

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 the [university catalog](#) for details).

- 1) The Basic Science elective can be any course from the list below. Other courses of 2 SH or greater in the major or minor programs of biology, chemistry, geology, nursing, or physics may be considered for substitution – contact the department chair to obtain approval.

ASTR 201 (4) – Astrophysical Black Holes (SP, alt years)	GEO 120 (4) – Earth Systems (FA, SP)
ASTR 211 (4) – Planetary and Stellar Astronomy (SP, alt years)	GEO 151 (4) – Introduction to Geology (FA, SP)
ASTR 212 (4) – Galactic Astronomy and Cosmology (SP, alt years)	GEO 152 (4) – Historical Geology (SP)
BIOL 141 (4) – Cell Biology and Genetics for Health Sciences (SP)	GEO 215 (4) – Mineralogy (FA)
BIOL 160 (4) – Ecological and Evolutionary Systems (FA, SP)	GEO 252 (4) – Geomorphology (FA)
BIOL 161 (4) – Cellular and Genetic Systems (FA, SP)	GEO 325 (4) – Hydrogeology (FA, odd years)
BIOL 205 (4) – Human Anatomy (FA, SP, SU)	KIN 212 (4) – Anatomical Kinesiology (FA)
BIOL 206 (4) – Human Physiology (FA, SP, SU)	KIN 213 (2) – Biomechanics (SP)
BIOL 207 (4) – Medical Microbiology (SP)	PHYS 130 (2) – Particles, Nuclei, and Astronomy (FA)
BIOL 231 (2) – Introduction to Animal Physiology (SP)	PHYS 131 (2) – Matter, Light, and Energy (FA)
BIOL 232 (2) – Introduction to Plant Physiology (SP)	PHYS 246 (4) – Waves, Optics and Optical Tech (SP, alt years)
BIOL 364 (4) – Global Health, Env't, and Sustainability (FA, SP)	PHYS 306 (4) – Intro to Quantum Physics (SP, alt years)
BIOL 372 (2) – Dutch Sustainability (SU, alt years)	PHYS 335 (4) – Classical Mechanics (FA, alt years)
CHEM 102 (4) – General Chemistry II (SP)	PHYS 345 (4) – Electromagnetism (FA, alt years)
CHEM 210 (4) – Analytical Chemistry (FA, SP)	PHYS 346 (2) – Advanced Optics (SP, alt years)
CHEM 230 (4) – Essential Inorganic Chemistry (SP)	PHYS 365 (4) – Thermodynamics and Stat. Mech's (FA, alt years)
CHEM 240 (4) – Survey of Organic Chemistry (FA)	PHYS 375 (4) – Quantum Mechanics (FA, alt years)
CHEM 241 (4) – Organic Chemistry I (FA)	

Note: The Advanced Science Elective for the chemical engineering concentration is limited to BCHM 321/322/323/324, BIOL 141/160/161, or CHEM 210/230/270/311/341/353/371/372/373.

- 2) The Advanced Mathematics elective can be any 300-level course that has at least Math 172 as a prerequisite. See the website for a tentative schedule of planned MATH/STAT course offerings: <https://calvin.edu/academics/departments-programs/mathematics-statistics/academics/index.html>

MATH 305 – Geometry/Topology of Manifolds (FA, alt years)	MATH 362 – Real Analysis II (SP, alt years)
MATH 312 – Logic/Computability/Complexity (FA, alt years)	MATH 365 – Complex Variables with Topics (SP)
MATH 331 – Nonlinear Dynamics and Chaos (FA, alt years)	MATH 385 – Topics in Mathematics (as needed)
MATH 333 – Partial Differential Equations (FA, alt years)	STAT 341 – Computational Bayesian Statistics (SP, alt years)
MATH 335 – Numerical Analysis (offered occasionally)	STAT 343 – Probability and Statistics (FA)
MATH 355 – Advanced Linear Algebra (SP)	STAT 344 – Mathematical Statistics (SP, alt years)
MATH 361 – Real Analysis I (FA)	

Note: For a mathematics minor the following are required: MATH 171 plus 18 SH of additional MATH/STAT courses. At least 8 SH must be from 300-level courses.

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

Most typical option: STAT 241 (2) – Engineering Statistics (SP)	STAT 243 (4) – Statistics (SP)
AP Statistics (equivalent to STAT 143)	STAT 341 (4) – Computational Bayesian Statistics (SP, alt years)
STAT 145 (4) – Biostatistics (FA, SP)	STAT 343 (4) – Probability and Statistics (FA)

- 4) The Technical Elective can be any course from the list below. Other courses of 2 SH or greater that have significant mathematical or scientific content may be considered for substitution – contact the department chair to obtain approval.

CS 112 – Intro to Data Structures (FA, SP) (except for E&C)
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)

- 5) An Engineering elective course can be any course of 2 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 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 322 – Machine Design (SP)
ENGR 324 – Materials and Processes in Mfg (SP)
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)
ENGR 354 – Sustainability 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)
ENGR 354 – Sustainability Engineering (SP)

Energy, Environment, and Sustainability 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 315 – Control Systems (FA)
ENGR 250 – Introduction to Biomedical Engineering (SP)	ENGR 318 – Soil Mechanics and Found'n Design (SP, alt years)
ENGR 302 – Engineering Electromagnetics (SP)	ENGR 320 – Hydraulic Engineering (FA)
ENGR 303 – Chem Engr Principles and Thermodynamics (FA)	ENGR 321 – Hydraulic Engineering Design (SP)
ENGR 304 – Fundamentals of Digital Systems (SP)	ENGR 326 – Structural Analysis (SP)
ENGR 306 – Principles of Environmental Engineering (FA)	ENGR 327 – Structural Design (FA)
ENGR 307 – Electrical Signals and Systems (FA)	ENGR 330 – Fluid Flow and Heat Transfer (SP)
ENGR 308 – Environmental Engineering Design (SP)	ENGR 338 – Intro to Traffic Engineering (SP, alt years)
ENGR 311 – Electronic Devices and Circuits (FA)	ENGR 342 – Process Dynamics, Modeling, and Control (SP)
ENGR 312 – Chemical Engineering Thermo (SP)	ENGR 350 – Special Topics in Engineering (SP)
ENGR 314 – Vibration Analysis (SP)	ENGR 354 – Sustainability Engineering (SP)

Mechatronics Engineering Concentration

ENGR 250 – Introduction to Biomedical Engineering (SP)	ENGR 320 – Hydraulic Engineering (FA)
ENGR 302 – Engineering Electromagnetics	ENGR 324 – Materials and Processes in Mfg (SP)
ENGR 303 – Chem Engr Principles and Thermodynamics (FA)	ENGR 326 – Structural Analysis (SP)
ENGR 306 – Principles of Environmental Engineering (FA)	ENGR 332 – Analog Circuits and Systems Design (SP)
ENGR 314 – Vibration Analysis (SP)	ENGR 338 – Intro to Traffic Engineering (SP, alt years)
ENGR 315 – Control Systems (FA)	ENGR 342 – Process Dynamics, Modeling, and Control (SP)
ENGR 318 – Soil Mechanics and Found'n Design (SP, alt years)	ENGR 350 – Special Topics in Engineering (SP)
ENGR 319 – Introduction to Thermal Sciences (FA)	ENGR 354 – Sustainability Engineering (SP)