ENCH - ENGINEERING,
CHEMICAL

ENCH608 Research in Chemical Engineering (1 Credit)
Students gain experience in research through lab rotations and experience presenting their findings.
Restriction: Must be in the Chemical Engineering Doctoral or Master of Science program.
Repeatable to: 8 credits.

ENCH610 Chemical Engineering Thermodynamics (3 Credits)
Advanced application of the general thermodynamic methods to chemical engineering problems. First and second law consequences; estimation and correlation of thermodynamic properties; phase and chemical reaction equilibria.
Prerequisite: CHBE301; and CHBE302. Or students who have taken courses with comparable content may contact the department.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.

ENCH620 Methods of Engineering Analysis (3 Credits)
Application of selected mathematical techniques to the analysis and solution of engineering problems; included are the applications of matrices, vectors, tensors, differential equations, integral transforms, and probability methods to such problems as unsteady heat transfer, transient phenomena in mass transfer operations, stagewise processes, chemical reactors, process control, and nuclear reactor physics.
Prerequisite: MATH246; and CHBE250. Or students who have taken courses with comparable content may contact the department.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.

ENCH630 Transport Phenomena (3 Credits)
Heat, mass and momentum transfer theory from the viewpoint of the basic transport equations. Steady and unsteady state; laminar and turbulent flow; boundary layer theory, mechanics of turbulent transport; with specific application to complex chemical engineering situations.
Prerequisite: CHBE422; and ENCH424. Or students who have taken courses with comparable content may contact the department.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.

ENCH640 Advanced Chemical Reaction Kinetics (3 Credits)
The theory and application of chemical reaction kinetics to reactor design. Reaction rate theory; homogeneous batch and flow reactors; fundamentals of catalysis; design of heterogeneous flow reactors.
Prerequisite: CHBE440; or students who have taken courses with comparable content may contact the department.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.

ENCH648 Special Problems in Chemical Engineering (1-16 Credits)
ENCH739 Modern Computing Techniques in Process Engineering (3 Credits)
Presentation of recent developments in computing techniques in the context of chemical engineering problems. Symbolic computation and artificial intelligence, neural networks, data filtering and statistical treatment of data.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

ENCH751 Turbulent and Multiphase Transport Phenomena (3 Credits)
Basic equations and statistical theories for transport of heat, mass, and momentum in turbulent fluids with applications to processing equipment. Fundamental equations of multiphase flow for dilute systems with applications to particles, drops and bubbles. Current approaches for analysis of concentrated suspensions including deterministic models and population balance approaches.
Prerequisite: ENCH620 and ENCH630.

ENCH781 Polymer Reaction Engineering (3 Credits)
Advanced topics in polymerization kinetics, reactor design and analysis; addition and step-growth polymerization; homogeneous and heterogeneous polymerization; photopolymerization; reactor dynamics; optimal operation and control of industrial polymerization reactors.
Prerequisite: ENCH640; or permission of instructor.

ENCH799 Master's Thesis Research (1-6 Credits)
ENCH818 Advanced Topics in Thermodynamics (3 Credits)
Second semester.
ENCH828 Advanced Topics in Chemical Reaction Systems (3 Credits)
First semester. Offered in alternate years.
Prerequisite: ENCH640.

ENCH838 Advanced Topics in Transfer Theory (3 Credits)
First semester. Offered in alternate years.

ENCH858 Advanced Topics in Process Control (3 Credits)
Advanced topics in chemical process control -- robust control, model based process control, process sensing, fault detection, expert systems, neural networks, and integration of design and control.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

ENCH859 Advanced Topics in Biochemical Systems (3 Credits)
Presentation of techniques for characterizing and manipulating nonlinear biochemical reaction networks. Methods are applied to current biotechnological systems, some include: recombinant bacteria; plant, insect and mammalian cells; and transformed cell lines.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

ENCH868 Advanced Topics of Process Design (3 Credits)
Advanced topics in chemical process analysis and design; construction of process models, steady-state and dynamic simulation, process synthesis, heat-exchanger networks, separation systems, chemical reaction systems, and bioprocesses.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

ENCH869 Advanced Computer-Aided Process Engineering (3 Credits)
Advanced topics and projects involving modern computing techniques in chemical and process engineering. Topics include but not restricted to advanced process simulation; parallel computation; symbolic, Boolean, and algebraic computation in process modelling; molecular-based modelling; connectionist systems.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

ENCH898 Pre-Candidacy Research (1-8 Credits)
ENCH899 Doctoral Dissertation Research (1-8 Credits)