

COURSES FOR CHEMICAL AND BIOLOGICAL ENGINEERING

Chemical and Biological Engineering Courses

CHE125 Introduction To Chemical Engineering

Hours 1

An introduction to the chemical engineering profession, its history and its career-enabling potential. The course contains selected topics, and alumni seminars covering the full range of career opportunities from emerging areas (nanotechnology, biochemical, multifunctional materials) to those found in the more traditional positions within the chemical, petrochemical and petroleum industries.

CHE254 Chemical Engineering Calculations

Hours 4

Study of physical and chemical processes and chemical reactions; material and energy balance calculations for single-phase and multiphase systems; simultaneous energy and material balances. Offered fall and spring.

Prerequisite(s): CH 101 or CH 117; and MATH 125 or MATH 145; AEM 121 or AEM 131 or CE 121 or ECE 121 or ENGR 111 or ME 121 or MTE 121 or EE 121 or CS 121

Prerequisite(s) with concurrency: CHE 125

CHE255 Chemical Engineering Thermodynamics

C

Hours 4

The backbone of thermodynamics theory is based on ideal gas and structured as following: First, establish theory/property model ideal gas pure substance, use ideal gas model to describe real gas by introduce residual property; Second, use theory/property model ideal gas mixture to describe real gas mixture by residual property and partial property; Third, establish theory/property of model ideal solution, use it to describe real solution mixture with excessive property. Computer proficiency is required for a passing grade in this course. Offered fall and spring.

Prerequisite(s): ENGR 103 or ENGR 123 and CHE 254 and MATH 126 or MATH 146

Prerequisite(s) with concurrency: MATH 238

Computer Science

CHE304 Fluid Flow Operations

Hours 3

Equations of momentum and energy transport and their applications to the analysis of fluid process behavior, filtration, fluidization and metering of fluids.

Prerequisite(s): CHE 254 and MATH 126 or MATH 146 and PH 105

CHE305 Separation Processes

C

Hours 3

Unified approach to the basic calculations and fundamental concepts involved in the design of equilibrium-stage separations processes and continuous contacting equipment. Computer proficiency is required for a passing grade in this course.

Prerequisite(s): CHE 255

Computer Science

CHE306 Heat Transfer Operations

Hours 3

Study of heat transfer and its application in the design of specific processes and process equipment.

Prerequisite(s): CHE 254, MATH 238, and CHE 304

Prerequisite(s) with concurrency: CHE 304

CHE321 Basic CHE Lab

W

Hours 2

Basic chemical engineering measurements are made, including temperature, pressure, concentration, and fluid flow. Fundamental and empirical equations are used to analyze mass, energy, and momentum transport. Writing proficiency is required for a passing grade in this course. A student who does not write with the skill normally required of an upper-division student will not earn a passing grade, no matter how well the student performs in other areas of the course. Offered both fall and spring semesters.

Prerequisite(s): CHE 255, CHE 304

Writing

CHE322 Unit Operations Laboratory

W

Hours 2

Performance tests on chemical engineering unit operations, such as distillation and heat transfer, are designed, operated, and analyzed in a formal report. Writing proficiency is required for a passing grade in this course. A student who does not write with the skill normally required of an upper-division student will not earn a passing grade, no matter how well the student performs in other areas of the course. Offered fall and spring semesters. Successful completion of CHE 321 and CHE 322 satisfies the curriculum requirement of CHE 323.

Prerequisite(s): CHE 304 and CHE 305 and CHE 306 and CHE 321

Writing

CHE323 Operations Laboratory

W

Hours 4

Performance tests on chemical engineering unit operations, such as distillation and heat transfer, are designed, operated, and analyzed in a formal report. Writing proficiency is required for a passing grade in this course. A student who does not write with the skill normally required of an upper-division student will not earn a passing grade, no matter how well the student performs in other areas of the course. Offered summer only. Can be replaced by successful completion of CHE 321 and CHE 322.

Prerequisite(s): CHE 304 and CHE 305 and CHE 306

Writing

CHE324 Transport Phenomena

C

Hours 3

This course will give junior & senior level students a working knowledge of conservation equations for mass, momentum and energy with application to steady-state chemical processes. Computer proficiency is required for a passing grade in this course.

Prerequisite(s): CHE 255 and MATH 238 and CHE 304

Computer Science

CHE325 ChE Honors Forum

UH

Hours 1

Designed to expose students to the rich array of resources, ideas and experiences of chemical engineering. Emphasis and content based on faculty member's area of expertise.

University Honors

CHE354 Chemical Reactor Design

Hours 3

Reaction rate equations and comparisons with experimental data; use of rate information for the design of chemical reactors. Offered primarily in the spring semester.

Prerequisite(s): CHE 255, MATH 238

CHE412 Polymer Materials Engineering

Hours 3

Introduction to the manufacture, processing and applications of organic polymeric materials. This course covers the chemistry of polymer manufacture, the molecular structures of polymers, and the structure-property relationships for thermoplastic and thermosetting polymers. Offered primarily in the spring semester.

Prerequisite(s): CH 102 or CH 118

CHE413 Honors Polymer Materials Engineering

UH

Hours 3

Introduction to the manufacture, processing and applications of organic polymeric materials. This course covers the chemistry of polymer manufacture, the molecular structures of polymers, and the structure-property relationships for thermoplastic and thermosetting polymers. Honors designation.

Prerequisite(s): CH 102 or CH 118

University Honors

CHE414 Computer Methods in Chemical Engineering

Hours 3

A survey of common software, data processing, and statistical analysis tools applied to chemical engineering, science, and general interest topics. This course covers the fundamentals of computer programming (coding) and problem solving for chemical engineering students.

Prerequisite(s) with concurrency: CHE 354

CHE415 Honors Computer Methods in Chemical Engineering

UH

Hours 3

A survey of common software, data processing, and statistical analysis tools applied to chemical engineering, science, and general interest topics. This course covers the fundamentals of computer programming (coding) and problem solving for chemical engineering students. Honors designation.

Prerequisite(s) with concurrency: CHE 354

University Honors

CHE416 Stem Cell Bioengineering

Hours 3

Introduction to stem cell biology and bioengineering approaches for stem cell-based therapy and related applications. This course will provide special emphasis on the application of chemical engineering skills to bioengineering and development of stem cell-based therapy and diagnostics.

Prerequisite(s): CHE 255 or CHE 418 or CHE 445 or BSC 300 or CH 461

CHE417 Honors Stem Cell Bioengineering

UH

Hours 3

Introduction to stem cell biology and bioengineering approaches for stem cell-based therapy and related applications. This course will provide special emphasis on the application of chemical engineering skills to bioengineering and development of stem cell-based therapy and diagnostics. Honors designation.

Prerequisite(s): CHE 255 or CHE 418 or CHE 445 or BSC 300 or CH 461

University Honors

CHE418 Tissue Engineering

Hours 3

Tissue Engineering is an emerging dynamic, experimental science in which engineering and biological science principles are used to develop techniques for improving or restoring the structure and function of tissue. Offered primarily in the fall semester.

Prerequisite(s): CH 231 and (BSC 114 or BSC 118)

CHE419 Honors Tissue Engineering*UH*

Hours 3

Tissue Engineering is an emerging dynamic, experimental science in which engineering and biological science principles are applied to develop techniques for improving or restoring the structure and function of tissues and organs.

Prerequisite(s): CH 231 and BSC 114 or BSC 118

University Honors

CHE440 Health & Safety

Hours 3

Health and safety in the chemical process industry that will introduce chemical engineering students to health and safety, regulations and the designs and procedures to meet them in the chemical process. Advanced topics will also be introduced, including current relevant topics such as recent accidents and ways and means of preventing a re-occurrence, advanced models of spills and advanced safety analysis. Senior standing required.

Prerequisite(s): CH 102 or CH 118, and CHE 255 and two of the following courses CHE 304, CHE 305, CHE 306, CHE 324, CHE 354

CHE441 Honors Health and Safety*UH*

Hours 3

Health and safety in the chemical process industry that will introduce chemical engineering students to health and safety, regulations and the designs and procedures to meet them in the chemical process. Advanced topics will also be introduced, including current relevant topics such as recent accidents and ways and means of preventing a reoccurrence, advanced models of spills and advanced safety analysis. The ChE 441/540 designation will allow ChE graduate students and qualified senior-level chemical engineering majors to take this course. Several loss prevention topics are more complex than typically assigned to the undergraduate chemical engineering students. Advanced topics may include recent accidents and ways and means of preventing a reoccurrence, advanced models of spills and advanced safety analysis. Greater analysis, synthesis and evaluation-of-knowledge skills will be required for students enrolled in ChE 441/540.

Prerequisite(s): CH 102 or CH 118, and completed at least two courses from CHE 304, CHE 305, CHE 306, CHE 324, CHE 354

University Honors

CHE445 Introduction to Biochemical Engineering

Hours 3

Study of biological processes; application of chemical engineering skills to areas including enzyme kinetics, fermentation, cell growth and metabolic processes. Offered primarily in the spring semester.

Prerequisite(s): CH 231

CHE446 Honors Intro to Biochemical Engineering*UH*

Hours 3

Study of biological processes; application of chemical engineering skills to areas including enzyme kinetics, fermentation, cell growth and metabolic processes. Offered primarily in the spring semester.

Prerequisite(s): CH 231

University Honors

CHE481 Chemical Process Design I

Hours 3

Technical and economic design of chemical processes and plants. It is required that students complete at least two 300-level ChE classes before enrolling in 481.

Prerequisite(s): CHE 255 plus at least two from CHE 305, CHE 306, CHE 324, CHE 354

CHE482 Chemical Process Design II*W*

Hours 3

Optimal design of chemical processes and plants. Writing proficiency is required for a passing grade in this course. A student who does not write with the skill normally required of an upper-division student will not earn a passing grade, no matter how well the student performs in other areas of the course.

Prerequisite(s): CHE 481 and CHE 354

Writing

CHE491 Special Problems*SP*

Hours 1-3

Research combined with practical application and testing. Credit is based on the amount of work undertaken. Students undertaking research project must obtain clearance from the supervising professor before registering.

Special Topics Course

CHE492 Special Topics*SP*

Hours 3

Various topics relevant to Chemical & Biological Engineering majors.

Special Topics Course

CHE493 Process Dynamics & Control

Hours 3

Development of model equations that describe the unsteady-state behavior of chemical processes; automatic control design and analysis emphasizing time-domain methods; introduction to digital computer control.

Prerequisite(s): CHE 255 and MATH 238

CHE495 Undergraduate Honors Seminar

UH

Hours 1

Presentation of research/practical study results before a group of peers (graduate students, other honors students, faculty and invited guests).

University Honors

CHE496 Undergrad Honors Seminar

UH

Hours 1

Presentation of research/practical study results before a group of peers (graduate students, other honors students, faculty, and invited guests).

University Honors

CHE497 Honors Co-op/Internship

UH

Hours 3

This course is designed to allow B.S. Chemical Engineering students to earn credit for work completed through a co-op, internship, research experience for undergraduates (REU) program or other approved activity external to UA. The course focuses on delivery of a presentation on the work completed in the activity with preparation of the presentation materials done with guidance from the instructor to ensure that material is suited to a freshman- or sophomore- level Chemical Engineering class. Students for this course must submit the ChBE Honors Co-Op/ Internship/REU Approval Form before the co-op/internship/REU period ends. Students are also required to receive approval by the ChBE Honors Program Chair prior to registration. Honors designation.

Prerequisite(s): Permission and approval by ChBE Honors Program Chair

University Honors

CHE498 Honors Special Problems

SP, UH

Hours 1-3

Credit is based on the amount of work undertaken. Research or practical study in a chemical engineering area, the outcome of which is a definite result presented in a report, paper, or manuscript. Instructor permission required.

Special Topics Course, University Honors

CHE499 Honors Special Problems

SP, UH

Hours 1-3

Credit is based on the amount of work undertaken. Research, teaching assistantship, practical study, honors co-op or internship in a chemical engineering area, the outcome of which is a definite result presented in a report, paper, or manuscript. Instructor or Honors Chair permission required.

Special Topics Course, University Honors