College of Business

201. Shorthand I
Fall, Winter, Spring. 3(4-0) BOA 234 or 1 term typewriting.
GREGG shorthand theory, dictation and transcription for students with no previous training.

234. Typewriting I
Fall, Winter, Spring. 2(2-2) Approval of department.
Mastery of keyboard, building speed and accuracy; elementary typewriting problems.

235. Typewriting II
Fall, Winter, Spring. 2(2-2) BOA 234 or approval of department.
Improvement of speed and accuracy; arrangement of business letters, tabulation and manuscripts; production typewriting.

236. Advanced Typewriting
Fall, Winter, Spring. 3(3-1) BOA 235 or 1-12 to 2 years typewriting.
Instruction in specialized typewriting problems to develop high-level competency.

304. Shorthand II
Fall, Winter, Spring. 3(3-1) May reenroll for a maximum of 6 credits. BOA 201, BOA 235.
Development of theory and transcription competency, speed building.

308. Secretarial Administration I
Winter, Spring. 4(4-0) BOA 236, BOA 304. Sophomores.
Development of proficiency in transcription skills.

309. Secretarial Administration II
Fall, Winter. 4(4-2) BOA 239, Sophomores.
Machine dictation-transcription, duplication and copying processes; machine calculations; records management.

341. Survey of Business Law
Fall, Winter, Spring. 4(4-0) Juniors. Not open to business administration students.
Historical development of the law; courts, court procedures and civil remedies, torts, crimes; contracts, agency, sales, negotiable instruments, real and personal property, including mortgages and liens. Textbook and lecture rather than case approach.

370. Administrative Office Management
Fall, Winter, Spring. 3(3-0) Juniors.
Analysis of office function and relationship to business organization; information handling and data processing, office design and layout, responsibilities of office administrators.

400H. Honors Work
Fall, Winter, Spring. 1 to 15 credits. Approval of department.
Independent and informal study in law, office administration or business communications.

416. Secretarial Administration III: Seminar
Winter, Spring. 4(4-0) Seniors or approval of department.
Analysis of the role of the executive secretary.

Business Law and Office Administration - Descriptions of Courses

885. Plant Diseases in the Field
Spring. 4 credits. BOT 405 and approval of department.
Diagnosis, distribution, and sequential development of plant diseases in the field. Field trips permit observation of diseases in the natural setting.

890. Selected Topics in Plant Pathology
Fall, Winter, Spring. 2 to 5 credits. Approval of department.
Topics will be selected from the following areas: parasitism, plant viruses, ecology, genetics, nematology, fungicidal action, and soil microbiology.

899. Master's Thesis Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
Research in anatomy, histology, cytology, ecology, genetics, lichenology, morphology, mycology, paleobotany, pathology, physiology, and taxonomy.

918. Advanced Genetics
Winter of odd-numbered years. 3(3-0) Approval of department.
Role of the gene in differentiation and development, with special emphasis upon the genetic mechanisms responsible for the control of phenogenetics.

920. Advanced Plant Taxonomy
Spring of even-numbered years. 4(4-0) BOT 824, ZOL 441.
Consideration of the recent scientific developments affecting plant classification.

930. Advanced Plant Ecology
Winter of odd-numbered years. Summer of even-numbered years. Given at W. K. Kellogg Biological Station summer term. 3(3-0) Approval of department.
Fundamental theories and modern research horizons.

956. Advanced Plant Physiology I
Spring of even-numbered years. 3(3-0) Approval of department.
Factors influencing vegetative and reproductive physiology.

999. Doctoral Dissertation Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
Research in anatomy, histology, cytology, ecology, genetics, lichenology, morphology, mycology, paleobotany, pathology, physiology, and taxonomy.

Business Law and Office Administration - BOA

(Business Law and Office Administration, formerly Business Law, Insurance and Office Administration.)

Building Construction

See Agricultural Engineering

A-33
CHEMICAL ENGINEERING CHE

College of Engineering

222. Pollution of the Environment—Causes and Cures
   Spring, 3(3-0) Nonmajors; no science or technical background required.
   Pollutants of air, water and land. Adulteration of foods. Overtaxing waste facilities. Depletion of natural resources. Interaction of engineers, industry, government, and the public in creating and combating these problems.

300. Material and Energy Balances
   Fall, Winter, Spring. 4(3-2) One year general chemistry, MTH 214 or concurrently, CPS 120 or concurrently.
   Chemical engineering calculations. Synthesis of chemical process systems. Analysis of chemical process systems by material and energy balances. Behavior of gases.enthalpy calculations for changes of temperature, phase changes, chemical reactions.

305. Transfer Processes and Separations I
   Fall, 4(3-2) MTH 215, CHE 300 or concurrently.
   Thermodynamics of fluid flow. Treatment of fluid flow as a momentum transfer process. Laminar and turbulent flow of compressible and incompressible fluids. Heat transfer in solids and flowing fluids.

306. Transfer Processes and Separations II
   Winter, 4(3-2) CHE 305.

307. Transfer Processes and Separations III
   Spring, 4(3-2) CHE 306.
   Mass transfer in continuous contacting systems and stagewise processes. Countercurrent processes, fractionation, contacting, efficiency, and simultaneous momentum, heat, and mass transfer.

311. Thermodynamics for Chemical Engineering
   Winter, Spring, 3(3-0) CHE 300 or approval of department.
   First and second laws. Energy, enthalpy, entropy, free energy, the mathematics of property relationships. Energy conversion processes. Thermodynamics of flow.

381. Chemical Engineering Analysis
   Fall, Spring, 3(3-0) Students may not receive credit in both CHE 391 and MTH 341. MTH 310. Interdepartmental with the Department of Mathematics.
   Formulation of ordinary and partial differential equations describing chemical systems. Boundary value problems, numerical methods, matrices, and applications, to chemical engineering systems.

411. Phase and Chemical Equilibria
   Fall, 3(3-0) CEM 361, CHE 311 or concurrently.

423. Chemical Engineering Laboratory
   Fall, Summer, 3(1-5) CHE 307.
   Assigned laboratory problems, requiring team effort. Experimental work, involving momentum, heat and mass transfer, separation processes, such as distillation, filtration, and drying. Reacter kinetics; automatic process control.

424. Transport Phenomena and Physical Properties Laboratory
   Winter, Spring, 3(1-6) CHE 306.
   Experiments involving the transport processes and measurement of physical, chemical and thermodynamic properties of various materials. Comparison of theoretical and experimental results.

428. Chemical Reaction Engineering
   Spring, 3(3-0) CEM 361, CHE 306, CHE 311.

442. Polymer Science and Engineering
   Spring, 3(3-0) One year organic chemistry, CEM 361.

443. Chemical Engineering of the Solid State
   Winter, 3(3-0) CEM 361.
   Structure and properties of inorganic and organic solids. Relation of bond type and steric configuration to mechanical, electrical, thermal, optical properties. Macroscopic structure influence on physical properties. Surface phenomena. Applications.

451. Process Systems Control
   Winter, Spring, 3(3-0) CHE 307, CHE 428.
   Foundation of control theory for chemical processes. Integration of present and developing practice with modern theory.

460. Problems and Reports
   Fall, Winter, Spring. 1 to 9 credits.
   Senior's approval of department.
   Library and laboratory investigations of problems relating to departmental research.

461. Process Selection and Optimization
   Winter, 5(5-0) CHE 307, CHE 428.
   Application of chemical engineering principles in design calculations. Selection of the optimum design for equipment, functional units, and for the overall process. Influence of design on capital investment, operating cost, product loss, and product quality.

462. Process Design
   Spring, 3(1-6) CHE 451.
   Integrated design of the complete chemical engineering process. Process engineering, project engineering, instrumentation, and layout.

465. Process Optimization Methods
   Fall, Spring, 3(3-0) MTH 215, knowledge of linear algebra. Interdepartmental with Systems Science.
   Methods for determining optimum design and operating policies of systems of varying complexity. Includes classical methods, mathematical programming and modern methods.

470. Theory of Nuclear Reactors
   Winter, 3(3-0) PHY 289 and MTH 215 or approval of department.
   Theory and design of nuclear research and power reactors. Nuclear transformation, fission, and energy conversion. Derivation of chain reaction design criteria, and calculation of flux-power distribution. Analysis of reactor safety, reliability and economics.

481. Transport Phenomena
   Fall, 3(3-0) CHE 307, CHE 381.
   Fundamental treatment of momentum, energy and mass transport. Use of special differential equations and equations of change for chemical engineering applications. Analogies among the phenomena, dimensional analysis, and boundary layer theory.

801. Advanced Chemical Engineering Calculations I
   Fall, 3(3-0) CHE 307.
   Chemical engineering applications of advanced mathematical methods. Formulation and solution of mathematical equations which describe physical problems. Computer solutions.

802. Advanced Chemical Engineering Calculations II
   Winter, 3(3-0) CHE 801.
   Continuation of CHE 801.

806. Thermodynamics and Kinetics in Chemical Engineering
   Summer, 4(3-2) B.S. with a major in chemistry, biochemistry, or a closely allied area. Mathematics through calculus. College level physics. General physical, and organic chemistry. Not open to students with B.S. in chemical engineering for graduate credit.

807. Transfer and Separation Processes
   Summer, 4(3-2) B.S. with a major in chemistry, biochemistry, or a closely allied area. Mathematics through calculus. College level physics. General physical, and organic chemistry. Not open to students with B.S. in chemical engineering for graduate credit.

808. Transport Phenomena
   Summer, 4(3-2) B.S. with a major in chemistry, biochemistry, or a closely allied area. CHE 807. Not open to students with B.S. in chemical engineering for graduate credit.