



Students must take the equivalent of the following courses at their liberal arts college before entering CWRU

General Requirements for the Dual Degree Program		
Course	Course Title	Semester Credit Hours
MATH		
MATH 121	Calculus for Science & Engineering I	4
MATH 122	Calculus for Science & Engineering II	4
MATH 223	Calculus for Science & Engineering III	3
MATH 224	Elementary Differential Equations	3
CHEMISTRY		
CHEM 105	Principles of Chemistry I	3
CHEM 106	Principles of Chemistry II	3
CHEM 113	Principles of Chemistry Laboratory	2
PHYSICS		
PHYS 121	General Physics I – Mechanics	4
PHYS 122	General Physics II – Electricity and Magnetism	4
COMPUTER PROGRAMMING		
Students should take one of the following courses. Note that students in the Computing & Analysis track are required to take ECSE 132 .		
ENGR 130	Foundations of Engineering and Programming	3
ECSE 132	Introduction to Programming in Java	3

Sample Course Sequence for Biomedical Engineering Track: Biomaterials

Summer before entering CWRU

Course	Course Title	Credit Hours
ENGR 145	Chemistry of Materials	4
ENGR 210	Introduction to Circuits and Instrumentation	4
		8

Year 1 Fall

Course	Course Title	Credit Hours
EBME 201	Physiology-Biophysics I	3
EBME 306	Introduction to Biomedical Materials	3
EBME 356	Biomaterials Lab (if possible)	1
EBME 308	Biomedical Signals and Systems	3
EBME 358	Biomedical Signals and Systems Lab	1
EMAC 270	Intro to Polymer Science & Engineering	3
EMAC 351	Physical Chemistry for Engineering	3
		16-17

Year 1 Spring

Course	Course Title	Credit Hours
EBME 202	Physiology-Biophysics II	3
ENGR 200	Statics and Strength of Materials	3
EBME 310	Principles of Biomedical Instrumentation	3
EBME 360	Biomedical Instrumentation Lab	1
CHEM 223	Introductory Organic Chemistry I	3
EMAC 352	Polymer Physics and Engineering	3
		16

Year 2 Fall

Course	Course Title	Credit Hours
EBME 370	Principles of Biomedical Engineering Design	3
EBME 356	Introduction to Biomaterials Lab (if not already taken)	1
ENGL 398	Professional Communication for Engineers	2
ENGR 398	Prof. Comm. Engineers (must take both ENGL & ENGR 398)	1
STAT 312	Basic Stats for Engineering and Science	3
Tech. Elec.	Approved Technical Elective or Conjoiner Course	3
Tech. Elec.	Approved Technical Elective	3
		15-16

Year 2 Spring

Course	Course Title	Credit Hours
EBME 380	Biomedical Engineering Design Experience	3
EBME 309	Modeling of Biomedical Systems	3
EBME 359	Modeling of Biomedical Systems Lab	1
Tech. Elec.	Approved Technical Elective or Conjoiner	3
Tech. Elec.	Approved Technical Elective	3
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Biomaterials Conjoiner Class: Choose either

EBME 316 Biomaterials for Drug Delivery

EBME 325 Introduction to Tissue Engineering

EBME 305 Materials for Prosthetics and Orthotics

See the bulletin for guidance on choosing the approved technical electives (3 required).

Sample Course Sequence for Biomedical Engineering Track: Biomechanics

Summer before entering CWRU

Course	Course Title	Credit Hours
ENGR 145	Chemistry of Materials	4
ENGR 210	Introduction to Circuits and Instrumentation	4
		8

Year 1 Fall

Course	Course Title	Credit Hours
EBME 201	Physiology-Biophysics I	3
EBME 306	Introduction to Biomedical Materials	3
EBME 356	Biomaterials Lab (if possible)	1
EBME 308	Biomedical Signals and Systems	3
EBME 358	Biomedical Signals and Systems Lab	1
EMAE 160	Mechanical Manufacturing	3
ENGR 200	Statics and Strength of Materials	3
		16-17

Year 1 Spring

Course	Course Title	Credit Hours
EBME 202	Physiology-Biophysics II	3
EBME 309	Modeling of Biomedical Systems	3
EBME 359	Biomedical Computer Simulation Lab	1
EBME 310	Principles of Biomedical Instrumentation	3
EBME 360	Biomedical Instrumentation Lab	1
EMAE 181	Dynamics	3
EMAE 260	Design and Manufacturing I	3
		17

Year 2 Fall

Course	Course Title	Credit Hours
EBME 370	Principles of Biomedical Engineering Design	3
EBME 356	Introduction to Biomaterials Lab (if not already taken)	1
ENGL 398	Professional Communication for Engineers	2
ENGR 398	Prof. Comm. Engineers (must take both ENGL & ENGR 398)	1
STAT 312	Basic Stats for Engineering and Science	3
ECIV 310	Strength of Materials	3
Tech. Elec.	Approved Technical Elective*	3
		15-16

Year 2 Spring

Course	Course Title	Credit Hours
EBME 380	Biomedical Engineering Design Experience	3
EBME 307	Biomechanical Prosthetic Systems (Conjoiner)	3
ENGR 225	Thermodynamics	4
Tech. Elec.	Approved Technical Elective	3
Tech. Elec.	Approved Technical Elective	3
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Biomechanics Conjoiner Class: Choose either

EBME 307 Biomechanical Prosthetic Systems

EMAE 414 Nano-biomechanics in Biology

See the bulletin for guidance on choosing the approved technical electives (3 required)

Sample Course Sequence for Biomedical Engineering Track: Devices and Instrumentation

Summer before entering CWRU

Course	Course Title	Credit Hours
ENGR 145	Chemistry of Materials	4
ENGR 210	Introduction to Circuits and Instrumentation	4
		8

Year 1 Fall

Course	Course Title	Credit Hours
EBME 201	Physiology-Biophysics I	3
ECSE 281	Logic Design and Computer Organization	4
EBME 308	Biomedical Signals and Systems	3
EBME 358	Biomedical Signals and Systems Lab	1
ENGR 200	Statics and Strength of Materials	3
ENGL 398	Professional Communication for Engineers	2
ENGR 398	Prof. Comm. Engineers (must take both ENGL & ENGR 398)	1
		17

Year 1 Spring

Course	Course Title	Credit Hours
EBME 202	Physiology-Biophysics II	3
EBME 309	Modeling of Biomedical Systems	3
EBME 359	Biomedical Computer Simulation Lab	1
EBME 310	Principles of Biomedical Instrumentation	3
EBME 360	Biomedical Instrumentation Lab	1
ECSE 245	Electronic Circuits	4
ECSE 309	Electromagnetic Fields I	3
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Year 2 Fall

Course	Course Title	Credit Hours
EBME 370	Principles of Biomedical Engineering Design	3
EBME 306	Introduction to Biomaterials	3
EBME 356	Introduction to Biomaterial Lab	1
STAT 312	Basic Statistics for Engineering and Science	3
Tech. Elec.	Technical Elective or Conjoiner course	3
Tech. Elec.	Approved Technical Elective	3
		16

Year 2 Spring

Course	Course Title	Credit Hours
EBME 380	Biomedical Engineering Design Experience	3
ENGR 225	Thermodynamics	4
Tech. Elec.	Approved Technical Elective or Conjoiner	3
Tech. Elec.	Approved Technical Elective	3
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Devices and Instrumentation Conjoiner Class: Choose either

EBME 320 Biomedical Imaging

EBME 327 Bioelectric Engineering

See the bulletin for guidance on choosing the approved technical electives (3 required)

Sample Course Sequence for Biomedical Engineering Track: Computing and Analysis

Summer before entering CWRU

Course	Course Title	Credit Hours
ENGR 145	Chemistry of Materials	4
ENGR 210	Introduction to Circuits and Instrumentation	4
ECSE 132	Introduction to Programming in Java**	3

**Required for students in the Computing & Analysis track

Year 1 Fall

Course	Course Title	Credit Hours
EBME 201	Physiology-Biophysics I	3
CSDS 233	Introduction to Data Structures	4
CSDS 302	Discrete Mathematics	3
EBME 308	Biomedical Signals and Systems	3
EBME 358	Biomedical Signals and Systems Lab	1
ENGR 200	Statics and Strength of Materials	3
		17

Year 1 Spring

Course	Course Title	Credit Hours
EBME 202	Physiology-Biophysics II	3
EBME 309	Modeling of Biomedical Systems	3
EBME 359	Biomedical Computer Simulation Lab	1
EBME 310	Principles of Biomedical Instrumentation	3
EBME 360	Biomedical Instrumentation Lab	1
CSDS 310	Algorithms	3
STAT 312	Basic Statistics for Engineering and Science	3
		17

Year 2 Fall

Course	Course Title	Credit Hours
EBME 370	Principles of Biomedical Engineering Design	3
EBME 306	Introduction to Biomaterials	3
EBME 356	Introduction to Biomaterial Lab	1
DCSI 351	Exploratory Data Science	3
Tech. Elec.	Approved Technical Elective or Conjoiner course	3
Tech. Elec.	Approved Technical Elective	3
		16

Year 2 Spring

Course	Course Title	Credit Hours
EBME 380	Biomedical Engineering Design Experience	3
ENGR 225	Thermodynamics	4
ENGL 398	Professional Communication for Engineers	2
ENGR 398	Professional Communication for Engineers	1
Tech. Elec.	Approved Technical Elective or Conjoiner	3
Tech. Elec.	Approved Technical Elective	3
		16

Devices and Instrumentation Conjoiner Class: Choose either

EBME 320 Biomedical Imaging

EBME 327 Bioelectric Engineering

EBME 350 Quantitative Molecular, Cellular, and Tissue Bioengineering

EBME 361 Biomedical Image Processing and Analysis

See the bulletin for guidance on choosing the approved technical electives (3 required)