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, electronic 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 6 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) RB: (CEM 991) Analytical and numerical methods for solving quantum chemical problems. Statistical mechanics of solids and liquids.

993 **Advanced Topics in Quantum Chemistry**  
Spring of odd years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to graduate students in the College of Natural Science or the College of Engineering. Spectroscopic theory, properties of atoms and molecules in electric and magnetic fields, intermolecular forces. Many-body theory, molecular electronic structure, solid state chemistry, or molecular reaction dynamics.

994 **Advanced Topics in Statistical Mechanics**  
Spring of even years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to graduate students in the College of Natural Science or the College of Engineering. Nonequilibrium statistical mechanics and thermodynamics. Correlation functions and spectroscopy, light scattering, magnetic relaxation, transport properties of fluids and gases, or statistical mechanics of chemical reactions.

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 24 credits. A student may earn a maximum of 120 credits in all enrollments for this course. R: Open only to doctoral students in Chemistry and Chemical Physics. Doctoral dissertation research.

**CHINESE**

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.M.: (CHS 101) Not open to students with credit in CHS 105. Further work on conversation, character writing, and comprehension, with increasing emphasis on vocabulary building and grammar.

105 **Introductory Chinese with Business Emphasis**  
Summer. 5(5-0) SA: CHS 111, CHS 112 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.

201 **Second-Year Chinese I**  
Fall. 5(5-1) P.M.: (CHS 102) R: 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.M.: (CHS 201) R: 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.M.: (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.M.: (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.M.: (CHS 201) 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.M.: (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.M.: (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**

Department of Civil and Environmental Engineering

**College of Engineering**

271 **Engineering Surveying**  
Fall, Spring. 4(3-3) P.M.: (MTH 114 or MTH 116 or MTH 124 or MTH 132 or MTH 152H 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.M.: (CEM 141 or CEM 151 or LBS 171) and (MTH 132 or concurrently or MTH 152H or concurrently or LBS 118 or concurrently) Elements of hydrology. Groundwater and surface water supply and contamination. Treatment systems for drinking water, wastewater, air, and solid and hazardous waste. Noise and radiation pollution.