Elective Options for the Engineering Program

See the concentration-specific Model Program Worksheets to determine which electives are required. Please note that not all courses on this list are offered every year (see catalog for details).

1) The Basic Science elective can be any course from the list below. Other courses of 3 SH or greater in the major or minor programs of astronomy, biology, chemistry, geology, nursing, or physics may be considered for substitution – contact the department chair to obtain approval.

ASTR 211 – Planetary and Stellar Astronomy (SP, alt years)
ASTR 212 – Galactic Astronomy and Cosmology (SP, alt years)
BIOL 141 – Cell Biology and Genetics (FA, SP)
BIOL 160 – Ecological and Evolutionary Systems (FA, SP)
BIOL 161 – Cellular and Genetic Systems (FA, SP)
BIOL 205 – Human Anatomy (FA, SP)
BIOL 206 – Human Physiology (FA, SP)
BIOL 207 – Medical Microbiology (SP)
BIOL 230 – Physiological Systems (FA)
BIOL 364 – Global Health, Env't, and Sustainability (FA, SP)
CHEM 102 – General Chemistry II (SP)
CHEM 210 – Analytical Chemistry (FA, SP)
CHEM 230 – Essential Inorganic Chemistry (SP)
CHEM 240 – Survey of Organic Chemistry (FA)
CHEM 241 – Organic Chemistry I (FA)
GEO 120 – Earth Systems (FA, SP)
GEO 151 – Introduction to Geology (FA, SP)
GEO 152 – Historical Geology (SP)
GEO 215 – Mineralogy (FA)
GEO 252 – Geomorphology (FA)
GEO 325 – Hydrogeology (SP, alt years)
KIN 212 – Anatomical Kinesiology (FA)
KIN 213 – Biomechanics (SP)
PHYS 132 – Matter, Light, and Energy (FA)
PHYS 246 – Waves, Optics and Optical Technology (SP, alt years)
PHYS 306 – Intro to Quantum Physics (SP, alt years)
PHYS 335 – Classical Mechanics (FA, alt years)
PHYS 345 – Electromagnetism (FA, alt years)
PHYS 346 – Advanced Optics (SP, alt years)
PHYS 365 – Thermodynamics and Stat. Mechanics (FA, alt years)
PHYS 375 – Quantum Mechanics (FA, alt years)

Note: The Advanced Science Elective for the chemical engineering concentration is limited to BIOL 141, BIOL 160, BIOL 161, CHEM 210, CHEM 270, CHEM 320, CHEM 321, CHEM 330, or CHEM 340.

2) The Advanced Mathematics elective can be any 300-level course that has at least Math 172 as a prerequisite. See the following website for a tentative schedule of planned MATH/STAT course offerings: https://calvin.edu/academics/departments-programs/mathematics-statistics/files/UpperLevelSchedule-2021.pdf?language_id=1

MATH 305 – Geometry/Topology of Manifolds (FA, alt years)
MATH 312 – Logic/Computability/Complexity (FA, alt years)
MATH 331 – Nonlinear Dynamics and Chaos (FA, alt years)
MATH 333 – Partial Differential Equations (FA, alt years)
MATH 335 – Numerical Analysis (offered occasionally)
MATH 355 – Advanced Linear Algebra (SP)
MATH 361 – Real Analysis I (FA)
MATH 362 – Real Analysis II (SP, alt years)
MATH 365 – Complex Variables (SP)
STAT 341 – Computational Bayesian Statistics (SP, alt years)
STAT 343 – Probability and Statistics (FA)
STAT 344 – Mathematical Statistics (SP, alt years)

Note: For a mathematics minor the following are required: MATH 171 plus 18 SH of additional MATH/STAT courses. At least 7 SH must be from 300-level courses.

3) The Statistics requirement can be met by the following courses:

Most typical option: STAT 241 – Engineering Statistics (SP)
AP Statistics (equivalent to STAT 143)
STAT 145 – Biostatistics (FA, SP)
STAT 243 – Statistics (SP)
STAT 343 – Probability and Statistics (FA)
STAT 341 – Computational Bayesian Statistics (SP, alt years)

4) The Technical Elective can be any course from the list below. Other courses of 3 SH or greater that have significant mathematical or scientific content may be considered for substitution – contact the department chair to obtain approval.

ME/C&E only: CS 112 – Intro to Data Structures (FA, SP)
CS 212 – Data Structures and Algorithms (FA)
CS 214 – Programming Language Concepts (SP)
CS 232 – Operating Systems and Networking (SP)
CS 300 – Special Topics in CS (FA, SP)
CS 326 – Embedded Systems and IoT (SP, alt years)
GEO 260 – GIS and Cartography (FA, SP)

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5) An Engineering elective course can be any course of 3 SH or greater from the appropriate concentration-specific lists below. Consult the catalog to determine any necessary prerequisites.

Civil & Environmental Engineering Concentration

ENGR 220 – Introduction to Computer Architecture (FA)
ENGR 250 – Introduction to Biomedical Engineering (SP)
ENGR 302 – Engineering Electromagnetics (SP)
ENGR 303 – Chem Engr Principles and Thermodynamics (FA)
ENGR 304 – Fundamentals of Digital Systems (SP)
ENGR 307 – Electrical Signals and Systems (FA)
ENGR 308 – Environmental Engineering Design (SP)
ENGR 311 – Electronic Devices and Circuits (FA)
ENGR 312 – Chemical Engineering Thermo (SP)
ENGR 314 – Vibration Analysis (SP)
ENGR 315 – Control Systems (FA)
ENGR 318 – Soil Mechanics and Found'n Design (SP, alt years)
ENGR 319 – Introduction to Thermal Sciences (FA)
ENGR 321 – Hydraulic Engineering Design (SP)
ENGR 322 – Machine Design (SP)
ENGR 324 – Materials and Processes in Mfg (SP)
ENGR 327 – Structural Design (FA)
ENGR 328 – Intermediate Thermofluids (SP)
ENGR 330 – Fluid Flow and Heat Transfer (SP)
ENGR 334 – Dynamics of Machinery (SP)
ENGR 338 – Traffic Engineering (SP, alt years)
ENGR 342 – Process Dynamics, Modeling, and Control (SP)
ENGR 350 – Special Topics in Engineering (SP)

Electrical & Computer Engineering Concentration

ENGR 250 – Introduction to Biomedical Engineering (SP)
ENGR 303 – Chem Engr Principles and Thermodynamics (FA)
ENGR 305 – Mechanics of Materials (FA)
ENGR 306 – Principles of Environmental Engineering (FA)
ENGR 314 – Vibration Analysis (SP)
ENGR 315 – Control Systems (FA)
ENGR 318 – Soil Mechanics and Found'n Design (SP, alt years)
ENGR 319 – Introduction to Thermal Sciences (FA)
ENGR 320 – Hydraulic Engineering (FA)
ENGR 324 – Materials and Processes in Mfg (SP)
ENGR 326 – Structural Analysis (SP)
ENGR 334 – Dynamics of Machinery (SP)
ENGR 338 – Intro to Traffic Engineering (SP, alt years)
ENGR 342 – Process Dynamics, Modeling, and Control (SP)
ENGR 350 – Special Topics in Engineering (SP)

Mechanical Engineering Concentration

The first engineering elective is limited to one of the following courses.

ENGR 315 – Control Systems (FA)
ENGR 314 – Vibration Analysis (SP)
ENGR 342 – Process Dynamics, Modeling, and Control (SP)

Additional engineering electives can be from any of the courses listed below.

ENGR 220 – Introduction to Computer Architecture (FA)
ENGR 250 – Introduction to Biomedical Engineering (SP)
ENGR 302 – Engineering Electromagnetics (SP)
ENGR 303 – Chem Engr Principles and Thermodynamics (FA)
ENGR 304 – Fundamentals of Digital Systems (SP)
ENGR 306 – Principles of Environmental Engineering (FA)
ENGR 307 – Electrical Signals and Systems (FA)
ENGR 308 – Environmental Engineering Design (SP)
ENGR 311 – Electronic Devices and Circuits (FA)
ENGR 312 – Chemical Engineering Thermo (SP)
ENGR 314 – Vibration Analysis (SP)
ENGR 315 – Control Systems (FA)
ENGR 318 – Soil Mechanics and Found'n Design (SP, alt years)
ENGR 320 – Hydraulic Engineering (FA)
ENGR 321 – Hydraulic Engineering Design (SP)
ENGR 326 – Structural Analysis (SP)
ENGR 327 – Structural Design (FA)
ENGR 330 – Fluid Flow and Heat Transfer (SP)
ENGR 338 – Intro to Traffic Engineering (SP, alt years)
ENGR 342 – Process Dynamics, Modeling, and Control (SP)
ENGR 350 – Special Topics in Engineering (SP)