UCI Samueli School of Engineering
University of California, Irvine

# 2018 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:

a. An ability to apply knowledge of mathematics, science, and engineering to chemical engineering problems.

b. An ability to design and conduct experiments, as well as to analyze and interpret data.

c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

d. An ability to function on multi-disciplinary teams.

e. An ability to identify, formulate, and solve chemical engineering problems.

f. An understanding of professional and ethical responsibility.

g. An ability to communicate effectively orally and in writing.

h. A broad education necessary to understand the impact of chemical engineering solutions in a global, economic, environmental, and societal context.

i. A recognition of the need for, and an ability to engage in life-long learning.

j. A knowledge of contemporary issues in chemical engineering.

k. An ability to use techniques, skills, and modern engineering and computing tools necessary for chemical engineering practice.

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# 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.

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## Specializations (2017/18 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 CBEMS112 and a minimum of 8 units from CBEMS115, CBEMS119, CBEMS199* or H199* (up to 4 units), BME 50A, BME 50B, BME 121, BME 160, BioSci 98, BioSci 99.

**Specialization in Energy and the Environment:** requires a minimum of 11 units including at least one course from CBEMS133, CBEMS141, CBEMS143, CBEMS199* or H199* (up to 4 units). The remaining units can be selected from CEE160, CEE162, CEE163, CEE171, CEE172, MAE110, MAE164.

**Specialization in Materials Science:** requires a minimum of 12 units from ENGR150 (requires ENGR30, not included in total), CBEMS154, CBEMS155, CBEMS158, CBEMS163, CBEMS174, CBEMS175, CBEMS199* or H199* (up to 4 units), MAE155.

* CBEMS 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 Faculty Advisor

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## Chemical Engineering Core Courses

The ChEMS 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 Bachelor's 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 towards the 19 unit requirement.

**Technical Elective Restrictions**:

1. 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).

2. Technical electives generally must be upper division courses (course number > 100). A maximum of 4 units of lower division course (e.g., dynamics, molecular biology) may count towards the 19 unit requirement.

3. A maximum of 4 units of individual study/undergraduate research (E199, CBEMS199) may count toward the 19 units of technical electives.

4. Technical electives can include courses in engineering, science, and math. Students typically need at least 14 units of engineering topics from technical electives to meet school requirements.

**Pre-approved Technical Electives**

Note: Courses not listed below must be approved by the undergraduate faculty advisor.

**School of Engineering**

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

CBEMS 106: Pollution Control
CBEMS 112: Introduction to Biochemical Engineering
CBEMS 115: Kinetics of Biochemical Networks
CBEMS 119: Biomaterials: Structural Biology and Assembly
CBEMS 124: Transport Phenomena in Living Systems
CBEMS 126: Biomedical Photonics
CBEMS 128: Introduction to Numerical Methods in Engineering
CBEMS 133: Nuclear and Radiochemistry
CBEMS 141: Nanoscale Materials and Applications
CBEMS 143: Chemistry and Technology for the Nuclear Fuels Cycle

CBEMS 154: Polymer Science and Engineering
CBEMS 155: Mechanical Behavior and Design Principles
CBEMS 158: Ceramic Materials
CBEMS 159: Plasticity and Metal Forming
CBEMS 160: Advanced Laboratory in Chemistry & Synthesis of Materials
CBEMS 163: Computer Techniques in Experimental Materials Research
CBEMS 164: X-Ray Diffraction, Electron Microscopy, and Microanalysis
CBEMS 165: Diffusion and Phase Transformations
CBEMS 169: Electronic and Optical Properties in Materials
CBEMS 174: Semiconductor Device Packaging
CBEMS 175: Design Failure Investigation

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

**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 2018 by Professor Nancy Da Silva)