

Descriptions—Chemistry of Courses

883. Computational Quantum Chemistry

Fall. 3(2-3) P: CEM 461 or CEM 881.

Computational methods in determining electronic energy levels, equilibrium nuclear configurations, and other molecular properties.

890. Chemical Problems and Reports

Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 12 credits in all enrollments for this course.

Investigation and report of a nonthesis problem in chemistry.

899. Master's Thesis Research

Fall, Spring, Summer. 1 to 20 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to graduate students in Chemistry.

913. Selected Topics in Inorganic Chemistry

Fall, Spring. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Engineering. Chemistry of metal-metal bonds and clusters, organometallic chemistry, layered oxides, and complex layered oxides. Photochemistry. Solid state chemistry and applications of quantum mechanics.

918. Inorganic Chemistry Seminar

Fall, Spring. 1(1-0) A student may earn a maximum of 3 credits in all enrollments for this course. R: Open only to graduate students in Chemistry. Advances in inorganic chemistry reported by graduate students.

924. Selected Topics in Analytical Chemistry

Fall, Spring. 2 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Engineering. Advanced computer techniques, surface chemistry, analytical chemistry of polymers, or statistics for chemists.

938. Analytical Chemistry Seminar

Fall, Spring. 1(1-0) A student may earn a maximum of 3 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Engineering. Advances in analytical chemistry reported by graduate students, faculty, and guest lecturers.

956. Selected Topics in Organic Chemistry

Fall, Spring. 1 to 3 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Engineering. Heterocyclic and organometallic chemistry, natural products, photochemistry, free radicals, or reaction mechanisms.

958. Organic Chemistry Seminar

Fall, Spring. 1(1-0) A student may earn a maximum of 2 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Engineering. Advances in organic chemistry reported by graduate students.

971. Emerging Topics in Chemistry

Fall, Spring. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to doctoral students in the Chemistry or Chemical Physics major.

Discussion of a research topic of emerging interest in chemistry. Preparation of a proposal for funding of research.

987. Selected Topics in Physical Chemistry I

Fall. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to doctoral students or approval of department.

Topics such as kinetics and photochemistry, macromolecular and surface chemistry, molecular spectroscopy, electric and magnetic properties of matter, or applications of statistical mechanics to chemical problems.

988. Selected Topics in Physical Chemistry II

Spring. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to doctoral students or approval of department.

Topics such as analysis and interpretation of molecular spectra, advanced molecular structure theory, magnetic resonance, X-rays and crystal structure, scientific analysis of vacuum systems, or problems in statistical mechanics.

991. Quantum Chemistry and Statistical Thermodynamics I

Fall. 3(3-0) R: Open only to graduate students in College of Natural Science or College of Engineering.

Principles and applications of quantum chemistry. Partition functions, spectroscopic measurements, and thermodynamic applications.

992. Quantum Chemistry and Statistical Thermodynamics II

Spring. 3(3-0) P: CEM 991.

Analytical and numerical methods for solving quantum chemical problems. Statistical mechanics of solids and liquids.

998. Physical Chemistry Seminar

Fall, Spring. 1(1-0) A student may earn a maximum of 3 credits in all enrollments for this course. R: Open only to graduate students in Chemistry. Advances in physical chemistry reported by graduate students.

999. Doctoral Dissertation Research

Fall, Spring, Summer. 1 to 20 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to doctoral students in Chemistry and Chemical Physics.

CHINESE

CHS

Department of Linguistics and Germanic, Slavic, Asian and African Languages College of Arts and Letters

101. Elementary Chinese I

Fall. 5(5-0) Not open to students with credit in CHS 112.

Pronunciation, writing system, and basic vocabulary and sentence patterns, with emphasis on conversation.

102. Elementary Chinese II

Spring. 5(5-0) P: (CHS 101 or CHS 112)

Further work on conversation, character writing, and comprehension, with increasing emphasis on vocabulary building and grammar.

111. Introductory Chinese: Business Emphasis I

Summer. 3(3-0) Not open to students with credit in CHS 101.

Beginning-level speaking, listening comprehension, and reading for Chinese in business-related contexts. Economic conditions and business culture in China.

112. Introductory Chinese: Business Emphasis II

Summer. 3(3-0) P: (CHS 111) Not open to students with credit in CHS 101.

Further development of skills in speaking, listening comprehension, and reading for Chinese in business-related contexts. Economic conditions and business culture in China.

201. Second-Year Chinese I

Fall. 5(5-1) P: CHS 102 or approval of department.

Intermediate-level work on skills in conversation, comprehension, and grammar. Practice in composition.

202. Second-Year Chinese II

Spring. 5(5-0) P: CHS 201 or approval of department.

Further intermediate-level work on skills in conversation, comprehension, and grammar. Continued practice in composition.

301. Third-Year Chinese I

Fall. 4(4-0) P: CHS 202.

Advanced-level work on speaking, listening comprehension, reading, and writing skills, based on materials of cultural interest.

302. Third-Year Chinese II

Spring. 4(4-0) P: CHS 301.

Advanced-level work on speaking, listening comprehension, reading, and writing skills, based on materials of cultural interest.

350. Studies in the Chinese Language

Spring. 3(3-0) P: CHS 201 or approval of department.

Grammatical structures of modern Chinese. Grammar review, sound system, word formation, sentence and discourse structures, historical evolution of the Chinese language, dialects, sociolinguistics.

401. Fourth-Year Chinese I

Fall. 3(3-0) P: CHS 302.

Reading, discussion, and writing of advanced materials, including classical texts of broad cultural interest.

402. Fourth-Year Chinese II

Spring. 3(3-0) P: CHS 401.

Further reading, discussion and writing based on original materials, including classical texts of broad cultural interest.

499. Senior Thesis Research
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Approval of department.
An individual research project supervised by a faculty member that demonstrates the student's ability to do independent research and submit or present a major paper.

CIVIL ENGINEERING CE

Department of Civil and Environmental Engineering College of Engineering

271. Engineering Surveying
Fall, Spring. 4(3-3) P: (MTH 104 or MTH 116 or MTH 120 or MTH 124 or MTH 132 or LBS 117 or LBS 118)

Application of surveying and error analysis to civil engineering problems. Earth work. Calculations. Layout and management of construction sites.

280. Introduction to Environmental Engineering

Fall, Spring. 3(3-0) P: (CEM 141 or CEM 151) and (MTH 132 or concurrently or LBS 118) and (CSE 101 or concurrently or CSE 131)

Elements of hydrology. Groundwater and surface water supply and contamination. Treatment systems for drinking water, wastewater, air, and solid and hazardous waste. Introduction to noise and radiation pollution.

305. Structural Analysis

Fall, Spring. 3(3-0) P: (MSM 211) R: Open only to juniors or seniors in the Department of Civil and Environmental Engineering.

Determinate and indeterminate plane structures. Linearity, stability, determinacy. Virtual-work calculation of forces and displacements. Flexibility and stiffness methods in plane structures.

312. Soil Mechanics

Fall, Spring. 3(2-3) P: (MSM 211) and completion of Tier I writing requirement. R: Open only to juniors or seniors in the Department of Civil and Environmental Engineering or in the Biosystems Engineering major.

Engineering properties of soil and their measurement. Effective-stress concept. Permeability and seepage. Compaction. Consolidation, shear strength and stress-strain behavior.

321. Introduction to Fluid Mechanics

Fall, Spring. 4(3-2) P: (MTH 235 or concurrently) and completion of Tier I writing requirement. R: Open only to juniors or seniors in the Department of Civil and Environmental Engineering or in the Biosystems Engineering major. Not open to students with credit in ME 332.

Fluid properties, fluid statics, fluids in motion. Conservation of mass, energy and momentum. Dimensional analysis and similitude. Internal and external flows. Applications.

337. Civil Engineering Materials I

Fall, Spring. 4(3-3) P: (MSM 211 or concurrently) R: Open only to juniors or seniors in the Department of Civil and Environmental Engineering.

Common civil engineering construction and paving materials: aggregates, inorganic cements, asphalts, concretes, wood and steel. Composition, structure, physical and mechanical properties, tests, and production mix design.

341. Transportation Engineering

Fall, Spring. 3(3-0) P: (MTH 234 or concurrently) RB: (STT 351) R: Open only to juniors or seniors in the Department of Civil and Environmental Engineering or in the Urban and Regional Planning major.

Overview of transportation system issues and problems. Fundamentals of highway design and operations. Planning and evaluation of transportation system alternatives.
SA: CE 346

400. Structural Mechanics

Fall. 3(3-0) P: (CE 305) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Matrix methods of structural analysis. Flexibility method. Direct stiffness method for plane structures. Elastic supports, inclined supports, member releases and non-prismatic members. Application software.

405. Design of Steel Structures

Fall, Spring. 3(3-0) P: (CE 305) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Design of steel beams, columns, tension members and connections. Stability and plastic strength.

406. Design of Concrete Structures

Fall, Spring. 3(3-0) P: (CE 305 and CE 337) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Design of reinforced concrete beams, slabs, columns and footings.

418. Geotechnical Engineering

Fall, Spring. 4(4-0) P: (CE 312) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Shallow foundation design including bearing capacity, stress distribution, and settlement analysis. Pile foundations. Design of retaining structures including rigid walls, braced excavations, and sheet-pile walls. Stability of slopes and embankments.

421. Engineering Hydrology

Fall. 3(2-2) P: (CE 321 or concurrently) RB: (STT 351) R: Open only to juniors or seniors or graduate students in the College of Engineering or College of Natural Science or Department of Crop and Soil Sciences.

Hydrologic design of stormwater systems. Equilibrium hydrograph analysis, unit hydrographs, infiltration, hydrograph synthesis, and reservoir routing. Groundwater: Darcy's law, flow nets, well hydraulics, design of capture wells.

422. Applied Hydraulics

Spring. 3(2-2) P: (CE 321 or ME 332) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering or Department of Mechanical Engineering or in the Biosystems Engineering major.

Fundamentals of open-channel flow. Rapidly and gradually varied nonuniform flow analysis. Confined flows past submerged bodies, in pipe networks, and in turbo machinery. Design applications.

431. Pavement Design and Analysis I

Fall. 4(4-0) P: (CE 312 and CE 337) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Highway and airfield pavement structural design. Performance measures. Failure mechanisms, popular thickness design procedures, and design considerations for surface friction, pavement joints, and drainage. Design of rehabilitation alternatives, design of overlays.

442. Airport Planning and Design

Fall. 3(3-0) P: (CE 341) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Components of the airport system including ground access facilities, aircraft characteristics, air traffic control, airport configuration, capacity analysis.

443. Advanced Airport Systems Design

Spring. 3(3-0) P: (CE 442) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Analysis and design of airport systems using computer models. Design parameters, demand analysis. Runway orientation and capacity, air-side delay, vehicle processing. Passenger processing.

448. Transportation Planning

Spring. 3(3-0) P: (CE 341 and STT 351)

Transportation planning process and procedures. Estimation of travel demand using traditional models of trip generation, trip distribution, modal split, and traffic assignment. Use of "quick-response" procedures. Traffic impact of new facilities.

449. Highway Design

Fall, Spring. 4(3-3) P: (CE 271 and CE 341) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Geometric design of highways as related to operation, capacity and safety. Alignment, drainage and pavement design. The use of CAD systems in preparing contract plans.

480. Water and Wastewater Analysis Laboratory

Fall. 1(0-3) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering. C: CE 481 concurrently.

Chemical and microbial analysis of water and wastewater.

481. Environmental Engineering Chemistry

Fall. 3(3-0) P: (CEM 361 and CHE 201 and CE 280)

Chemistry of environmental processes including alkalinity, precipitation-dissolution reactions, chemical complexation and redox reactions. Engineering applications to processing plants for water and wastewater.

483. Water and Wastewater Treatment

Fall. 3(3-0) P: (CE 280 and CE 321 or concurrently) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Distribution of water and collection of sewage. Theory and design of water treatment processes.