

Chemical and Materials Engineering

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Chemical Engineering Program

Chemical engineering deals with any situation in which changes in the chemical composition or the physical state of matter (or both) are involved and, hence, finds unusually wide application. Heat and mass transfer, fluid mechanics, thermodynamics, chemical reaction kinetics, and process control constitute the heart of chemical engineering. Chemical engineers work in many diverse fields ranging from production of many basic chemical products required by today's industrial society to research on major technical and social problems, including energy resources development, space applications, pollution control, and biotechnology.

Students pursuing a UAH Chemical Engineering bachelor's degree may choose one of two concentrations:

1. Materials (<http://catalog.uah.edu/undergrad/colleges-departments/engineering/chemical-materials-engineering/chemical-engineering-bschee-materials-concentration>)
2. Biotechnology (<http://catalog.uah.edu/undergrad/colleges-departments/engineering/chemical-materials-engineering/chemical-engineering-bschee-biotechnology-concentration>)

Program Educational Objectives

The program educational objectives (PEOS) are designed to prepare graduates to be successful in their professional careers and for them to have the skills needed to contribute to the economic advancement of their firms, their local region, the state and the nation. The PEOS are:

- Graduates have gained a core competency and are expected to advance professionally in positions of increasing technical and/or managerial responsibilities within their chosen field.
- Graduates are expected to engage in educational, business, or technical activities with an understanding of global and economic impacts, civic responsibility, and environmental and human safety.
- Graduates are expected to pursue life-long learning for continuous improvement which is a requisite for a successful engineer to become a leader in the work force or graduate education.

Majors in Chemical Engineering

- Chemical Engineering, BSChE - Biotechnology Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/engineering/chemical-materials-engineering/chemical-engineering-bschee-biotechnology-concentration>)
- Chemical Engineering, BSChE - Materials Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/engineering/chemical-materials-engineering/chemical-engineering-bschee-materials-concentration>)

CHE 201 - INTRO CHEMICAL ENGR PROCESS

Semester Hours: 2

Introduction to industrial processes used in the production of commodity chemicals important to chemical engineers. Computer programming, spreadsheets, symbolic math, and drawing packages to model fundamental stages of these processes will be presented. Prerequisites: ENG 101 and CH 123.

CHE 244 - INTRO TO CHEM ENGRG SYSTEMS

Semester Hours: 3

Introduction to basic analysis of chemical engineering systems, emphasizing material balances on physical and chemical process systems. Analysis includes single-component and multi-component systems, single-phase and multi-phase systems, single unit operations and complete flow sheet systems. Prerequisites: PH 111, CH 123, MA 201 and CHE 201.

CHE 294 - NATURE & PROPERTIES OF MATLS

Semester Hours: 3

Introduction to the fundamental nature and properties of materials including bonding, composition, and phase diagrams. Composite materials and aspects of materials processing, including diffusion, nucleation, and transformation diagrams, will be presented. Prerequisites: CH 121 and PH 111.

CHE 295 - NATURE & PROPERTIES MATLS LAB

Semester Hour: 1

Experiments include characterizing material structures, testing mechanical properties and mapping phase diagram boundaries. Emphasis on numerical and statistical analysis of the data. Written reports are required, and elements of materials design are presented.

CHE 342 - TRANSPORT PHENOMENA

Semester Hours: 3

Fundamental aspects of heat and mass transfer and the use of these basic principles in solving problems in transport operations. Heat transfer with phase change. Diffusive and convective mass transfer with applications. Prerequisites: CH 341 and CHE 244 and MAE 310 w/concurrency.

CHE 344 - CHEM ENGR THERMODYNAMICS

Semester Hours: 3

Thermodynamics of phase equilibria, chemical reactions and thermodynamic analysis of chemical processes, with emphasis on topics of special interest to chemical engineers. Prerequisites: CHE 244 and CH 341.

CHE 347 - QUANTITATIVE MODELING FOR CHE

Semester Hours: 3

Modeling and analysis of physical phenomena that arise in chemical engineering and an introduction to computer-aided design. Prerequisites: CHE 244, and MA 238.

CHE 359 - INDEPENDENT STUDIES IN CHE

Semester Hours: 1-3

Independent studies or research on a topic that requires the application of basic principles in chemical engineering. A written report, analytical or experimental analysis, and oral presentation will be required. Prerequisites: CHE 244 and CHE 294.

CHE 439 - UNIT OPERATIONS I

Semester Hours: 2

Experimental studies cover fluid mechanics and heat transfer in unit operations. Theoretical classes provide an introduction to engineering economy as well as standard laboratory practice, probability and statistical data analysis. Emphasis placed on written and oral laboratory report presentation techniques. Prerequisites: CHE 295, CHE 441, and CHE 446.

CHE 440 - UNIT OPERATIONS II

Semester Hours: 2

Experimental studies covering reaction kinetics, mass separation, biotechnology, and special material properties. Applications of laboratory practices, probability and statistical data analysis, and ethics in professional practice. Emphasis placed on technical communications. Prerequisites: CHE 439, CHE 441, and CHE 443.

CHE 441 - CHEM KINETICS & REACTOR DESIGN

Semester Hours: 3

Fundamental principles of chemical kinetics and chemical reactor engineering along with the design of both thermal and catalytic reactors. (Same as CHE 541) Prerequisites: CHE 344 and CHE 347.

CHE 442L - LABORATORY

Semester Hours: 0

CHE 443 - MASS TRANSFER OPERATIONS

Semester Hours: 3

Theory of mass transfer phenomena, with applications to both stage-wise and diffusion controlled distillation, gas absorption/desorption, humidification, and extraction processes. Prerequisites: CHE 342, CHE 344, and MAE 310.

CHE 445 - CHEMICAL PROCESS CONTROL

Semester Hours: 3

Fundamental principles of chemical process control; control system design for chemical processes. Prerequisite: CHE 441 and CHE 446.

CHE 446 - ANAL & DESIGN TRANSPORT EQUIP

Semester Hours: 3

Theory of transport phenomena from a unified approach to momentum, heat and mass transfer. Application of theory to the design of various transport equipment. Prerequisites: CHE 342 and CHE 443.

CHE 448 - CHEMICAL ENGINEERING DESIGN

Semester Hours: 3

Capstone design course. Design of chemical engineering components, concluding with an overall team design effort using modern CAD techniques includes preliminary design, simulation, and economic evaluation of a chemical production flow sheet, and a study of ethical issues. Prerequisites: CHE 441, CHE 443, CHE 445 and CHE 446.

CHE 459 - ADVD INDEPENDENT STUD CHE

Semester Hours: 1-3

Independent studies or research on a topic that requires a solid background in the foundations of chemical engineering. A written report, analytical or experimental analysis, and oral presentation will be required. Prerequisites: CHE 347 and either CH 363 or CH 440.

CHE 460 - INTRO TO BIOPROCESS ENGRG

Semester Hours: 3

Application of engineering principles to analysis of and development and design of processes using biological catalysts including enzymes, plant and animal cells, and genetically engineered cells. Other topics include fermentation and biological mass transport processes. (Same as CHE 560). Prerequisite: CH 361.

CHE 461 - BIOSEPARATIONS

Semester Hours: 3

Characteristics of separation processes used in biotechnology industries including removal of insolubles, isolation and purification of thermally sensitive products, and preparation for customer use. Applications for biological separations, recombinant DNA techniques, and protein engineering. (Same as CHE 561). Prerequisite: CHE 460.

CHE 485 - PROCESS SAFETY & TOXICOLOGY

Semester Hours: 3

Fundamentals of process safety and aspects of toxicology. Requires the application of chemical engineering concepts to review and analyze case studies to learn from industrial accidents. Introduces regulatory and design concepts. Prerequisite: CHE 448.

CHE 494 - APPLIED MATERIALS ENGINEERING

Semester Hours: 3

Synthesis and processing methods of materials. Selection and use of materials performance factors for design of structural and functional components. Use of computational methods in solving open-ended design problems using nature and properties of materials will be emphasized. (Same as CHE 594) Prerequisites: CHE 294 and CHE 344.

CHE 495 - POLYMER ENGINEERING

Semester Hours: 3

Engineering principles of polymers and their role in manufacturing processes. Aspects of polymer phenomena and their relationship to processing of structural and functional components. (Same as CHE 595) Prerequisites: CH 341 and CH 440.