### Elective Options for the Engineering Program

See the concentration-specific Model Program Sheets 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 or any appropriate course of 3 SH or greater in the major or minor programs of astronomy, biology, chemistry, geology, nursing, or physics. The most typically selected basic science courses are:

#### FALL
- BIOL 141 – Cell Biology and Genetics
- BIOL 160 – Ecological and Evolutionary Systems
- BIOL 205 – Human Anatomy
- BIOL 364 – Global Health, Environment, and Sustainability
- CHEM 210 – Analytical Chemistry
- CHEM 241 – Organic Chemistry I
- GEOL/GEOG 120 – Earth Systems
- GEOL 151 – Introduction to Geology
- GEOL 325 – Hydrogeology
- PHYS 132 – Matter, Light, and Energy
- PHYS 335 – Classical Mechanics
- PHYS 345 – Electromagnetics

#### SPRING
- ASTR 211 – Planetary and Stellar Astronomy
- ASTR 212 – Galactic Astronomy and Cosmology
- BIOL 161 – Cellular and Genetic Systems
- BIOL 141 – Cell Biology and Genetics
- BIOL 160 – Ecological and Evolutionary Systems
- BIOL 161 – Cellular and Genetic Systems
- BIOL 205 – Human Anatomy
- BIOL 364 – Global Health, Environment, and Sustainability
- CHEM 210 – Analytical Chemistry
- CHEM 241 – Organic Chemistry I
- CHEM 230 – Essential Inorganic Chemistry
- GEOL/GEOG 120 – Earth Systems
- GEOL 151 – Introduction to Geology
- GEOL 325 – Hydrogeology
- PHYS 246 – Waves, Optics and Optical Technology
- PHYS 306 – Intro to Quantum Mechanics

**The Advanced Science Elective for the chemical engineering concentration is limited to:** CHEM 201, CHEM 271, CHEM 303, CHEM 323, CHEM 325, CHEM 330, BIOL 141, BIOL 160, or BIOL 161.

2) **The Advanced Mathematics** elective can be any 300-level course that has at least Math 172 as a prerequisite. Recommended courses include:

#### FALL
- MATH 305 – Geometry and Topology of Manifolds
- MATH 312 – Logic, Computability, and Complexity
- MATH 331 – Nonlinear Dynamics and Chaos
- MATH 333 – Partial Differential Equations
- MATH 361 – Real Analysis I
- STAT 343 – Probability and Statistics

#### SPRING
- MATH 335 – Numerical Analysis
- MATH 355 – Advanced Linear Algebra
- MATH 365 – Complex Variables
- STAT 344 – Mathematical Statistics (need 343)

For a mathematics minor the following are required: 171, 172, 231, 232/271 and two 300 level courses. Approval must be obtained from the mathematics department.

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

- AP Statistics (from High School)
- STAT 241 – Statistics for Engineers
- STAT 243 – Statistics
- STAT 343 and STAT 344 (see above)

4) **The Engineering** elective can be any course of 3 SH or greater from the appropriate concentration-specific lists below. Consult the catalog to determine prerequisites needed for these courses:

#### Electrical & Computer Engineering Concentration:

#### FALL
- ENGR 303 – Chem Engr Principles and Thermodynamics
- ENGR 305 – Mechanics of Materials
- ENGR 306 – Principles of Environmental Engineering

#### SPRING
- ENGR 314 – Vibration Analysis
- ENGR 318 – Soil Mech and Foundation Design (odd years)
- ENGR 334 – Dynamics of Machinery

### Last Update: April 2020
ENGR 315 – Control Systems
ENGR 319 – Introduction to the Thermal/Fluid Sciences

Civil & Environmental Engineering Concentration:

**FALL**
- ENGR 220 – Introduction to Computer Architecture
- ENGR 303 – Chem Engr Principles and Thermodynamics
- ENGR 307 – Electrical Signals and Systems
- ENGR 315 – Control Systems
- ENGR 321 – Hydraulic Engineering Design
- ENGR 327 – Structural Design

**SPRING**
- ENGR 304 – Fundamentals of Digital Systems
- ENGR 308 – Environmental Engineering Design
- ENGR 314 – Vibration Analysis
- ENGR 318 – Soil Mech and Foundation Design (odd years)
- ENGR 322 – Machine Design
- ENGR 328 – Intermediate Thermal/Fluid Sciences
- ENGR 334 – Dynamics of Machinery
- ENGR 338 – Traffic Engineering (even years)
- ENGR 342 – Process Dynamics, Modeling, and Control

**Mechanical Engineering Concentration:**

**FALL**
- ENGR 315 – Control Systems

**SPRING**
- ENGR 314 – Vibration Analysis
- ENGR 342 – Process Dynamics, Modeling, and Control

5) The **Technical Elective** can be any course from the Basic Science, Advanced Math, or Engineering Elective categories, as well as the following courses:

**FALL**
- CS 112 – Introduction to Data Structures (ME/C&E only)
- CS 212 – Data Structures and Algorithms
- CS 322 – Operating Systems and Networking
- GEOG 261 – Geographic Info Systems and Cartography
- KIN 212 – Anatomical Kinesiology

**SPRING**
- CS 214 – Programming Language Concepts
- GEOG 261 – Geographic Info Systems and Cartography
- KIN 213 – Biomechanics

Optional Designations

1) **International**

Students may receive an international designation to their concentration (e.g., "BSE International Mechanical Concentration") by completing any two of the following three items:

1. An international engineering interim course
2. An international internship and demonstrating some ability to speak the language of their internship country
3. The Engineering Summer Program in Germany

Other activities may qualify for the international designation. For additional details, please contact the department chair or the department Internship Coordinator, Prof. Ned Nielsen.

2) **Sustainability**

Students may receive a sustainability designation to their concentration with the completion of these requirements:

1. ENGR 184 – Sustainability Challenges
2. A 3 or 4-semester hour sustainability-themed course
3. ENGR 384 – Analysis of Sustainability Engineering Systems
4. A sustainability-related practical experience such as senior design project or internship

Last Update: April 2020
Contact the Program for Sustainability Engineering Director (Prof. Matthew Heun) for a list of qualifying 3-4 semester hour sustainability-themed courses and additional details.