432	Molecular and Cellular Biomechanics	
BMEN 480	Biomedical Engineering of Tissues	
BMEN 486	Biomedical Nanotechnology	
BMEN 487	Drug Delivery	
BMEN 491	Research	
Select from the following to apply to any of the tracks above:		0-3
ACCT 640	Accounting Concepts and Procedures I (MSF Students only)	
BMEN 400/	History of Human and Veterinary	
VTPP 401	Medicine in Europe	
BMEN 404	FDA Good Laboratory and Clinical Practices	
BMEN 469	Entrepreneurial Pathways in Medical Devices	
CHEM 228	Organic Chemistry II	
ENGR 385	Problems for Co-Op Students	
ENGR 410	Global Engineering Design (International Engineering Certificate only)	
VTPB 410	Cell Mechanisms of Disease	
400-Level BMEN with department approval (http://catalog.tamu.edu/undergraduate/course-descriptions/bmen/)		