CHEMICAL ENGINEERING (CHE)

CHE LDEA, LOWER DIVISION ED ABROAD, 0-16 Credits

This course is repeatable for 99 credits.

CHE UDEA, UPPER DIVISION ED ABROAD, 0-16 Credits

This course is repeatable for 99 credits.

CHE 199, SPECIAL TOPICS, 1-16 Credits

Equivalent to: CHE 199H
This course is repeatable for 99 credits.

CHE 199H, SPECIAL TOPICS, 1-16 Credits

Attributes: HNRS – Honors Course Designator
Equivalent to: CHE 199

CHE 299, PROFESSIONAL WORKSKILLS, 1-16 Credits

Equivalent to: CHE 299H
This course is repeatable for 99 credits.

CHE 311, THERMODYNAMICS, 3 Credits

Entropy, the second law of thermodynamics, equations of state, and thermodynamic network.
Prerequisite: (CBEE 212 with C or better or CBEE 212H with C or better or CBEE 280 with C or better) and (MTH 256 [C] or MTH 256H [C])
Available via Ecampus

CHE 312, CHEMICAL ENGINEERING THERMODYNAMICS, 3 Credits

Thermodynamic mixtures, fugacity, phase equilibrium, and chemical reactions equilibrium.
Prerequisite: CHE 311 with C or better
Available via Ecampus

CHE 320, SAFETY, ENGINEERING ETHICS AND PROFESSIONALISM, 3 Credits

Introduction to engineering ethics and safety concepts. Topics include professional engineering responsibility, codes of ethics, ethical assessment, conflicts of interest, loyalty and dissent, life-long learning, hazard identification, risk and safety, and process safety management.
Prerequisite: CBEE 212 with C or better or CBEE 212H with C or better or CBEE 280 with C or better

CHE 331, TRANSPORT PHENOMENA I, 4 Credits

Applies momentum and energy transfer phenomena to fluid (i.e., gases and liquids) flow for the design of processes in chemical, biological, and environmental engineering.
Prerequisite: (MTH 256 with C or better or MTH 256H with C or better) and (CBEE 212 (may be taken concurrently) [C] or CBEE 212H (may be taken concurrently) [C] or CBEE 280 (may be taken concurrently) [C])
Equivalent to: CHE 331H
Available via Ecampus

CHE 331H, TRANSPORT PHENOMENA I, 4 Credits

Applies momentum and energy transfer phenomena to fluid (i.e., gases and liquids) flow for the design of processes in chemical, biological, and environmental engineering.
Attributes: HNRS – Honors Course Designator
Prerequisite: (MTH 256 with C or better or MTH 256H with C or better) and (CBEE 212 (may be taken concurrently) [C] or CBEE 212H (may be taken concurrently) [C] or CBEE 280 (may be taken concurrently) [C])
Equivalent to: CHE 331

CHE 332, TRANSPORT PHENOMENA II, 3 Credits

A unified treatment using control volume and differential analysis of heat transfer, prediction of heat transport properties, and introduction to heat transfer operations.
Prerequisite: CHE 311 with C or better and (CHE 331 [C] or CHE 331H [C])
Equivalent to: CHE 332H
Available via Ecampus

CHE 332H, TRANSPORT PHENOMENA II, 3 Credits

A unified treatment using control volume and differential analysis of heat transfer, prediction of heat transport properties, and introduction to heat transfer operations.
Attributes: HNRS – Honors Course Designator
Prerequisite: CHE 311 with C or better and (CHE 331 [C] or CHE 331H [C])
Equivalent to: CHE 332

CHE 333, TRANSPORT PHENOMENA III, 3 Credits

A unified treatment using control volume and differential analysis of binary mass transfer, prediction of mass transport properties, and introduction to mass transfer operations.
Prerequisite: CHE 331 with C or better or CHE 331H with C or better or CHE 332 with C or better or CHE 332H with C or better
Equivalent to: CHE 333H
Available via Ecampus

CHE 333H, TRANSPORT PHENOMENA III, 3 Credits

A unified treatment using control volume and differential analysis of binary mass transfer, prediction of mass transport properties, and introduction to mass transfer operations.
Attributes: HNRS – Honors Course Designator
Prerequisite: CHE 331 with C or better or CHE 331H with C or better or CHE 332 with C or better or CHE 332H with C or better
Equivalent to: CHE 333

CHE 334, TRANSPORT PHENOMENA LABORATORY, 3 Credits

Engineering lab practices and the application of the macroscopic balances of mass, energy, and chemical species; fluid flow, heat and mass transfer experiments by teams for demonstrations of principles established in previous transport phenomena courses.
Prerequisite: CBEE 213 (may be taken concurrently) with C or better and (CHE 333 (may be taken concurrently) [C] or CHE 333H (may be taken concurrently) [C])
Available via Ecampus

CHE 361, CHEMICAL PROCESS DYNAMICS AND SIMULATION, 3 Credits

Fundamental principles for process dynamic modeling used in the control of process variables such as pressure, temperature, flow rate and chemical composition.
Prerequisite: (MTH 256 with C or better or MTH 256H with C or better) and (CHE 331 [C] or CHE 331H [C])
Available via Ecampus

CHE 399, SPECIAL TOPICS, 1-16 Credits

This course is repeatable for 16 credits.

CHE 401, RESEARCH, 1-16 Credits

Equivalent to: CHE 401H
This course is repeatable for 16 credits.

CHE 403, THESIS, 1-16 Credits

This course is repeatable for 16 credits.

CHE 405, READING AND CONFERENCE, 1-16 Credits

Equivalent to: CHE 405H
This course is repeatable for 16 credits.

CHE 405H, READING AND CONFERENCE, 1-16 Credits

Attributes: HNRS – Honors Course Designator
Equivalent to: CHE 405
This course is repeatable for 16 credits.

CHE 406, PROJECTS, 1-16 Credits

This course is repeatable for 16 credits.

CHE 408, WORKSHOP, 1-16 Credits

This course is repeatable for 16 credits.

CHE 410, INTERNSHIP, 1-16 Credits

This course is repeatable for 16 credits.

CHE 411, MASS TRANSFER OPERATIONS, 4 Credits

Mass transfer operations; design of separation processes.
Prerequisite: CHE 312 with C or better and (CHE 333 [C] or CHE 333H [C])

CHE 415, CHEMICAL ENGINEERING LABORATORY I, 3 Credits

Theoretical and empirical analysis of several unit operations, use of formal work processes, safety, teamwork, oral and written communication, and personal accountability.
Prerequisite: CBEE 414 with C or better and CHE 411 [C] and CHE 443 [C] and CHE 361 (may be taken concurrently) [C]

CHE 417, ANALYTICAL INSTRUMENTATION IN CHEMICAL, BIOLOGICAL, AND ENVIRONMENTAL ENGINEERING, 4 Credits

Equips students with a toolbox of instrumental techniques important in chemical, biological, and environmental engineering and the background required to determine the appropriate instrumental technique to address a specific problem.
Prerequisite: CH 331 with C or better
Recommended: CH 221Z/CH 227Z and CH 222Z/CH 228Z and CH 223Z/CH 229Z or CH 201/CH 204, CH 202/CH 205 and CH 203

CHE 431, CHEMICAL PLANT DESIGN I, 3 Credits

Short-cut techniques and other abbreviated and useful methods for specifying equipment sufficient for the preliminary design of processes and equipment; estimating capital and manufacturing costs based on equipment specifications.
Prerequisite: CHE 312 with C or better and CHE 411 [C] and CHE 443 [C]

CHE 432, +CHEMICAL PLANT DESIGN II, 3 Credits

Continues the application of Chemical Engineering practice started in CHE 431. Focuses on the transformation from preliminary design to detailed design. Explores safety, ethics, economics, and environmental impacts as considerations in chemical processing and plant design. Relates the design experiences alongside career engagement activities and future career goals in chemical engineering.
Attributes: CSC2 – Core Ed - Beyond OSU Career Engagement
Prerequisite: CHE 431 with C or better and ENGR 102 [C]

CHE 443, CHEMICAL REACTION ENGINEERING, 4 Credits

Design of chemical reactors for economical processes and waste minimization. Contacting patterns, kinetics and transport rate effects in single phase and catalytic systems.
Prerequisite: CHE 312 with C or better and (CHE 333 [C] or CHE 333H [C])

CHE 444, THIN FILM MATERIALS PROCESSING, 4 Credits

Focus on the technology associated with processing thin films and patterning of thin films for solid state devices with topics including chemical vapor deposition, physical vapor deposition, plasma etching, and thin-film characterization.
Prerequisite: CHE 331 with C or better or CHE 331H with C or better or MATS 321 with C or better or MATS 321H with C or better

CHE 445, POLYMER ENGINEERING AND SCIENCE, 4 Credits

Polymer engineering and science with an emphasis on practical applications and recent developments. Topics include polymer synthesis, characterization, mechanical properties, rheology, and processing at a level suitable for most engineering and science majors.
Recommended: CH 334 and CH 335 and CH 336 and MTH 256 and/or junior standing in engineering or science

CHE 446, POLYMER SYNTHESIS AND PROCESSING, 3 Credits

Covers theoretical aspects of all commonly used methods for preparations of polymers, including free radical polymerization, ionic polymerization, vinyl polymerization with complex coordination catalyst, step-group polymerization, and ring-opening polymerization in the first part of the course. Explores practical synthetic methods for preparations of commonly used polymers that include polyesters, polyamides (Nylons), polyethers, polyamines, epoxy resins, phenol-formaldehyde resins, urea-formaldehyde resins, polyurethanes (foams, adhesives, and coatings), pressure-sensitive adhesives, unsaturated polyester resins, vinyl ester resins, rubbers and other elastomers in the second part.
Prerequisite: CH 331 with C or better or CH 331H with C or better or CH 334 with C or better

CHE 450, CONVENTIONAL AND ALTERNATIVE ENERGY SYSTEMS, 3 Credits

Principles of energy conversion from chemical/mechanical energy to electrical energy including an overview of conventional energy systems and of likely renewable energy systems with a focus on the fundamental physico-chemical and thermodynamic concept for each technology. The economics of energy systems will also be discussed.
Prerequisite: CHE 311 (may be taken concurrently) with C or better or ME 311 (may be taken concurrently) with C or better or ME 311H (may be taken concurrently) with C or better or NSE 311 (may be taken concurrently) with C or better or NSE 311H (may be taken concurrently) with C or better or CH 440 (may be taken concurrently) with C or better
Available via Ecampus

CHE 451, SOLAR ENERGY TECHNOLOGIES, 3 Credits

A foundation in the principles of solar energy processes is provided. Topics covered include photovoltaics and solar thermal, and will cover the fundamental solid state physics of semiconductors to applied heat transfer analysis of solar collectors. The course objective is to equip students with an adequate depth of understanding of the operational principles of solar energy systems, and to cover the breadth of the various approaches employed in active solar energy systems.
Prerequisite: CHE 311 (may be taken concurrently) with C or better or ME 311 (may be taken concurrently) with C or better or ME 311H (may be taken concurrently) with C or better or NSE 311 (may be taken concurrently) with C or better or NSE 311H (may be taken concurrently) with C or better or CH 440 (may be taken concurrently) with C or better
Recommended: CHE 311

CHE 452, ELECTROCHEMICAL ENERGY SYSTEMS, 3 Credits

Introduces principles and processes of electrochemical energy storage and conversion systems. Topics include fundamentals of electrochemistry and concepts of electrochemical energy storage systems. Examples from batteries, fuel cells, supercapacitors devices will be discussed.
Prerequisite: CHE 311 with C or better and (CHE 333 [C] or CHE 333H [C])

CHE 461, PROCESS CONTROL, 3 Credits

Principles of PID feedback control based on models of chemical processes; analysis and implementation of proportional, integral and derivative tuning; cascade, feedforward, ratio and deadtime compensation; multivariable control and control system design issues and methods.
Prerequisite: (CHE 331 with C or better or CHE 331H with C or better) and (CHE 332 (may be taken concurrently) [C] or CHE 332H (may be taken concurrently) [C]) and CHE 361 [C]
Available via Ecampus

CHE 499, SPECIAL TOPICS, 1-4 Credits

This course is repeatable for 8 credits.

CHE 501, RESEARCH, 1-16 Credits

This course is repeatable for 16 credits.

CHE 503, THESIS, 1-16 Credits

This course is repeatable for 999 credits.

CHE 505, READING AND CONFERENCE, 1-16 Credits

This course is repeatable for 16 credits.

CHE 506, PROJECTS, 1-16 Credits

This course is repeatable for 16 credits.

CHE 510, INTERNSHIP, 1-16 Credits

This course is repeatable for 16 credits.

CHE 514, FLUID FLOW, 4 Credits

Fundamentals of fluid dynamics for Newtonian and non-Newtonian fluids; flow through porous media; two-phase flow.

CHE 517, ANALYTICAL INSTRUMENTATION IN CHEMICAL, BIOLOGICAL, AND ENVIRONMENTAL ENGINEERING, 4 Credits

Equips students with a toolbox of instrumental techniques important in chemical, biological, and environmental engineering and the background required to determine the appropriate instrumental technique to address a specific problem.
Recommended: CH 221Z/CH 227Z and CH 222Z/CH 228Z and CH 223Z/CH 229Z or CH 201/CH 204, CH 202/CH 205 and CH 203

CHE 520, MASS TRANSFER I, 4 Credits

Diffusion in gases, liquids, solids, membranes, and between phases. Effects of reactions on mass transfer. Mass transfer rates by convection and dispersion. Rates of dispersion. Rates of combined heat and mass transfer.

CHE 525, CHEMICAL ENGINEERING ANALYSIS, 4 Credits

Modeling of physical and chemical processes; mathematical analysis of models with appropriate advanced techniques.

CHE 537, CHEMICAL ENGINEERING THERMODYNAMICS I, 4 Credits

Applications of the fundamental laws of thermodynamics to complex systems. Properties of solutions of non-electrolytes. Phase and chemical equilibrium.

CHE 540, CHEMICAL REACTORS I, 4 Credits

Catalysis, reactions coupled with transport phenomena. Reactors for high tech applications.

CHE 541, CATALYSIS, 3 Credits

Introduction to topics related to catalysts and catalytic reactions. Course covers catalytic reaction mechanisms and kinetics, catalyst characterization and testing, and catalyst preparation and manufacturing processes

CHE 542, MOLECULAR ASPECTS OF HETEROGENEOUS CATALYSIS, 3 Credits

Introducing the principles of heterogeneous catalysis from the molecular aspect with emphasis on computational molecular approaches and surface science. The role of surface structure in heterogeneous catalytic reactions and surface interactions, development and analysis of reaction kinetics through microkinetic modeling approaches will be covered. A class project will utilize Density Functional Theory software to calculate catalytic properties of model systems.
Prerequisite: CHE 540 with C or better

CHE 544, THIN FILM MATERIALS PROCESSING, 4 Credits

Focus on the technology associated with processing thin films and patterning of thin films for solid state devices with topics including chemical vapor deposition, physical vapor deposition, plasma etching, and thin-film characterization.
Recommended: CHE 331 or MATS 321

CHE 545, POLYMER ENGINEERING AND SCIENCE, 4 Credits

Polymer engineering and science with an emphasis on practical applications and recent developments. Topics include polymer synthesis, characterization, mechanical properties, rheology, and processing at a level suitable for most engineering and science majors.
Recommended: CH 334 and CH 335 and CH 336 and MTH 256

CHE 546, POLYMER SYNTHESIS AND PROCESSING, 3 Credits

Covers theoretical aspects of all commonly used methods for preparations of polymers, including free radical polymerization, ionic polymerization, vinyl polymerization with complex coordination catalyst, step-group polymerization, and ring-opening polymerization in the first part of the course. Explores practical synthetic methods for preparations of commonly used polymers that include polyesters, polyamides (Nylons), polyethers, polyamines, epoxy resins, phenol-formaldehyde resins, urea-formaldehyde resins, polyurethanes (foams, adhesives, and coatings), pressure-sensitive adhesives, unsaturated polyester resins, vinyl ester resins, rubbers and other elastomers in the second part.

CHE 550, CONVENTIONAL AND ALTERNATIVE ENERGY SYSTEMS, 3 Credits

Principles of energy conversion from chemical/mechanical energy to electrical energy including an overview of conventional energy systems and of likely renewable energy systems with a focus on the fundamental physico-chemical and thermodynamic concept for each technology. The economics of energy systems will also be discussed.
Recommended: CHE 311 or ME 311 or NSE 311
Available via Ecampus

CHE 551, SOLAR ENERGY TECHNOLOGIES, 3 Credits

A foundation in the principles of solar energy processes is provided. Topics covered include photovoltaics and solar thermal, and will cover the fundamental solid state physics of semiconductors to applied heat transfer analysis of solar collectors. The course objective is to equip students with an adequate depth of understanding of the operational principles of solar energy systems, and to cover the breadth of the various approaches employed in active solar energy systems.
Recommended: CHE 311

CHE 552, ELECTROCHEMICAL ENERGY SYSTEMS, 3 Credits

Introduces principles and processes of electrochemical energy storage and conversion systems. Topics include fundamentals of electrochemistry and concepts of electrochemical energy storage systems. Examples from batteries, fuel cells, supercapacitors devices will be discussed.
Recommended: CHE 311 and CHE 333

CHE 581, SELECTED TOPICS, 3 Credits

This course is repeatable for 9 credits.

CHE 599, SPECIAL TOPICS, 1-16 Credits

This course is repeatable for 16 credits.

CHE 601, RESEARCH, 1-16 Credits

This course is repeatable for 16 credits.

CHE 603, THESIS, 1-16 Credits

This course is repeatable for 999 credits.

CHE 605, READING AND CONFERENCE, 1-16 Credits

This course is repeatable for 16 credits.

CHE 606, PROJECTS, 1-16 Credits

This course is repeatable for 16 credits.

CHE 611, ELECTRONIC MATERIALS PROCESSING, 3 Credits

Technology, theory, and analysis of processing methods used in integration circuit fabrication. CROSSLISTED as CHE 611/ECE 611.
Equivalent to: ECE 611