

Degree-Audit-Format Program Plan Effective Fall 2024 and Beyond

Department: **Engineering and Aviation Sciences**

Updated Program: **Biomedical Engineering**

Updated Date: **9/8/24**

University Wide General Education Program www.umes.edu/gep

GEP Curriculum Area 1.1 Arts & Humanities: 1 course (3 credits)

Options: ARTS 101, ARTS 310, ARAB 101, ASLS 203, CHIN 101, ENGL 204, ENGL 205, ENGL 206, ENGL 207, FREN 101, HIND 101, HONR 101, JAPN 101, KORE 101, PORT 101, SPAN 101, THAR 101

GEP Curriculum Area 1.2 Arts & Humanities; REQUIRED: ENGL 203 (3 credits)

GEP Curriculum Area 2 Social & Behavioral Sciences: 2 courses (6 credits)

Options: CRJS 101, ECON 201, ECON 202, GEOG 201, GEOG 202, HIST 101, HIST 102, HIST 201, HIST 202, HONR 201, HUEC 203, HUEC 220, HUEC 361, PHIL 201, PHIL 202, POLI 200, POLI 220, POLI 342, PSYC 100, SOCI 101, SOCI 201

GEP Curriculum Area 3 Biological & Physical Sciences: 2 courses and 1 lab (7 credits)

(GEP SC)

Non-STEM options: ANPT 114, BIOL 101, BIOL 103 (LAB), CHEM 102, CHEM 104 (LAB), ENVS 101, NUDT 210, PLSC 184, PLSC 185 (LAB)

STEM options: BIOL 111, BIOL 113 (LAB), BIOL 112, BIOL 114 (LAB), BIOL 118, BIOL 120 (LAB), CHEM 111, CHEM 113 (LAB), PHYS 121, PHYS 123 (LAB), PHYS 122, PHYS 124 (LAB), PHYS 161, PHYS 163 (LAB), PHYS 181, PHYS 183 (LAB), PHYS 182, PHYS 184 (LAB)

GEP Curriculum Area 4 Math (3-4 credits) (GEP SC)

Humanities non-STEM option: MATH 103

STEM options: MATH 102, MATH 109, MATH 110, MATH 111, MATH 112

GEP Curriculum Area 5.1 Composition; REQUIRED: ENGL 101 (3 credits)

GEP Curriculum Area 5.2 Composition; REQUIRED: ENGL 102 (3 credits)

GEP Curriculum Area 5.3 Composition; Options: ENGL 305 or ENGL 310 (3 credits) **(GEP SC)**

GEP Curriculum Area 6.1 First-Year Experience (1 credit) (GEP SC)

Options: AGNR 111, ARTS 100, AVSC 100, BUED 100, CRJS 100, CSDP 100, DNSC 100, EDCI 100, ENGE 100, ENGL 100, EXSC 100, GNST 100, HUEC 100, REHA 100, SOSC 100

GEP Curriculum Area 6.2 Computer Literacy (3 credits)

Options: BUAD 213, BUED 212, EDCI 306, ETGE 110, ETGE 111, ETGE 112

GEP Curriculum Area 6.3 JEDI (Justice, Equity, Diversity, Inclusion) (3 credits)

Options: BUAD 311, CRJS 455, DMST 440, EDCI 408, ENGL 348, ENGL 359, EXSC 111, EXSC 265, EXSC 382, HUEC 230, HUEC 463

Total Required for General Education: 39 (if requiring a 4-credit Math)

Program Specific GEP Courses (Specific Requirements for BS Biomedical Engineering Majors)

Area 1.1 Arts & Humanities; 1 course (3 credits): (All options)

Area 1.2 Arts & Humanities; REQUIRED: ENGL 203 (3 credits)

Area 2 Social & Behavioral Sciences: 2 courses (6 credits): (All options)

Area 3 Biological & Physical Sciences: 2 courses and 1 lab (7 credits): PHYS 161 (3), PHYS 163 (1) **AND** CHEM 111 (3)

Area 4 Math: MATH 112 (4)

Area 5.1 ENGL 101 Basic Composition I (3 credits)

Area 5.2 ENGL 102 Basic Composition II (3 credits)

Area 5.3 ENGL 305 Technical Writing (3 credits)

Area 6.1 ENGE 100 Freshmen Experience (1 credit)

Area 6.2 (3 credits) (All options)

Area 6.3 (3 credits) (All options)

GEP Total: 39 credits

Biomedical Engineering (BS) Credit Requirement Breakdown:

General Education Courses: 39 credits

Required Major Courses: 43 credits

Support Science and Math Courses: 28 credits

Major Electives: 15 credits

Total Credits: 125

Required Major Courses: 43 credits

- BMEN 150 Freshman Biomedical Engineering Design (3 credits)
- ENGE 260 Statics (3 credits)
- BMEN 265 Biomaterials (3 credits)
- ENGE 320 Statistics & Probability for Engineers (3 credits)
- BMEN 242 Fluid Mechanics of Bio-systems (3 credits)
- BMEN 245 Bio-Thermodynamics (3 credits)
- BMEN 346 Transport Phenomena for Bio-systems (3 credits)
- BMEN 362 Bio-Mechanics (3 credits)

- BMEN 364 Human Physiology for Engineers (3 credits)
- BMEN 365 Cell Biology for Engineers (3 credits)
- ENGE 370 Computational Methods in Engineering (3 credits)
- BMEN 380 Bioinstrumentations (3 credits)
- BMEN 383 Bioinstrumentation Lab (1 credit)
- BMEN 384 Biomedical Engineering Lab (1 credit)
- BMEN 475 Biomedical Engineering Seminar (1 credit)
- BMEN 476 Senior Design Project I (2 credits)
- BMEN 477 Senior Design Project II (2 credits)

Supportive Science and Math Courses: 28 credits

- MATH 211 Calculus I (4 credit)
- MATH 212 Calculus II (4 credits)
- MATH 241 Differential Equations for Engineers (3 credits)
- PHYS 262 General Physics II (3 credits)
- PHYS 264 General Physics Laboratory II (1 credit)
- CHEM 112 Chemistry II (3 credit)
- CHEM 114 Chemistry II Lab (1 credit)
- BIOL 111/BIOL 111H Biology I (3 credits)
- BIOL 113/BIOL 113H Biology I Lab (1 credit)
- BIOL 222 Genetics (3 credits)
- BIOL 223 Genetics Lab (1 credit)
- CHEM 113 Chemistry I Lab (1 credit)

Major Electives: 15 credits

- BMEN 450 Bio-Solid Mechanics (3)
- BMEN 386 Design and Modeling in Bio-Solid Mechanics (3)
- BMEN 447 Cardiovascular Engineering (3)
- BMEN 388 Tissue Engineering (3)
- BMEN 390 Bio-reaction Engineering (3)
- BMEN 410 Nanotechnology (3)
- BMEN 415 Cellular Biotechnology (3)
- BMEN 448 Biomechanics of Human Movement (3)
- BMEN 449 Biomechanics of Rehabilitation (3)
- ENME 442 Micro-Electro-Mechanical System (3)
- ENGE 382 Control System (3)
- ENGE 261 Dynamics (3)
- BMEN 472 Selected Topics in Biomedical Engineering (3)

ENGE 240 Basic Circuit Theory (3)
ENEE 330 Signals and Systems (3)
ENEE 460 Digital Signal Processing (3)
BMEN 340 Bio-Electronics (3)
BMEN 349 Neural Engineering (3)
BMEN 445 Biomedical Imaging (3)
BMEN 446 Bioimage Processing (3)
BMEN 422 Machine Learning in Biomedical Engineering (3)
BMEN 452 Artificial Intelligence in Biomedical Engineering (3)
BMEN 454 Electrical Biophysics (3)
BMEN 461 Bioinformatics (3)

Semester-by-Semester-Format Program Plan Effective Fall 2024 and BeyondDepartment: **Engineering and Aviation Sciences**Updated Program: **Biomedical Engineering**Updated Date: **9/8/24****Color Legend:**

GEP credits	Yellow
Supportive Science and Math credits	Green
BME Major Required credits	Blue
BME Major Elective credits	Grey

Freshman Year: 31 credits

Fall: 16 credits

- GEP Curriculum Area 6.1 ENGE 100 Freshman Experience (1 credit)
- BIOL 111 Principles of Biology I (3 credits)
- BIOL 113 Principles of Biology I Laboratory (1 credit)
- GEP Curriculum Area 4 MATH 112 Calculus I (4 credits)
- GEP Curriculum Area 3.3 CHEM 111 Chemistry I (3 credits)
- CHEM 113 Chemistry I Laboratory (1 credit)
- BMEN 150 Freshman Biomedical Engineering Design (3 credits)

Spring: 15 credits

- GEP Curriculum Area 5.1 Composition ENGL101 Principles of Composition I (3 credits)
- GEP Curriculum Area 3 PHYS 161 General Physics I (3 credits)
- GEP Curriculum Area 3 PHYS 163 General Physics I Laboratory (1 credit)
- MATH 211 Calculus II (4 credits)
- CHEM 112 Chemistry II (3 credits)
- CHEM 114 Chemistry II Lab (1 credit)

Sophomore Year: 33 credits

Fall: 17 credits

- GEP Curriculum Area 5.2 Composition ENGL102 Principles of Composition II (3 credits)
- PHYS 262 General Physics II (3 credits)
- PHYS 264 General Physics II Lab (1 credits)
- BIOL 222 Genetics (3 credits)
- BIOL 223 Genetics Lab (1 credits)
- ENGE 260 Statics (3 credits)
- MATH 241 Differential Equations for Engineers (3 credits)

Spring: 16 credits

- GEP Curriculum Area 1.2 ENGL 203 Fundamentals of Contemporary Speech (3 credits)
- BMEN 245 Bio-thermodynamics (3 credits)
- BMEN 265 Bio-materials (3 credits)
- BMEN 242 Fluid Mechanics for Bio-Systems (3 credits)
- MATH 212 Calculus III (4 credits)

Junior Year: 32 credits

Fall: 16 credits

- GEP Curriculum Area 5.3 Composition ENGL 305 Technical Writing (3 credits)
- BMEN 364 Human Physiology for Engineers (3 credits)
- BMEN 362 Biomechanics (3 credits)
- BMEN 380 Bioinstrumentation (3 credits)
- BMEN 383 Bioinstrumentation Lab (1 credit)
- ENGE 370 Computational Methods in Engineering (3 credits)

Spring: 16 credits

- BMEN Elective (3 credits)
- BMEN Elective (3 credits)
- BMEN 365 Cell Biology for Engineers (3 credit)
- BMEN 346 Transport Phenomena for Bio-systems (3 credits)
- BMEN 384 Biomedical Engineering Lab (1 credit)
- GEP Curriculum Area 2.1 Social & Behavioral Sciences choice (3 credits)

Senior Year: 29 credits

Fall: 15 credits

- BMEN 476 Senior Design Project I (2 credits)
- BMEN 475 Biomedical Engineering Seminar (1 credits)
- BMEN Elective (3 credits)
- ENGE 320 (3 credits)
- GEP Curriculum Area 2.2 Social & Behavioral Sciences choice (3 credits)
- GEP Curriculum Area 1.1 Arts and Humanities choice (3 credits)

Spring: 14 credits

- BMEN 477 Senior Design Project II (2 credits)
- BMEN Elective (3 credits)
- BMEN Elective (3 credits)

- GEP Curriculum Area 6.3 JEDI choice (3 credits)
- GEP Curriculum Area 6.2 Computer Literacy choice (3 credits)