**CHEMICAL AND BIOLOGICAL ENGINEERING (CBE)**

**CBE 1 — COOPERATIVE EDUCATION PROGRAM**

1 credit.

Work experience which combines classroom theory with practical knowledge of operations to provide students with a background upon which to base a professional career. Enroll Info: So st

**Requisites:** None

**Course Designation:** Workplace - Workplace Experience Course

**Repeatable for Credit:** Yes, unlimited number of completions

**Last Taught:** Fall 2020

**CBE 150 — INTRODUCTION TO CHEMICAL ENGINEERING**

1 credit.

Overview of the field of chemical engineering, including types of careers, industries, and skills required for successful completion of the degree and entry into the chemical engineering profession. Enroll Info: None

**Requisites:** None

**Repeatable for Credit:** No

**Last Taught:** Fall 2020

**CBE 250 — PROCESS SYNTHESIS**

3 credits.

An introduction to the invention of processes for the large scale, low cost processing of materials such as water, chemicals, petroleum products, food, drugs and wastes. Open to students in any field. Enroll Info: CHEM 329 or CHEM 343 or concurrent registration

**Requisites:** None

**Course Designation:** Sustain - Sustainability

**Repeatable for Credit:** No

**Last Taught:** Fall 2020

**CBE 255 — INTRODUCTION TO CHEMICAL PROCESS MODELING**

3 credits.

Introduction to modeling of chemical processes and introduction to using modern computational tools to analyze the models. Enroll Info: MATH 319 or 320 or con reg

**Requisites:** None

**Repeatable for Credit:** No

**Last Taught:** Fall 2020

**CBE 310 — CHEMICAL PROCESS THERMODYNAMICS**

3 credits.

Introduction to thermodynamics, energy balances, applications to steady state and unsteady state processes, behavior of pure fluids, chemical reaction equilibria. Enroll Info: MATH 234, PHYSICS 201 or equiv; CBE 255 or equiv or con reg; CBE 250 with a grade of C or better

**Requisites:** None

**Repeatable for Credit:** No

**Last Taught:** Fall 2020

**CBE 311 — THERMODYNAMICS OF MIXTURES**

3 credits.

Properties of ideal and non-ideal vapors and liquids, ideal and non-ideal multicomponent vapor-liquid and liquid-liquid equilibria, complex chemical reaction equilibria, electrolytic solutions, surface thermodynamics, solid phase thermodynamics. Enroll Info: CBE 310 with a grade of C or better

**Requisites:** None

**Repeatable for Credit:** No

**Last Taught:** Fall 2020

**CBE/B M E 320 — INTRODUCTORY TRANSPORT PHENOMENA**

4 credits.

Mass, momentum, and energy transport; calculation of transport coefficients; solution to problems in viscous flow, heat conduction, and diffusion; dimensional analysis; mass, momentum, and heat transfer coefficients; over-all balances; elementary applications. Enroll Info: None

**Requisites:** None

**Repeatable for Credit:** No

**Last Taught:** Fall 2020

**CBE 324 — TRANSPORT PHENOMENA LAB**

3 credits.

Determination of thermodynamic properties, transport properties, and transfer coefficients; study of related phenomena. Enroll Info: CBE 310 320, or concurrent registration; STAT 324

**Requisites:** None

**Repeatable for Credit:** No

**Last Taught:** Fall 2020

**CBE 326 — MOMENTUM AND HEAT TRANSFER OPERATIONS**

3 credits.

Analysis of chemical engineering operations involving fluid flow and heat transfer. Flow of fluids through ducts and porous media; motion of particulate matter in fluids; general design and operation of fluid-flow equipment. Conductive, convective and radiative heat exchange with and without phase change; general design and operation of heat-exchange equipment. Enroll Info: CBE 310 320 with grades of C or better

**Requisites:** None

**Repeatable for Credit:** No

**Last Taught:** Fall 2020

**CBE/B M E 330 — ENGINEERING PRINCIPLES OF MOLECULES, CELLS, AND TISSUES**

4 credits.

Introduction to the fundamental principles of kinetics and transport that are relevant for the analysis of biological systems. Topics covered include concepts of reaction rate, stoichiometry, equilibrium, momentum/mass transport, and the interaction between transport and kinetics in biological systems. Enroll Info: None

**Requisites:** (E M A 201, PHYSICS 201, 207, or 247), (MATH 319, 320, or 375) and (CHEM 104, 109, or 116), or member of Engineering Guest Students

**Repeatable for Credit:** No

**Last Taught:** Fall 2020
CBE 361 — BIOMOLECULAR ENGINEERING LABORATORY
3 credits.
Instruction and laboratory experiments in basic molecular biology techniques, recombinant protein production, fermentation processes, protein purification and characterization, and related bioengineering laboratory topics. Geared towards chemical engineering students with interests in biotechnology and synthetic biology. Enroll Info: CBE 250; Zoo 151 or 153 or equivalent; or consent of instructor
Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2017

CBE 424 — OPERATIONS AND PROCESS LABORATORY
5 credits.
Experiments in unit operations, and supervised individual assignments selected from areas such as: fluid dynamics, analytical methods, reaction kinetics, plastics technology, and use of computers in data processing and simulation. Enroll Info: CBE 324, 326, 426 430; or consent of instructor
Requisites: None
Course Designation: Gen Ed - Communication Part B  
Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Summer 2020

CBE/CHEM/E M A/M E 425 — UNDERGRADUATE RHEOLOGY SEMINAR
0-1 credits.
Rheology seminar encouraged for all interested in professions related to polymers, suspensions or rheology. Enroll Info: None
Requisites: Junior or senior standing only, or member of Engineering Guest Students
Course Designation: Level - Advanced  
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2011

CBE 426 — MASS TRANSFER OPERATIONS
3 credits.
Analysis of chemical engineering operations involving mass transfer. Differential and stagewise separation processes; simultaneous heat and mass transfer; mass transfer accompanied by chemical reaction; general design and operation of mass-transfer equipment. Enroll Info: CBE 311 320 with grades of C or better, or consent of instructor
Requisites: None
Repeatable for Credit: No
Last Taught: Fall 2020

CBE 430 — CHEMICAL KINETICS AND REACTOR DESIGN
3 credits.
Analysis and interpretation of kinetic data and catalytic phenomena; application of basic engineering principles to chemical reactor design. Enroll Info: CBE 311 320; or consent of instructor
Requisites: None
Course Designation: Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Fall 2020

CBE 440 — CHEMICAL ENGINEERING MATERIALS
3 credits.
Structure and properties of metallic and nonmetallic materials of construction, interrelations between chemical bonding, structure, and behavior of materials. Enroll Info: CHEM 345
Requisites: None
Course Designation: Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Fall 2020

CBE 450 — PROCESS DESIGN
3 credits.
Analysis and design of chemical processing systems and equipment. Enroll Info: CBE 326, 426 430 or consent of instructor
Requisites: None
Course Designation: Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Fall 2020

CBE 470 — PROCESS DYNAMICS AND CONTROL
3 credits.
A systematic introduction to dynamic behavior and automatic control of industrial processes; lab includes instrumentation, measurement and control of process variables by using conventional hardware and real-time digital computers. Enroll Info: CBE 326; CBE 430 or concurrent registration
Requisites: None
Repeatable for Credit: No
Last Taught: Fall 2020

CBE 489 — HONORS IN RESEARCH
1-3 credits.
Undergraduate honors research projects supervised by faculty members. Enroll Info: Admission to CBE honors in research prgm
Requisites: Consent of instructor
Course Designation: Honors - Honors Only Courses (H)
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2019

CBE/CHEM 505 — ASPECTS OF INDUSTRIAL CHEMISTRY AND BUSINESS FUNDAMENTALS
3 credits.
The objective of this course is to educate students in the chemistry and chemical engineering that defines societies’ standard of living. Commercial chemical processes will be reviewed. Practical realities of how a discovery moves from research to commercial product will be taught through examples and case studies. Financial concepts that guide investment will be reviewed. Enroll Info: Junior standing and CHEM 345
Requisites: CHEM 345 and junior standing or higher
Course Designation: Level - Advanced  
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2020
CBE/B M E 510 — INTRODUCTION TO TISSUE ENGINEERING
3 credits.

Overview of tissue engineering, including discussion of cell sources, cell-material interactions, tailoring biomaterials, methods of culture and characterization of engineering tissues, ethical issues, concluding with case studies of specific types of tissue engineering. Optional laboratory exercises offered throughout semester. Enroll Info: None
Requisites: B M E/PHM SCI 430, graduate/professional standing, or member of Engineering Guest Students
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2020

CBE 512 — ENERGY TECHNOLOGIES AND SUSTAINABILITY
3 credits.

Chemical engineering principles of material and energy balances, chemical process design, and chemical engineering economics are used to analyze a wide variety of energy systems and their impact on the economy, the environment, society, and the chemical process industry. Enroll Info: None
Requisites: CBE 310 or M E 361, graduate/professional standing, or member of Engineering Guest Students
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Sustain - Sustainability
Repeatable for Credit: No

CBE/B M E/BSE 517 — BIOLOGY IN ENGINEERING SEMINAR
1 credit.

Current topics at the interface of biology and engineering with special emphasis on the ways in which engineers have contributed to knowledge and advances in biology. Enroll Info: None
Requisites: Junior standing and (ZOOLOGY/BIOLOGY 101 and 102, ZOOLOGY/BIOLOGY/BOTANY 151, ZOOLOGY 153, or BIOCORE 381), graduate/professional standing, or member of Engineering Guest Students
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2020

CBE/B M E 520 — STEM CELL BIOENGINEERING
3 credits.

Covers engineering approaches that are used to understand and manipulate stem cells. Concepts covered include: introduction to stem cell biology, quantitative modeling of stem cell signaling, methods to engineer the stem cell microenvironment, and the role of stem cells in tissue development and regeneration. Enroll Info: None
Requisites: (MATH 319 or 320), (ZOOLOGY 470, 570, or BIOCORE 383), and (CHEM 341 or 343), graduate/professional standing, or member of Engineering Guest Students
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2020

CBE/M E 525 — MACROMOLECULAR HYDRODYNAMICS
3 credits.

Requisites: M E 363, B M E/CBE 320, member of Engineering Guest Students, or graduate/professional standing
Repeatable for Credit: No
Last Taught: Spring 2015

CBE 535 — HETEROGENEOUS CATALYSIS: PRINCIPLES AND APPLICATIONS
3 credits.

This course discusses catalytic phenomena, with extensions to reactor design and catalyst characterization. Examples will be drawn from current problems in catalysis. Enroll Info: CBE 430 or cons inst
Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2018

CBE 538 — PROCESSES FOR THE PRODUCTION OF RENEWABLE FUELS AND CHEMICALS FROM BIOMASS
3 credits.

Various options for conversion of biomass into fuels and chemicals. Evaluation of different biofuel technologies from a chemical engineering perspective, and a holistic overview of the current technical, legal, business, and financial challenges, and opportunities for the production of fuels and chemicals from biomass. Several case studies on biomass conversion provide an overview of how technology is developed. Enroll Info: None
Requisites: CBE 250 and 310, graduate/professional standing, or member of Engineering Guest Students
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Sustain - Sustainability
Repeatable for Credit: No

CBE 540 — POLYMER SCIENCE AND TECHNOLOGY
3 credits.

Synthesis, properties, and fabrication of plastic materials of industrial importance. Enroll Info: CHEM 345; CBE 326 430, or concurrent registration; STAT 324; or consent of instructor
Requisites: None
Repeatable for Credit: No
Last Taught: Fall 2020

CBE 541 — PLASTICS AND HIGH POLYMER LABORATORY
1-3 credits.

Experiments on polymerization, fabrication, and testing of plastics. Enroll Info: CBE 540 or concurrent registration; or CHEM 664 or concurrent registration
Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2015
CBE 547 — INTRODUCTION TO COLLOID AND INTERFACE SCIENCE
3 credits.

Introduction to topics in colloid and interface science, including sedimentation and diffusion, solution thermodynamics, rheology, light scattering, surface tension and contact angle, adsorption, association colloids, particle interactions, electrokinetics, and colloidal stability. Enroll Info: None
Requisites: CHEM 561 or (CBE 310 and 311), graduate/professional standing, or member of Engineering Guest Students
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

CBE 555 — SEMINAR-CHEMICAL ENGINEERING CONNECTIONS
1 credit.

Considers a variety of current engineering applications and problems. Students will investigate background information on topics of their choice, and present seminars to describe how engineering fundamentals interact with societal impact and how our undergraduate education in chemical engineering is relevant to societal concerns at large. Enroll Info: Sr st or cons inst
Requisites: None
Repeatable for Credit: No
Last Taught: Fall 2020

CBE/B M E 560 — BIOCHEMICAL ENGINEERING
3 credits.

Properties of biological molecules; enzyme kinetics, enzyme reactors, and enzyme engineering; metabolic engineering; microbial growth kinetics; bioreactor design; bioseparations. Enroll Info: None
Requisites: (CBE 310 and B M E/CBE 320, or B M E/CBE 330) and (ZOOLOGY/BIOLOGY 101 and 102, ZOOLOGY/BIOLOGY/BOTANY 151, ZOOLOGY 153, or BIOCORE 383), graduate/professional standing, or member of Engineering Guest Students
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Fall 2019

CBE 562 — SPECIAL TOPICS IN CHEMICAL ENGINEERING
1-3 credits.

Topics of specialized interest to majors in chemical engineering. Given on demand. Enroll Info: Jr st and cons inst
Requisites: None
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2020

CBE/M E 567 — SOLAR ENERGY TECHNOLOGY
3 credits.

Radiant energy transfer and its application to solar exchangers; energy balances for solar exchangers, review of theory, economics, and practice of solar energy applications. Enroll Info: None
Requisites: (M E 364, CBE 326, or concurrent enrollment), or graduate/professional standing, or member of Engineering Guest Students
Course Designation: Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Fall 2020

CBE 575 — INSTRUMENTAL ANALYSIS FOR CHEMICAL ENGINEERS
3 credits.

Instrumental methods as applied to chemical and physical processes in chemical engineering. Spectroscopic, optical, and electrochemical methods; chromatography, differential thermal analysis, and microscopy. Enroll Info: CBE 324 or consent of instructor
Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2020

CBE 599 — SPECIAL PROBLEMS
1-4 credits.

Research or independent study. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2020

CBE 620 — INTERMEDIATE TRANSPORT PHENOMENA
3 credits.

Mass, momentum, and energy transport; kinetic theory of transport properties; analytical and approximate solutions to the equations of change; boundary layer theory; turbulence; simultaneous heat and mass transfer; multicomponent diffusion. Enroll Info: Grad standing in CBE or consent of instructor
Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2020

CBE 648 — SYNTHETIC ORGANIC MATERIALS IN BIOLOGY AND MEDICINE
2-3 credits.

Introduction to topics relevant to the design, synthesis, fabrication, engineering, and characterization of organic materials currently used in or being designed for use in medical and biotechnological applications. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
CBE 660 — INTERMEDIATE PROBLEMS IN CHEMICAL ENGINEERING
3 credits.
Illustrations of solving chemical engineering problems by using a variety of mathematical topics such as ordinary and partial differential equations, Laplace transform, Bessel functions, matrices, and tensor analysis. Problem formulation and interpretation of results emphasized. Enroll Info: Grad st in CBE or cons inst
Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2020

CBE 720 — MICROHYDRODYNAMICS, BROWNIAN MOTION, AND COMPLEX FLUIDS
3 credits.
Foundations for understanding microscale flow and transport phenomena in multiphase and complex fluids, as well as tools for modeling and simulation of their dynamics. Enroll Info: Students are expected to have had course work in fluid mechanics or transport phenomena.
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

CBE 731 — COMPUTATIONAL MODELLING OF REACTIVE SYSTEMS
3 credits.
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2018

CBE 747 — ADVANCED COLLOID AND INTERFACE SCIENCE
3 credits.
Advanced topics in colloid and interface science. Topics include: intermolecular forces, stability of thin films, association colloids, liquid crystals, microhydrodynamics, electrostatics, electrokinetics, colloidal stability, and dispersion rheology. Enroll Info: CBE 547 or cons inst
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2015
CBE 750 — ADVANCED CHEMICAL PROCESS SYNTHESIS AND OPTIMIZATION
3 credits.

Methodologies for synthesis and optimization of chemical process systems. Application of linear, nonlinear, and mixed integer programming to steady state process optimization, production planning, and flowsheet synthesis. Enroll Info: Graduate standing in CBE or consent of instructor
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Sustain: Sustainability
Repeatable for Credit: No
Last Taught: Spring 2016

CBE 770 — ADVANCED PROCESS DYNAMICS AND CONTROL
3 credits.

Modern methods for the mathematical analysis and control of dynamical systems. Application to physico-chemical systems. Real-time computer control. Enroll Info: Grad st in CBE or cons inst
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2017

CBE/E CE/MATH 777 — NONLINEAR DYNAMICS, BIFURCATIONS AND CHAOS
3 credits.

Advanced interdisciplinary introduction to qualitative and geometric methods for dissipative nonlinear dynamical systems. Local bifurcations of ordinary differential equations and maps. Chaotic attractors, horseshoes and detection of chaos. Enroll Info: None
Requisites: Graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2016

CBE 781 — BIOLOGICAL ENGINEERING: MOLECULES, CELLS & SYSTEMS
3 credits.

Protein engineering and protein-protein interactions, receptor-ligand binding, cell metabolism and signaling, metabolic engineering and synthetic biology, tissue engineering. Additional topics may be covered such as: regenerative medicine, biomaterials, microbe-host interactions. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2020

CBE/B ME 782 — MODELING BIOLOGICAL SYSTEMS
3 credits.

Literature survey of mathematical models in biology at the molecular and cellular levels; application of chemical kinetics and thermodynamics to biological systems; comparison of deterministic and stochastic strategies. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2015

CBE/B ME 783 — DESIGN OF BIOLOGICAL MOLECULES
3 credits.

Introduction to the methodologies for engineering the structure and function of biological molecules, especially proteins. Develop an understanding for the integration of computation and experiment to address biological molecular engineering problems. Enroll Info: Knowledge of biochemistry and cell biology [such as BIOCHEM 501 or ZOOLOGY 570] required.
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

CBE 790 — MASTER'S RESEARCH OR THESIS
1-9 credits.

Enroll Info: Grad st, for Master's candidates only
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2020

CBE 890 — PRE-DISSERTATOR'S RESEARCH
1-9 credits.

Enroll Info: Grad st, for post-master's, pre-dissertator stdts only
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2020

CBE/B ME/B MI/BIOCHEM/COMP SCI/GENETICS 915 — COMPUTATION AND INFORMATICS IN BIOLOGY AND MEDICINE
1 credit.

Participants and outside speakers will discuss current research in computation and informatics in biology and medicine. This seminar is required of all CIBM program trainees. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2020
CBE 920 — SEMINAR ON ADVANCES IN TRANSPORT PHENOMENA
1 credit.
Critical review of recent and current research in transport phenomena and allied disciplines. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2013

CBE/CHEM/E M A/M E 925 — RHEOLOGY RESEARCH SEMINAR
0-1 credits.
Exploration of the most recent research literature on viscoelasticity, constitutive equations, non-Newtonian flow systems, fluid metering devices, kinetic theory of macromolecules, and rheooptical phenomena. Periodic reports on recent advances made by research workers in the various rheology groups on the Madison campus. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2011

CBE/BIOCHEM 932 — BIOTECHNOLOGY TRAINING PROGRAM SEMINAR
1 credit.
Biotechnology Training Program trainees will present their research for critical review by audience. Enroll Info: Grad st. Required of Biotechnology Training Program trainees
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2020

CBE 961 — SEMINAR-CHEMICAL ENGINEERING
0-1 credits.
Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2020

CBE 970 — SEMINAR ON PROCESS ANALYSIS, SYNTHESIS, DYNAMICS AND CONTROL
1 credit.
Critical review of recent and current research in these areas. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2014

CBE 990 — THESIS-RESEARCH
1-12 credits.
Enroll Info: Dissertator status
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2020

CBE 999 — ADVANCED INDEPENDENT STUDIES
1-6 credits.
Enroll Info: None
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 1997