## CHEMICAL (Sustainable Energy)

### First Year

**Fall Semester**
- **GE A**
- **WRIT 150**
- **MATH 125 (GE F)**
- **CHEM 105al (GE E)**
- **ENGR 102**

**Spring Semester**
- **CHE 120 or CHEM 105al**
- **CHEM 205**
- **MATH 126 or MATH 129**
- **CHEM 105bl (GE E)**
- **PHYS 151L (GE E)**

### Second Year

**Fall Semester**
- **CHEM 300L (CHEE 430)**
- **MATH 226 or MATH 229**
- **PHYS 152L**
- **OPTIONAL ELECTIVE**

**Spring Semester**
- **CHEM 322aL**
- **MATH 245**
- **CHE 350**
- **WRIT 340**

### Third Year

**Fall Semester**
- **GE C**
- **CHEM 430**
- **CHE 442**
- **CHE 450**
- **OPTIONAL ELECTIVE**

**Spring Semester**
- **CHEM TECH. ELECTIVE**
- **GE C**
- **CHEM 444al**
- **CHE 476 or MASC 350L**
- **OPTIONAL ELECTIVE**

### Fourth Year

**Fall Semester**
- **GE D**
- **CHEM 444bl or CHEM 445**
- **CHE 485**
- **CHE 405 or CHBE 460 or *BUAD 301**
- **OPTIONAL ELECTIVE**

**Spring Semester**
- **GE C**
- **CHEM 446**
- **CHE 460L**
- **CHE 480**
- **OPTIONAL ELECTIVE**

### Mathematics (16 Units)
- **MATH 125**: Calculus I
- **MATH 126 or MATH 129**: Calculus II
- **MATH 226 or MATH 229**: Calculus III
- **MATH 245**: Mathematics of Phys. and Engr.

### Physics (5 Units)
- **PHYS 151L**: Mechanics and Thermodynamics
- **PHYS 152L**: Electricity and Magnetism

### Chemistry (24 Units)
- **CHEM 105al**: General Chemistry
- **CHEM 105bl**: General Chemistry
- **CHEM 300L**: Analytical Chemistry
- **CHEM 322al**: Organic Chemistry
- **CHEM 430**: Physical Chemistry: Thermodynamics & Kinetics
- Chemistry Technical Electives:
  - **CHEM 322bl**: Organic Chemistry
  - **CHEM 431**: Physical Chemistry: Quantum Mechanics
  - **CHEM 433**: Advance Inorganic Chemistry

### General Education (32 Units)
- **GE A** The Arts (1 Course)
- **GE B** Humanistic Inquiry (2 Courses)
- **GE C** Social Analysis (2 Courses)
- **GE D** Life Sciences (1 Course)
- **GE E** Physical Sciences (1 Course)
- **GE F** Quantitative Reasoning (1 Course)
- **GE G, H** Global Perspectives (2 Courses)*
- **GESM** General Education Seminar (1 Course)*

### Writing (7 Units)
- **WRIT 150**: Writing and Critical Reasoning
- **WRIT 340**: Advanced Writing

### Engineering (54 Units)
- **CHE 120**: Intro. to Chemical Engineering
- **CHE 205**: Numerical Methods in Chemical Engineering
- **CHE 330**: Chemical Engr. Thermodynamics
- **CHE 350**: Intro. to Separation Processes
- **CHE 405**: Applications of Prob. & Stats. for ChE or **ISE 460**: Engineering Economy
- **BUAD 301**: Technical Entrepreneurship
- **CHEM 443**: Chemical Reactor Analysis
- **CHEM 444**: Viscous Flows
- **CHEM 444bl**: Chemical Engineering Lab
- **CHEM 448**: Heat Transfer in CHE Processes
- **CHEM 448**: Mass Transfer in CHE Processes
- **CHEM 450**: Sustainable Energy
- **CHEM 460L**: Chemical Process Dynamics & Control
- **CHEM 480**: Chem. Process and Plant Design
- **CHEM 485**: Comp.-Aided Chemical Process Design
- **ENGR 102**: Engineering Freshman Academy

### Special Notes
- Courses with this symbol may be satisfied with AP, IB or A-Level exams. See page 17 for more information.
- GE: Engineering students are encouraged to satisfy GE B and GE H with a course that also satisfies a Core Literacy. GE H may be satisfied by exam. Additionally, your GESM course should be taken in categories A, B, C, or D only. See pp. 16-17 for more information and consult your advisor for detailed assistance.

**OPTIONAL ELECTIVES**: Consult with your academic advisor to explore optional elective courses. These courses are not required.

**Sustainable Energy Elective (3):**
- Biofuel (CHEM 301 or CHEM 480 or CHEM 485)
- Solar (CHEM 487 or EE 513)
- Geothermal (EIV 463L)

*Must have 48 engineering units to be able to take BUAD 301.*