

# 2021 ChE Undergraduate Advising Sessions

## Program Educational Objectives

During the first few years after graduation, a successful graduate of the program will:

1. Demonstrate achievement by applying a broad knowledge in chemical engineering;
2. Apply critical reasoning and quantitative skills to identify and solve problems in chemical engineering;
3. Implement skills for effective communication and teamwork;
4. Demonstrate the potential to effectively lead chemical engineering projects in industry, government, or academia;
5. Exhibit a commitment to lifelong learning.

(Program educational objectives are those aspects of engineering that help shape the curriculum; achievement of these objectives is a shared responsibility between the student and UCI.)

## Student Outcomes

By the time of graduation, the UCI Chemical Engineering students will have demonstrated:

1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics;
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors;
3. An ability to communicate effectively with a range of audiences;
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts;
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions; and
7. An ability to acquire and apply new knowledge as needed, use appropriate learning strategies.

## **American Institute of Chemical Engineers Code of Professional Ethics**

Members of the American Institute of Chemical Engineers shall uphold and advance the integrity, honor, and dignity of the engineering profession by:

- Being honest and impartial and serving with fidelity their employers, their clients, and the public;
- Striving to increase the competence and prestige of the engineering profession;
- Using their knowledge and skill for the enhancement of human welfare.

To achieve these goals, members shall:

- Hold paramount the safety, health and welfare of the public and protect the environment in performance of their professional duties.
- Formally advise their employers or clients (and consider further disclosure, if warranted) if they perceive that a consequence of their duties will adversely affect the present or future health or safety of their colleagues or the public.
- Accept responsibility for their actions, seek and heed critical review of their work and offer objective criticism of the work of others.
- Issue statements or present information only in an objective and truthful manner.
- Act in professional matters for each employer or client as faithful agents or trustees, avoiding conflicts of interest and never breaching confidentiality.
- Treat fairly and respectfully all colleagues and co-workers, recognizing their unique contributions and capabilities.
- Perform professional services only in areas of their competence.
- Build their professional reputations on the merits of their services.
- Continue their professional development throughout their careers, and provide opportunities for the professional development of those under their supervision.
- Never tolerate harassment.
- Conduct themselves in a fair, honorable and respectful manner.

## Specializations (2021/22 catalog)

Three (3) specializations are offered in the undergraduate major in Chemical engineering. The specializations allow the students to concentrate technical electives in a specific area of interest, and will be listed on the student's final transcript.

**Specialization in Biomolecular Engineering:** requires CBE161 and a minimum of 8 units from CBE163, CBE199\* or H199\* (up to 4 units), BME 50A, BME 50B, BME 114, BME 121, BME 132, BME 160, BIO SCI 98, BIO SCI 99.

*(Note: CBE160: Engineering Biology can also be used. It is not listed as it will be a required course for entering Freshmen.)*

**Important change to Biomolecular Engineering Specialization:** CBE 160 will be a prerequisite for CBE 161 and CBE 163 starting in 2021/22 (this coming academic year).

**Specialization in Energy and Sustainability:** requires a minimum of 11 units including at least one course from CBE176, MSE141, CBE199\* or H199\* (up to 4 units). The remaining units can be selected from CEE160, CEE162, CEE163, CEE164, CEE165, MAE110, MAE114, MAE117, MAE164, MSE158, MSE171.

*(Note: CBE195: Electrochemical Engineering can also be used.)*

**Specialization in Materials Science:** requires a minimum of 12 units from CBE181, CBE 183, CBE187, CBE199\* or H199\* (up to 4 units), MSE69, MSE141, MSE155, MSE158, MSE164, MSE174, MAE155.

\* Other courses may be acceptable for the Specializations; submit a petition to the ChE UG Advisor

\* CBE 199 or H 199 research used for the Specializations must:

(1) be on a research topic within the Specialization

(2) be submitted (with a research description) for approval by the ChE UG Advisor

## **Chemical Engineering Core Courses**

The CBE department developed the standardized topics of the 14 chemical engineering core courses that satisfy the Program Criteria for Chemical Engineering submitted by the American Institute of Chemical Engineers. A list of the topics is shown on the departmental web page. The nominal Chemical Engineering program will require 192 units of courses to satisfy all university and major requirements.

## **Revised List of Technical Electives**

The requirements for a BS degree in Chemical Engineering include nineteen (19) units of technical electives. Specific requirements and restrictions are listed below along with a pre-approved list of courses. Any course that is not listed below must be approved by the undergraduate faculty advisor in order to count toward the 19 unit requirement.

### **Technical Elective Restrictions:**

1. Technical electives can include courses in engineering, science, and math. Students typically need at least 15 units of engineering topics from technical electives to meet school requirements.
2. The material covered in the course cannot substantially repeat the material covered in the ChE core courses (e.g., a heat transfer course from Mechanical and Aerospace Engineering would not be approved).
3. Technical electives generally must be upper division courses (course number > 100). A maximum of 4 units of select lower division courses may count toward the 19 unit requirement.
4. A maximum of 4 units of individual study/undergraduate research (e.g., CBE 199) may count toward the 19 units of technical electives.

### **Pre-approved Lower Division Technical Electives**

ENGR 7A, ENGR 7B; ENGR 30; BME 50A, BME 50B; BIO SCI 98, BIO SCI 99.

### **Pre-approved Upper Division Technical Electives**

#### **School of Engineering**

BME 120: Quantitative Physiology: Sensory Motor Systems  
BME 121: Quantitative Physiology: Organ Transport Systems  
BME 135: Photomedicine

CBE 160: Engineering Biology  
CBE 161: Introduction to Biochemical Engineering  
CBE 163: Kinetics of Biochemical Networks  
CBE 176: Nuclear and Radiochemistry  
CBE 178: Chemistry and Technology for the Nuclear Fuels Cycle  
CBE 181: Polymer Science and Engineering  
CBE 183: Surface and Adhesion Science  
CBE 187: Semiconductor Device Packaging

CEE 160: Environmental Processes  
CEE 162: Introduction to Environmental Chemistry  
CEE 163: Biological Treatment Processes  
CEE 171: Water Resources Engineering  
CEE 172: Groundwater Hydrology  
CEE 176: Hydrology

EECS 170A, B, C: Electronics I, II, III  
EECS 174: Semiconductor Devices  
EECS 176: Fundamentals of Solid-State Electronics & Materials

ENGR 150: Mechanics of Structures

MAE 110: Combustion and Fuel Cell Systems  
MAE 114: Fuel Cell Fundamentals and Technology  
MAE 117: Solar and Renewable Energy Systems  
MAE118: Sustainable Energy Systems  
MAE 130B: Introduction to Viscous and Compressible Flows  
MAE 135: Compressible Flow  
MAE 164: Air Pollution and Control  
MAE 185: Numerical Analysis in Mechanical Engineering

MSE 141: Nanoscale Materials and Applications  
MSE 155: Mechanical Behavior and Design Principles  
MSE 158: Ceramic Materials for Sustainable Energy  
MSE 160: Advanced Laboratory in Synthesis of Materials  
MSE 163: Computer Techniques in Experimental Materials Research  
MSE 164: X-Ray Diffraction, Electron Microscopy, and Microanalysis  
MSE 165: Materials Kinetics and Phase Transformations  
MSE 169: Electronic and Optical Properties in Materials  
MSE 171: Green Engineering: Theory and Practice

MSE 175: Design Failure Investigation

### **Chemistry**

CHEM 107: Inorganic Chemistry  
CHEM 107L: Inorganic Chemistry Laboratory  
CHEM 125: Advanced Organic Chemistry  
CHEM 137: Computational Chemistry  
CHEM 152: Advanced Analytical Chemistry  
CHEM 153: Physical Chemistry Laboratory  
CHEM 160: Organic Synthesis Laboratory  
CHEM 170: Radioisotope Techniques

### **Biological Sciences and Others**

BIO SCI 98: Biochemistry  
BIO SCI 99: Molecular Biology  
BIO SCI D103: Cell Biology  
BIO SCI D104: Developmental Biology  
BIO SCI M137: Microbial Genetics

**Mathematics**

MATH 112A,B,C: Introduction to Partial Differential Equations and Applications

**School of Business**

MGMT 101: Management Science

MGMT 109: Introduction to Managerial Finances

MGMT 149: Derivatives

(Revised in May 2021 by Professor Nancy Da Silva)