Current Curriculum:
(from the 2006-07 *College of Engineering Announcement*)

CHEMICAL ENGINEERING

FRESHMAN YEAR (48 units)

FALL	units	WINTER	units	SPRING	units
CH E 1A	1	CHEM 1B	3	CHEM 1C	3
CHEM 1A	3	CHEM 1BL	1	CHEM 1CL	1
CHEM 1AL	1	MATH 3B	4	MATH 3C	4
ENGR 3	3	PHYS 1	4	PHYS 2	4
MATH 3A	4	WRIT 2E or 50E	4	WRIT 50E or G.E. elective	4
WRIT 1E or 2E	4				
TOTAL	**16**		**16**		**16**

SOPHOMORE YEAR (49 units)

FALL	units	WINTER	units	SPRING	units
CH E 10	3	CH E 110A	3	CH E 110B	3
CHEM 109A	4	CHEM 6A	2	CH E 132A	4
MATH 5A	4	CHEM 109B	4	CHEM 6B	2
PHYS 3	3	MATH 5B	4	CHEM 109C	4
PHYS 3L	1	PHYS 4	3	MATH 5C	4
		PHYS 4L	1		
TOTAL	**15**		**17**		**17**

JUNIOR YEAR (47 units)

FALL	units	WINTER	units	SPRING	units
CH E 119	1	CH E 120B	3	CH E 120C	3
CH E 120A	4	CH E 132C	3	CH E 140A	3
CH E 128	3	CHEM 113B	4	CH E 180A	3
CH E 132B	3	MATRL 101 or MATRL 100B*	3	CHEM 113C	4
G.E. Elective	4	G.E. Elective	3	Technical or Free Elective	3
TOTAL	**15**		**16**		**16**

SENIOR YEAR (47 units)

FALL	units	WINTER	units	SPRING	units
CH E 140B	3	CH E 180B	3	CH E 184B	3
CH E 152A	4	CH E 184A	3	G.E. Elective	4
CH E 172	3	G.E. Elective	4	Technical or Free Electives	7
G.E. Elective	4	Technical or Free Electives	6		
Technical or Free Elective	3				
TOTAL	**17**		**16**		**14**

* if applying to the BS/MS Materials program, juniors must take MATRL 100A in fall, MATRL 100B in winter, and MATRL 100C in spring.

CHEMICAL ENGINEERING

PREPARATION FOR THE MAJOR — 75 Units

	Units
CH E 1A	1
CH E 10	3
CHEM 1A, AL, 1B, 1BL, 1C, 1CL	12
CHEM 6A-B	4
CHEM 109A-B-C	12
ENGR 3	3
MATH 3A-B-C, 5A-B-C	24
PHYS 1, 2, 3, 3L, 4, 4L	16

UPPER DIVISION MAJOR — 78 Units

	Units
CH E 110A-B	6
CH E 119	1
CH E 120A-B-C	10
CH E 128	3
CH E 132A-B-C	10
CH E 140A-B	6
CH E 152A	4
CH E 172	3
CH E 180A-B	6
CH E 184A-B	6
CHEM 113B-C	8
MATRL 101 or MATRL 100B *	3

* see note on next page

Technical Elective requirement 12

Prior approval of the student's technical electives must be obtained from the student's faculty adviser.

Approved Technical Elective Requirement classes:

CH E 102	CHEM 145	MCDB 133
CH E 121	CHEM 147	MCDB 138
CH E 124	CHEM 150	ME 110
CH E 125	ECE 130A-B-C	ME 112
CH E 136	ENGR 101	ME 114
CH E 138	ENGR 103	ME 119
CH E 152B	ENGR 185A-B-C-D	ME 128
CH E 154	MATH 122A-B	ME 134
CH E 160	MATH 132A-B	ME 185
CH E 171	MATRL 100A,C	PHYS 123A-B
CH E 198	MCDB 101A-B	PHYS 127A
CHEM 123	MCDB 111	PHYS 127B
CHEM 126	MCDB 121A-B	PHYS 129
CHEM 142A-B-C	MCDB 126A-B-C	

Technical electives taken:

______________________ | ______________________

Courses required for the major, inside or outside of the Department of Chemical Engineering, cannot be taken for the passed/not passed grading option. They must be taken for **letter** grades.

UNIVERSITY REQUIREMENTS

American History and Institutions – (one 4-unit course, may be counted as G.E. if selected from approved list)

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UC Entry Level Requirement: English Composition
Must be fulfilled within three quarters of matriculation

Satisfied by: ______________________________________

GENERAL EDUCATION

General Subject Areas

Area A: English Reading & Comprehension – (2 courses required)

A-1: WRIT 2E or 2____ **A-2**: WRIT 50E or 50 or 109ST_____

Areas D & E: Social Sciences, Culture and Thought
(2 courses minimum)

______________________ ______________________

Areas F & G: The Arts, Literature
(2 courses minimum, at least 1 from Area G)

______________________ G______________________

2 additional courses from Areas D, E, F, or G

______________________ ______________________

Special Subject Areas
(Please refer to the General Education Program Requirements booklet for more information)

Depth:

______________________ ______________________
______________________ ______________________

Ethnicity (1 course): ______________________

European Traditions (1 course): ______________________

Writing (4 courses required):

______________________ ______________________
______________________ ______________________

NON-MAJOR ELECTIVES — 38

General Education and Free Electives taken:

TOTAL UNITS REQUIRED FOR GRADUATION 191

their education and obtain M.S. and Ph.D. degrees.

Education Abroad Program (EAP)

Students are encouraged to broaden their academic experience by studying abroad for a year, or part of a year, under the auspices of the University of California's Education Abroad Program.

Undergraduate Program

Courses required for the pre-major or major, inside or outside of the Department of Chemical Engineering, cannot be taken for the passed/not passed grading option. They must be taken for letter grades.

Bachelor of Science—Chemical Engineering

Note: Schedules should be planned to meet both General Education and major requirements. Detailed descriptions of these requirements are presented in the College of Engineering Announcement and General Education booklet.

Preparation for the major

Students should plan to meet the General Education requirements common to all engineering programs. A total of 113 lower-division units is required, of which 75 are specified for the major: Engineering 3, Chemical Engineering 1A and 10, Chemistry 1A-B-C, 1AL-BL-CL, 6A-B, 109A-B-C, and Mathematics 3A-B-C and 5A-B-C, and Physics 1, 2, 3, 4, and 3L, 4L.

Upper-division major

A total of 78 units is required, of which 66 upper-division units are specified: Chemical Engineering 110A-B, 119, 120A-B-C, 128, 132A-B-C, 140A-B, 152A, 172, 180A-B, 184A-B; Chemistry 113B-C; Materials 100B or 101. Twelve units of technical electives selected from a wide variety of upper-division science and engineering courses are also required. Lists of approved electives are available in the department office. Transfer students who have completed most of the lower-division courses listed above and are entering the junior year of the chemical engineering program may take Chemical Engineering 10 concurrently with Chemical Engineering 120A in the fall quarter.

Chemical Engineering Courses

LOWER DIVISION

1A. Engineering and the Scientific Method

(1) STAFF

Engineering and its relationship to basic science, with specific examples from engineering practice. Analysis and synthesis of engineering education. Career opportunities for chemical engineering graduates. Seminar/discussion format with guest lecturers and current experiences/issues from students' other freshman engineering/science classes.

10. Introduction to Chemical Engineering

(3) DOYLE, SCOTT

Prerequisites: Chemistry 1A-B-C; Mathematics 3A-B-C; and, Engineering 3.

Elementary principles of chemical engineering. The major topics discussed include material and energy balances, stoichiometry, and thermodynamics.

99. Introduction to Research

(1-3) STAFF

Prerequisites: consent of instructor and undergraduate advisor.

May be repeated for credit to a maximum of 6 units. Students are limited to 5 units per quarter and 30 units total in all 98/99/198/199/199DC/199RA courses combined.

Directed study, normally experimental, to be arranged with individual faculty members. Course offers exceptional students an opportunity to participate in a research group.

UPPER DIVISION

102. Biomaterials and Biosurfaces

(3) ISRAELACHVILI

Not open for credit to students who have completed Chemical Engineering 121.

Recommended preparation: prior biochemistry, physical chemistry, and organic chemistry.

Fundamentals of natural and artificial biomaterials and biosurfaces with emphasis on molecular level structure and function and the interactions of biomaterials and surfaces with the body. Design issues of grafts and biopolymers. Basic biological and biochemical systems reviewed for nonbiologists.

110A-B. Chemical Engineering Thermodynamics

(3-3) CHMELKA, ZASADZINSKI

Prerequisites: Mathematics 5A. Engineering majors only.

Use of the laws of thermodynamics to analyze flow processes encountered in engineering practice. Presentation of equations of state for describing state properties of fluids and mixtures. Applications include vapor-liquid phase equilibria, solution thermodynamics, and chemical-reaction equilibria.

119. Current Events in Chemical Engineering

(1) STAFF

Prerequisites: Chemical Engineering 110A-B.

Assigned readings in technical journals on current events of interest to chemical engineers. Student groups present oral reports on reading assignments pertaining to new technologies, discoveries, industry challenges, society/government issues, professional and ethical responsibilities.

120A-B-C. Transport Processes

(4-3-3) THEOFANOUS, ZASADZINSKI, SANDALL, MITAGOTRI, TIRRELL

Prerequisites: Mathematics 5A-B-C; and Physics 4.

Principles and applications of fluid mechanics, heat transfer, and mass transfer in determining rates of transport processes.

121. Colloids and Biosurfaces

(3) ISRAELACHVILI

Not open for credit to students who have completed Chemical Engineering 102.

Basic forces and interactions between atoms, molecules, small particles and extended surfaces. Special features and interactions associated with (soft) biological molecules, biomaterials and surfaces: lipids, proteins, fibrous molecules (DNA), biological membranes, hydrophobic and hydrophilic interactions, bio-specific and non-equilibrium interactions.

124. Advanced Topics in Transport Phenomena/Safety

(3) BANERJEE, THEOFANOUS

Prerequisites: Chemical Engineering 120A-B-C or Mechanical Engineering 151A-B; and Mechanical Engineering 152A.

Same course as ME 124.

Hazard identification and assessments, runaway reactions, emergency relief. Plant accidents and safety issues. Dispersion and consequences of releases.

125. Principles of Bioengineering

(3) MITRAGOTRI

Not open for credit to students who have completed Chemical Engineering 125A-B.

Applications of engineering to biological and medical systems. Introduction to drug delivery, tissue engineering, and modern biomedical devices. Design and applications of these systems are discussed.

128. Separation Processes

(3) SANDALL, SCOTT

Prerequisites: Chemical Engineering 10 and 110A-B; open to College of Engineering majors only.

Basic principles and design techniques of equilibrium-stage separation processes. Emphasis is placed on binary distillation, liquid-liquid extraction, and multicomponent distillation.

132A. Analytical Methods in Chemical Engineering

(4) DAUGHERTY, FREDRICKSON, SQUIRES

Prerequisites: Mathematics 5A-B.

Develop analytical tools to solve elementary partial differential equations and boundary value problems. Separation of variables, method of characteristics, Sturm-Liouville theory, generalized Fourier analysis, and computer math tools.

132B. Computational Methods in Chemical Engineering

(3) SANDALL

Prerequisites: Mathematics 5A-B-C.

Numerical methods for solution of linear and nonlinear algebraic equation sets, interpolation and numerical integration, optimization, initial-value problems in ordinary differential equations and boundary-value problems. Emphasis on development of computational tools for chemical engineering applications.

132C. Statistical Methods in Chemical Engineering

(3) SEBORG

Prerequisites: Mathematics 5A-B-C.

Probability concepts and distributions, random variables, error analysis, point estimation and confidence intervals, hypothesis testing, development of empirical chemical engineering models using regression techniques, design of experiments, process monitoring based on statistical quality control techniques.

136. Introduction to Multiphase Flows

(3) THEOFANOUS

Prerequisites: Chemical Engineering 120A-B-C, or Mechanical Engineering 151C and 152A.

Same course as ME 136.

Development from basic concepts and techniques of fluid mechanics and heat transfer, to local behavior in multiphase flows. Key multiphase phenomena, related physics. Extension of local conservation principles to usable formulations in multiphase flows. Modelling approaches. Practical examples.

138. Risk Assessment and Management

(3) THEOFANOUS

Prerequisites: Chemical Engineering 120A-B-C; or Mechanical Engineering 151B and 152A.

Same course as ME 138.

Conceptual foundations of risk and its utility for decision making. Determinism, statistical inference, and uncertainty. Formulation of safety goals and approaches to risk management. Generalized methodology and tools for assessing risks in the industrial, ecological, and public health context.

140A-B. Chemical Reaction Engineering

(3-3) MCFARLAND, SCOTT

Prerequisites: Chemical Engineering 110A and 120A-B.

Fundamentals of chemical reaction engineering with emphasis on kinetics of homogenous and heterogenous reacting systems. Reaction rates and reactor design are linked to chemical conversion and selectivity. Batch and continuous reactor designs with and without catalysts are examined.

152A. Process Dynamics and Control

(4) SEBORG, DOYLE

Prerequisites: Chemical Engineering 120A-B-C and 140A.

Development of theoretical and empirical models for chemical and physical processes, dynamic behavior of processes, transfer function and block diagram representation, process instrumentation, control system design and analysis, stability analysis, computer simulation of controlled processes.

152B. Introduction to Process Systems Engineering
(3) SEBORG, DOYLE

Prerequisite: Chemical Engineering 152A.

Advanced single-loop control methods; multivariable control problems, real-time optimization, model-based control.

154. Engineering Approaches to Systems Biology
(3) DOYLE

Prerequisites: Chemical Engineering 171 and Mathematics 5A-B-C.

Applications of engineering tools and methods to solve problems in systems biology. Emphasis is placed on integrative approaches that address multi-scale and multi-rate phenomena in biological regulation. Modeling, optimization, and sensitivity analysis tools are introduced.

160. Introduction to Polymer Science
(3) KRAMER

Prerequisites: Chemistry 107A-B or 109A-B.

Same course as Materials 160.

Introductory course covering synthesis, characterization, structure, and mechanical properties of polymers. The course is taught from a materials perspective and includes polymer thermodynamics, chain architecture, measurement and control of molecular weight as well as crystallization and glass transitions.

171. Introduction to Biochemical Engineering
(3) DAUGHERTY

Prerequisites: Chemical Engineering 140A and Chemistry 109C.

Introduction to biochemical engineering covering enzyme and microbial growth and chemical kinetics with emphasis on the application of chemical engineering principles to the design and operation of industrial microbial processes.

172. Molecular and Cellular Biology for Engineers
(3) DAUGHERTY

Prerequisites: Chemical Engineering 140A and Chemistry 109C.

Molecular and cellular biology will be introduced using engineering fundamentals. Topics include protein structure and function, transcription, translation, post-translational processing, cellular organization, molecular transport and trafficking, metabolic and protein networks, modification of cellular information, and molecular and cellular engineering.

180A-B. Chemical Engineering Laboratory
(3-3) STAFF

Prerequisites: Chemical Engineering 110A and 120A-B (for 180A): Chemical Engineering 128 and 140A (for 180B).

Experiments in thermodynamics, fluid mechanics, heat transfer, mass transfer, reactor kinetics, and chemical processing. Experimental design, analysis of results, and preparation of reports.

184A. Design of Chemical Processes
(3) DOHERTY

Prerequisites: Chemical Engineering 110A-B; 120A-B-C; 140A; and 152A.

Application of chemical engineering principles to plant design. Conceptual design of chemical processes. Flowsheeting methods. Engineering cost principles and economic aspects.

184B. Design of Chemical Processes
(3) DOHERTY

Prerequisites: Chemical Engineering 110A-B; 120A-B-C; 140A; 152A; and Chemical Engineering 184A.

The solution to comprehensive plant design problems. Use of computer process simulators. Optimization of plant design, investment and operations.

196. Undergraduate Research
(2-4) STAFF

Prerequisite: upper-division standing; consent of instructor.

Must have a minimum 3.0 grade-point average for the preceding three quarters. May be repeated for up to 12 units. Not more than 4 units may be applied to departmental electives.

Research opportunities for undergraduate students. Students will be expected to give regular oral presentations, actively participate in a weekly seminar, and prepare at least one written report on their research.

198. Independent Studies in Chemical Engineering
(1-5) STAFF

Prerequisites: consent of instructor; upper-division standing; completion of two upper-division courses in chemical engineering.

Must have a minimum 3.0 grade-point-average for the preceding three quarters. May be repeated up to twelve units. Students are limited to five units per quarter and 30 units total in all 98/99/198/199/199DC/199RA courses combined.

Directed individual studies.

GRADUATE COURSES

202. Biomaterials and Biosurfaces
(3) ISRAELACHVILI

Prerequisites: consent of instructor.

Same course as BMSE 202.

Recommended preparation: prior biochemistry, physical chemistry, and organic chemistry.

Fundamentals of natural and artificial biomaterials and biosurfaces with emphasis on molecular level structure and function and the interactions of biomaterials and surfaces with the body. Design issues of grafts and biopolymers. Basic biological and biochemical systems reviewed for nonbiologists.

210A. Fundamentals and Applications of Classical Thermodynamics and Statistical Mechanics
(4) DOHERTY

Not open for credit to students who have completed Chemical Engineering 210.

Fundamental concepts in classical thermodynamics and statistical mechanics for engineering students. Establishes the framework within which applied problems can be solved using methodologies that start with molecular level understanding.

210B. Advanced Topics in Equilibrium Statistical Mechanics
(3) FREDRICKSON

Same course as Materials 214. Not open for credit to students who have completed Chemical Engineering 214.

Application of the principles of statistical mechanics and thermodynamics to treat classical fluid systems at equilibrium. Topics include liquid state theory, computer simulation methods, critical phenomena and scaling principles, interfacial statistical mechanics, and electrolyte theory.

210C. Topics in Non-equilibrium Statistical Mechanics
(3) FREDRICKSON

Not open for credit to students who have completed Chemical Engineering 215.

An introduction to the non-equilibrium statistical mechanics of classical fluid systems. Topics include: time correlation functions, linear response theory, kinetic theory of gases, Brownian motion, polymer dynamics, generalized hydrodynamics, non-equilibrium thermodynamics, and kinetics of phase transformations.

210D. Computational Methods in Statistical Mechanics
(3) STAFF

Not open for credit to students who have completed Chemical Engineering 213.

Topics of computational quantum and statistical mechanics will be covered including pseudopotential methods for band-structure and total-energy calculations, ab initio molecular dynamics, and classical potential methods for structural relaxation, lattice-dynamics, Monte Carlo, and molecular-dynamics simulations.

211A. Matrix Analysis and Computation
(4) STAFF

Prerequisite: consent of instructor.

Same course as Computer Science 211A, ECE 210A, Geology 251A, ME 210A and Mathematics 206A. Students should be proficient in basic numerical methods,linear algebra, mathematically rigorous proofs, and some programming language.

Graduate level-matrix theory with introduction to matrix computations. SVD's, pseudoinverses, variational characterization of eigenvalues, perturbation theory, direct and iterative methods for matrix computations.

211B. Numerical Simulation
(4) STAFF

Prerequisite: consent of instructor.

Same course as Computer Science 211B, ECE 210B, Geology 251B, ME 210B and Mathematics 206B. Students should be proficient in basic numerical methods, linear algebra, mathematically rigorous proofs, and some programming language.

Linear multistep methods and Runge-Kutta methods for ordinary differential equations: stability, order and convergence. Stiffness. Differential algebraic equations. Numerical solution of boundary value problems.

211C. Numerical Solution of Partial Differential Equations—Finite Difference Methods
(4) STAFF

Prerequisite: consent of instructor.

Same course as Computer Science 211C, ECE 210C, Geology 251C, ME 210C and Mathematics 206C. Students should be proficient in basic numerical methods,linear algebra, mathematically rigorous proofs, and some programming language.

Finite difference methods for hyperbolic, parabolic and elliptic PDE's, with application to problems in science and engineering. Convergence, consistency, order and stability of finite difference methods. Dissipation and dispersion. Finite volume methods. Software design and adaptivity.

211D. Numerical Solution of Partial Differential Equations—Finite Element Methods
(4) STAFF

Prerequisite: consent of instructor.

Same course as Computer Science 211D, ECE 210D, Geology 251D, ME 210D, and Mathematics 206D. Students should be proficient in basic numerical methods, linear algebra, mathematically rigorous proofs, and some programming language.

Weighted residual and finite element methods for the solution of hyperbolic, parabolic and elliptical partial differential equations, with application to problems in science and engineering. Error estimates. Standard and discontinuous Galerkin methods.

212. Risk Assessment and Management
(3) THEOFANOUS

Prerequisites: consent of instructor.

Same course as ME 212.

Conceptual foundations of risk and its utility for decision making. Determinism, statistical inference, and uncertainty. Formulation of safety goals and approaches to risk management. Generalized methodology and tools for assessing risks in the industrial, ecological, and public health context.

216A. Introduction to Magnetic Resonance Spectroscopy Techniques
(3) CHMELKA

Prerequisite: consent of instructor.

An introduction to magnetic resonance theory and experimental techniques, with emphasis on quantum-mechanical descriptions of basic NMR methods for solid-state applications.

216B. Advanced Methods of Magnetic Resonance with Applications to Materials Science
(3) CHMELKA

Prerequisite: consent of instructor.

This course is intended to provide an understanding of advanced methods of magnetic resonance spectroscopy and imaging, emphasizing new applications to current issues in materials research.

218. Introduction to Multiphase Flows
(3) STAFF

Prerequisite: consent of instructor.

Same course as ME 218.

Development from basic concepts and techniques of fluid mechanics and heat transfer, to local behavior in multiphase flows. Key multiphase phenomena, related physics. Extension of local conservation principles to usable formulations in multiphase flows. Modelling approaches. Practical examples. Computer simulations.

220A-B. Advanced Transport Processes-Laminar Flow and Convective Transport Processes

(4-3) LEAL, BANERJEE, SQUIRES

Prerequisite: consent of instructor.

Principles of applied mathematics, dimensional analysis and asymptotic approximation methods applied to problems in fluid mechanics and convective transport phenomena; low-Reynolds number flows, free-boundary problems, boundary-layer theories and other advection dominated phenomena, introduction to linear stability theory.

220C. Advanced Transport Processes-Mass Transfer

(3) SANDALL, ZASADZINSKI

Basic principles of diffusional processes, multicomponent systems, diffusion with chemical reaction, penetration and surface renewal theories, turbulent transport.

222A. Colloids and Interfaces I

(3) ISRAELACHVILI

Prerequisite: consent of instructor.

Same course as Materials 222A and BMSE 222A.

Introduction to the various intermolecular interactions in solutions and in colloidal systems: Van der Waals, electrostatic, hydrophobic, solvation, H-bonding. Introduction to colloidal systems: particles, micelles, polymers, etc. Surfaces: wetting, contact angles, surface tension, etc.

222B. Colloids and Interfaces II

(3) ZASADZINSKI

Prerequisite: consent of instructor.

Same course as Materials 222B.

Recommended preparation: Materials 222A or Chemical Engineering 222A.

Continuation of 222A. Interparticle interaction, coagulation, flocculation, DLVO theory, steric interactions, polymer-coated surfaces, polymers in solution, viscosity in thin liquid films. Surfactant self-assembly: micelles, micro-emulsions, lamellar phases, etc. Surfactants in surfaces: Langmuir-Blodgett films, adsorption, adhesion.

226. Level Set Methods

(4) GIBOU

Prerequisite: Computer Science 211C, or Chemical Engineering 211C, or ECE 210C, or ME 210C.

Same course as CMPSC 216, ECE 226 and ME 226.

Mathematical description of the level set method and design of the numerical methods used in its implementations (ENO-WENO, Godunov, Lax-Friedrich, etc.). Introduction to the Ghost Fluid Method. Applications in CFD, Materials Sciences, Computer Vision and Computer Graphics.

230A. Advanced Theoretical Methods in Engineering

(4) CHMELKA, FREDRICKSON, LEAL

Prerequisite: consent of instructor.

Same course as ME 244A.

Methods of solution of partial differential equations and boundary value problems. Linear vector and function spaces, generalized Fourier analysis, Sturm-Liouville theory, calculus of variations, and conformal mapping techniques.

230B. Advanced Theoretical Methods in Engineering

(3) FREDRICKSON, SQUIRES

Prerequisites: Chemical Engineering 230A and consent of instructor.

Same course as ME 244B.

Advanced mathematical methods for engineers and scientists. Complex analysis, integral equations and Green's functions. Asymptotic analysis of integrals and sums. Boundary layer methods and WKB theory.

230C. Nonlinear Analysis of Dynamical Systems

(3) DOHERTY

Prerequisites: Chemical Engineering 230A and consent of instructor.

Bifurcation and stability theory of solutions to nonlinear evolution equations; introduction to chaotic dynamics. Emphasis on asymptotic and numerical methods for the analysis of steady-state and time-dependent nonlinear boundary-value problems.

230D. Numerical Methods in Chemical Engineering

(3) STAFF

Prerequisite: consent of instructor.

The course will cover topics of numerical analysis with emphasis on methods for solution of linear and nonlinear algebraic equation sets and initial-value problems, finite-difference and finite-element methods, numerical bifurcation analysis, nonlinear optimization, and Monte Carlo methods.

238A-B. Rheology of Polymeric Liquids

(3-3) LEAL

Same course as Materials 238A-B.

A fundamentally-based course focusing on: the microstructural and molecular basis of viscoelastic flow for complex fluids, with a particular focus on polymeric liquids, liquid crystals and colloidal suspensions; experimental techniques and the analysis of viscoelastic flow phenomena.

240A-B. Advanced Chemical Reaction Engineering

(3-3) MCFARLAND

Prerequisite: consent of instructor.

Following review of the theory of reaction kinetics for catalyzed and noncatalyzed systems, detailed consideration is given to design and performance of catalysts and chemical reactors. Mathematical studies of stability and optimization are emphasized in relationship to mass, energy, and momentum transport.

246. Advanced Catalysis

(3) MCFARLAND, SCOTT

Prerequisite: consent of instructor.

Theories of reaction rates. Heterogeneous and homogenous catalysis, including physical structure and characterization of catalysts. Catalyst poisoning.

252. Monitoring Process and Control System Performance

(3) SEBORG

Prerequisite: consent of instructor.

Introduction to methods that can be used to monitor performance and to detect faults. Both model-based and data-driven approaches are considered. Emphasis is placed on statistical techniques for the analysis of multivariate time series data.

255. Methods in Systems Biology

(3) DOYLE

Prerequisites: prior coursework in cellular biology and mathematics; consent of instructor.

Same course as BMSE 255.

Fundamentals of dynamic network organization in biology (genes, proteins, metabolites). Emphasis on mathematical approaches to model and analyze complex biophysical network systems. Detailed case studies demonstrating successes of systems biology. Basic biological systems reviewed for non-biologists.

256. Seminar in Process Control

(3) DOYLE

Selected research topics in process control.

290. Seminar

(.5) STAFF

May be repeated for credit.

Seminar featuring guest speakers and graduate students on topics of current research interest.

291. Research Group Studies

(1-2) STAFF

Prerequisite: consent of instructor.

Students or instructors present recently published papers and/or results relevant to their own research.

594. Special Topics

(1-4) STAFF

Special seminar on research subjects of current interest.

596. Directed Reading and Research

(1-12) STAFF

Experimental or theoretical research undertaken under the direction of a faculty member for graduate students who have not yet advanced to candidacy.

598. Master's Thesis Research and Preparation

(1-12) STAFF

Not applicable to course requirement for master of science degree.

Only for research underlying the thesis and writing the thesis.

599. Dissertation Research and Preparation

(1-12) STAFF

Only for research underlying the dissertation and writing the dissertation.

Computer Engineering

Computer Engineering Major,
Harold Frank Hall (Engr. I), Room 4157;
Telephone (805) 893-5615 or (805) 893-8292

E-mail: info@ce.ucsb.edu
Website: www.ce.ucsb.edu

Director: Malgorzata (Margaret) Marek-Sadowska

Faculty

Kevin Almeroth, Ph.D., Georgia Institute of Technology, Associate Professor (computer networks and protocols, large-scale multimedia systems, performance evaluation and distributed systems)

Kaustav Banerjee, Ph.D., UC Berkeley, Associate Professor (high performance VLSI and mixed signal system-on-chip designs and their design automation methods; single electron transistors; 3D and optoelectronic integration)

Forrest D. Brewer, Ph.D., University of Illinois at Urbana-Champaign, Professor (VLSI and computer system design automation, theory of design and design representations, symbolic techniques in high level synthesis)

Tevfik Bultan, Ph.D., University of Maryland, College Park, Associate Professor (specification and automated analysis of concurrent systems, computer-aided verification, model checking)

Steven E. Butner, Ph.D., Stanford University, Professor (computer architecture, VLSI design of CMOS and gallium-arsenide ICs with emphasis on distributed organizations and fault-tolerant structures)

Edward Chang, Ph.D., Stanford University, Associate Professor (multimedia systems, database systems, and distributed systems)

Kwang-Ting (Tim) Cheng, Ph.D., UC Berkeley, Professor (design automation, VLSI testing, design synthesis, design verification, algorithms)

Frederic T. Chong, Ph.D., Massachusetts Institute of Technology, Professor (computer architecture, novel computing technologies, quantum computing, embedded systems, and architectural support for system security and reliability)

Ryan Kastner, Ph.D., UCLA, Assistant Professor (computer engineering, reconfigurable computing; design of integrated circuits; embedded architectures)

Chandra Krintz, Ph.D., University of California, San Diego, Assistant Professor (dynamic and adaptive compilation systems, high-perfor-