CHEMICAL ENGINEERING (CHEN)

CHEN 1101 Introduction to Chemical Engineering 1 Credit
Department: College of Engineering
A survey of chemical engineering principles and introduction to the design process with emphasis on chemical engineering hardware and software.
Prerequisite(s)/Corequisite(s): MATH 2413
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 1301 Introduction to Chemical Engineering 3 Credits
Department: College of Engineering
A survey of chemical engineering principles and an introduction to the design process with emphasis on teamwork, problem solving, and presentation skills.
Prerequisite(s)/Corequisite(s): MATH 2413
Grade Mode(s): Standard Letter

CHEN 2100 Computer Aided Modeling 1 Credit
Department: College of Engineering
Introduction to mathematical and chemical process simulation software packages that will be useful to the students in their later chemical engineering courses.
Restriction(s):
Students with a class of Freshman may **not** enroll.

Enrollment is limited to students with a major in Chemical Engineering or Prov Chem Engineering.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 2140 Professional Seminar 1 Credit
Department: College of Engineering
Oral and written presentation of selected topics in chemical engineering from recent technical publications.
Restriction(s):
Students with a class of Freshman may **not** enroll.

Enrollment is limited to students with a major in Chemical Engineering or Prov Chem Engineering.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 2300 Chemical Engineering Applied Mathematics 3 Credits
Department: College of Engineering
Introduction to mathematical software and techniques including linear algebra as well as chemical process simulation packages that will be useful to the students in their upper-level chemical engineering courses.
Prerequisite(s)/Corequisite(s): CHEN 2374 and CHEN 3301
Grade Mode(s): Standard Letter

CHEN 2374 Thermodynamics I 3 Credits
Department: College of Engineering
The fundamental laws of thermodynamics; properties of systems solids, gases and liquids, and thermodynamic tables.
Prerequisite(s): PHYS 2425 and MATH 2414
Prerequisite(s)/Corequisite(s): CHEN 1101 or INEN 1101
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 3311 Momentum Transfer 3 Credits
Department: College of Engineering
Fluid-flow concepts are presented through the derivation of the basic equations of continuity, energy and momentum. Engineering aspects of flow measurement, pressure-drop calculations and pumping requirements are considered.
Prerequisite(s): CHEN 3340 and CHEN 2374 and MATH 3301
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 3320 Heat Transfer 3 Credits
Department: College of Engineering
Principles of conduction, convection and radiation, and their application to the design of heat transfer equipment and systems.
Prerequisite(s): CHEN 3311 and CHEN 3330
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 3330 Thermodynamics II 3 Credits
Department: College of Engineering
Application of the First and Second Laws to chemical processes. Thermodynamic properties of pure fluids and mixtures; physical equilibrium.
Prerequisite(s): CHEN 3340
Prerequisite(s)/Corequisite(s): CHEM 3311 and CHEM 1111
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 3340 Process Analysis 3 Credits
Department: College of Engineering
Application of mathematics, physics and chemistry to the solution of problems in industrial chemistry. Material and energy balance calculations on processes undergoing physical and chemical changes.
Prerequisite(s)/Corequisite(s): CHEN 2374 and CHEN 2100
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 4150 Process Control Laboratory 1 Credit
Department: College of Engineering
Experiments in level, flow and temperature control; computer-based adaptive control; PID tutorial program; control valve selection and sizing; interactive process control using the Honeywell TDC-3000 keyboard with a process control simulator.
Prerequisite(s)/Corequisite(s): CHEN 4331
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 4310 Laboratory I 3 Credits
Department: College of Engineering
Experiments in heat transfer, mass transfer, fluid flow, reaction kinetics and thermodynamics.
Prerequisite(s): CHEN 3311 and CHEN 3320
Prerequisite(s)/Corequisite(s): CHEN 4420 or CHEN 4320
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 4320 Mass Transfer 3 Credits
Department: College of Engineering
Principles of diffusion. Simultaneous mass, energy and momentum transfer. Analysis of absorption, extraction and distillation processes.
Prerequisite(s): CHEN 3330 and CHEN 3320 and CHEM 3311 and CHEM 3111
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 4331 Process Control I 3 Credits
Department: College of Engineering
Basic hardware and instrumentation needed to implement process control; principles of feedback controllers design and tuning; analysis of stability and performance of feedback loops using Laplace and frequency domain techniques. Introduction of advanced control strategies.
Prerequisite(s): CHEN 4410 and MATH 3301
Corequisite(s): CHEN 4320
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 4332 Process Control II 3 Credits
Department: College of Engineering
This course covers enhanced PID control, multivariable constrained control and statistical process control. Control and simulation software will be used.
Prerequisite(s): CHEN 4331
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 4340 Plant Design II 3 Credits
Department: College of Engineering
A continuation of CHEN 4360, with emphasis on a major design project.
Prerequisite(s): CHEN 4360
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 4350 Advanced Analysis 3 Credits
Department: College of Engineering
Development of mathematical equations for chemical engineering applications. Implementation of computer-aided modeling and simulation packages in chemical engineering applications.
Prerequisite(s): (CHEN 4420 or CHEN 4320) and CHEN 4331
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 4360 Plant Design I 3 Credits
Department: College of Engineering
Application of chemical engineering principles to the design of chemical processes and plants. Equipment design and specifications. Economic evaluation of processes and equipment.
Prerequisite(s): INEN 2373 and CHEN 4410
Prerequisite(s)/Corequisite(s): CHEN 4420 or CHEN 4320
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 4410 Reaction Kinetics 4 Credits
Department: College of Engineering
Chemical equilibrium; analysis of experimental data to determine reaction rate parameters in homogeneous, heterogeneous, catalytic and non-catalytic reactions. Development of equations for batch, stirred-tank and tubular flow reactors. Application of differential equations to process and reactor design.
Prerequisite(s): MATH 3301 and CHEN 3330
Prerequisite(s)/Corequisite(s): CHEN 3320 and CHEM 3311 and CHEM 3111
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 4420 Mass Transfer 4 Credits
Department: College of Engineering
Principles of diffusion. Simultaneous mass, energy and momentum transfer. Analysis of absorption, extraction and distillation processes.
Prerequisite(s): CHEN 3330 and CHEN 3320 and (CHEM 3411 or CHEM 3311 and CHEM 3111)
Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS, Satisfactory/Unsatisfactory

CHEN 5301 Special Topics 3 Credits
Department: College of Engineering
An investigation into specialized study in advanced areas of engineering under guidance of a faculty member. This course may be repeated for credit when topics of investigation differ.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 5302 Transport Phenomena 3 Credits
Department: College of Engineering
Analysis of transport with respect to fluid dynamics, heat arid mass transfer. Derivation of Navier-Stokes equation and its application to flow phenomena. Boundary layer flows, molecular interpretation of viscosity, and interfacial tension and its relation to slip/non-slip condition. Interdependence of fluid flow, heat transfer, and mass transfer. Tensor and vector notation will be presented and employed.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 5352 Advanced Process Control 3 Credits
Department: College of Engineering
Modem control theory concerning state-space formulation, multivariable control, optimal control, and discrete control for Jumped/distributed parameter systems is addressed. Applications of control theory and the implementation of control strategies for the chemical processing industries are demonstrated
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 5357 Process Simulation 3 Credits
Department: College of Engineering
Steady state chemical and refining processes simulation using state-of-the-art computer software.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 5358 Advanced Process Simulation 3 Credits
Department: College of Engineering
In depth coverage of chemical and refining processes using state-of-the-art steady-state computer simulation software. Advanced topics and fundamentals are emphasized.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 5371 Materials Science and Engineering 3 Credits
Department: College of Engineering
Materials preparation processes and applications in various chemical engineering processes, such as fuel cells, energy storage, corrosion protection, and oxygen membrane separation will be discussed in the class. Students will learn both theory and application of modern analytical method for material characterization.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 5372 Chemical Process Safety 3 Credits
Department: College of Engineering
This course aims to provide the undergraduate and graduate students with the knowledge, ability and skill of chemical process safety including the engineering principles, safety management concepts, leading and lagging metrics for process safety, techniques for process hazard analysis, risk assessment and accident investigation.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 5373 Numerical Methods for Engineers 3 Credits
Department: College of Engineering
This course will teach graduate students to develop and implement numerically stable and accurate algorithms for all the advanced tasks of computational chemical engineering.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 5374 Bio-Process Engineering 3 Credits
Department: College of Engineering
This course provides students with basic concepts and prepares them to meet the challenges of the new and emerging biotechnology industry. this course aims to provide the graduate students with the knowledge and skills of basic biological systems.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 5375 Plant Safety and Security 3 Credits
Department: College of Engineering
This course aims to provide the undergraduate and graduate students with the knowledge, ability and skill of plant safety and security including OSHA Process Safety Management (PSM), EPA Risk Management Program (RMP), DHS Chemical Facility Anti-Terrorism Standards (CFATS), DOT Chemical Transportation Safety and Security, Plant Operation and work Permit System.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 5378 Data Analysis for Chem Egr 3 Credits
Department: College of Engineering
This course will provide a variety of methods to help chemical engineers analyze data sets, uncover important information and make good decisions.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 5379 Applied Bioprocess and Fermentation Engineering 3 Credits
Department: College of Engineering
This course applies fluid flow, heat transfer, mass transfer, chemical kinetics and conservation of mass and energy to bioprocess unit operations applicable to the fields of food, pharmaceutical and brewery engineering. The course also introduces bioprocess design and simulation software to simulate bioprocesses and fermentation operations.
Prerequisite(s): MATH 3301 and CHEM 3311
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 5389 Applied Bioprocess and Fermentation Laboratory 3 Credits
Department: College of Engineering
This course applies fundamentals of Engineering (mass transfer, heat transfer, fluid mechanics, mass & energy balances), chemistry and analytical to design and analyze the treatment and conversion of raw materials to final process streams. Operations from the brewing industry will be used to demonstrate these phenomena. The lab is a hands-on exercises in the safety, operation and maintenance of process equipment; cell culture maintenance; and analysis of product using techniques from analytical chemistry.
Prerequisite(s)/Corequisite(s): (CHEN 5379 and CHEM 5346) or (CHEN 5376 and CHEM 6374)
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 5390 Thesis 3 Credits
Department: College of Engineering
Provide experience and practice in engineering research methodology, including defining a research problem, performing a literature review, and applying scientific knowledge in practice.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Satisfactory/Unsatisfactory, Registrar do not use FN, Registrar do not use FS, Thesis/Dissertation

CHEN 5391 Thesis 3 Credits
Department: College of Engineering
Provide experience and practice in performing hypothesis-driven scientific and engineering research experiments and development of technical writing and presentation skills leading to a successfully defended thesis. (May be repeated until thesis is completed.)
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Satisfactory/Unsatisfactory, Registrar do not use FN, Registrar do not use FS, Thesis/Dissertation

CHEN 5392 Intermolecular Forces w/Appl 3 Credits
Department: College of Engineering
An introduction to the various intermolecular and inter-particle interactions in solutions and in colloidal systems: van der Waals, electrostatic, hydrophobic. Polymers in solutions, surfactants in solutions, colloidal systems in electrolyte environment, with surfactants and with polymers. Surfaces and interfaces: surface energy, surface tension, wetting, biological surfaces and cell membranes, and how polymers interact with cell membrane.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 5394 Wetting Phenomena & Transport 3 Credits
Department: College of Engineering
Young-Dupre approach to wetting and the relation between Marangoni Effect and the spreading coefficient. Covers the concept of complete wetting, partial wetting, and non-wetting systems. Follows some experimental methods related to wetting.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6110 Professional Seminar 1 Credit
Department: College of Engineering
Advanced topics suitable for research along with research procedures will be discussed. Field study organization and content together with doctoral research problems and progress will be represented. Topics will vary each semester and course may be repeated for credit. Registration and completion for three semesters is required of all doctoral candidates.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6301 Special Topics 3 Credits
Department: College of Engineering
An investigation into specialized study in advanced areas of engineering under guidance of a faculty member. This course may be repeated for credit when topics of investigation differ.
May be Repeated for a maximum of 18 hours
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6302 Transport Phenomena 3 Credits
Department: College of Engineering
Analysis of transport with respect to fluid dynamics, heat and mass transfer. Derivation of Navier-Stokes Equation and its application to flow phenomena. Boundary layer flows, molecular interpretation of viscosity, and interfacial tension and its relation to slip/non-slip condition. Interdependence of fluid flow, heat transfer, and mass transfer. Tensor and vector notation will be presented and employed.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6343 Kinetics and Reactor Design 3 Credits
Department: College of Engineering
Emphasis is placed on complex reactor design, Attention is devoted to chemical kinetics and catalysis as well as to the engineering aspects of both homogeneous and heterogeneous reactors. Mixing problems in terms of residence, time distribution. The importance of temperature effects is stressed.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6345 Fundamentals of Sustainability 3 Credits
Department: College of Engineering
This course examines the scientific basis and technology details of sustainability, defined as minimization of the effect of entropy on society. Emphasizes the interface among engineering, environment, and economics. Incorporates the ideas of sustainability into chemical engineering fields such as process and product design, manufacturing, and value chain management for the purpose of minimizing both resource utilization and adverse environmental impact.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6347 Advanced Thermodynamics 3 Credits
Department: College of Engineering
Derivation of thermodynamic laws and application to physical chemical phenomena. Development of ideal and non-ideal gas, liquid, and solid solution behaviors for physical and chemical equilibria. Course credit in chemistry is optional.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6348 Adv Chem Engineering Math 3 Credits
Department: College of Engineering
The course covers the fundamentals and numerical techniques for Linear Systems of Equations, Nonlinear Systems of Equations, Numerical ifferentiation/Integration, Regression Analysis, Systems of Ordinary Differential Equations, and Partial Differential Equations, for modeling and analysis of chemical engineering systems.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6349 Advanced Air Pollution Control 3 Credits
Department: College of Engineering
Air pollution fundamentals and design principles; absoprtion, incineration, atmospheric dispersion modeling and particulate matter (PM)/volatile organic compounds (VOC's) sulfur dioxide (SO_2)/nitrogen oxides (NO_x)/ odor/carbon dioxide emissions control.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6352 Advanced Process Control 3 Credits
Department: College of Engineering
Learn the fundamentals in advanced PID control and be able to perform dynamic model fitting, advanced PID controller configuration/tuning with Control Station software. Learn to install a multi-loop, constraint controller to control a process and learn the fundamentals of dynamic modeling, constraint optimization, and multivariable control. Specifically, be able to apply the concepts of Linear Algebra, Regression Analysis, and Linear Programming through Dynamic Matrix Control workshop exercises (Fractionator, LP-Cost, Dynamic Tuning).
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6357 Process Simulation 3 Credits
Department: College of Engineering
The successful student will be able to perform complete and accurate simulations of flow sheets ranging from single units to entire plants by means of the techniques covered in this class.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6358 Advanced Process Simulation 3 Credits
Department: College of Engineering
Learn the use of computer software for full-scale plant process simulation. Learn the fundamentals (Thermodynamics, Convergence, Optimization, Dynamics).
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6361 Process Optimization 3 Credits
Department: College of Engineering
Linear and non-linear optimization. Introduction to optimization technique and concepts.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6368 Art Neural Networks/FZ Logic 3 Credits
Department: College of Engineering
Study of various Artificial Neural Network architectures for real-world applications. Massive parallel computation, fault tolerance and adaptation characteristics. Emphasis on computer simulation of ANN-architectures and their applications.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6371 Materials Science and Engineering 3 Credits
Department: College of Engineering
Materials preparation processes and applications in various chemical engineering processes, such as fuel cells, energy storage, corrosion protection and oxygen membrane separation will be discussed in this class. Students will learn both theory and application of modern analytical method for material characterization.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6372 Chemical Process Safety 3 Credits
Department: College of Engineering
This course aims to provide doctoral students with the knowledge, ability and skill of chemical process safety including the engineering principles, safety management concepts, leading and lagging metrics for process safety, techniques for process hazard analysis, risk assessment, and accident investigation.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6373 Numerical Methods for Engineers 3 Credits
Department: College of Engineering
This course will teach doctoral students to develop and implement numerically stable and accurate algorithms for all of the advanced tasks of computational chemical engineering.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6374 Bio-Process Engineering 3 Credits
Department: College of Engineering
This course provides students with basic concepts and prepares them to meet the challenges of the new and emerging biotechnology industry. This course aims to provide doctoral students with the knowledge and skills of basic biological systems.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6375 Plant Safety and Security 3 Credits
Department: College of Engineering
This course aims to provide doctoral students with the knowledge, ability and skill of plant safety and security - including the programs of OSHA, PSM, EPA RMP, DHS CFAT and DOT CTSS. Doctoral students are required to conduct advanced research and study on plant safety and security/abnormality management on national and global challenges for the chemical industry.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6378 Data Analysis for Engineering 3 Credits
Department: College of Engineering
This course will provide a variety of methods to help chemical engineers analyze data sets, uncover important information and make good decisions. Doctoral students are required to apply the techniques of data analysis to conduct advanced research and study on national and global challenges for the chemical industry.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

CHEN 6380 Research 3 Credits
Department: College of Engineering
A Ph.D. student must enroll in at least 12 hours of research courses (CHEN 6680) for conducting research project prior to admission to candidacy.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Satisfactory/Unsatisfactory, Registrar do not use FN, Registrar do not use FS, Thesis/Dissertation, Standard Letter

CHEN 6390 Dissertation 3 Credits
Department: College of Engineering
A continuous enrollment for at least six dissertation credit hours each semester upon advancement to candidacy; direct supervised research. Graded on a credit (CR) or no-credit (F) basis. Award of credit for the final dissertation course is contingent upon successful defense of the dissertation. Minimum of 18 credit hours is required.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Satisfactory/Unsatisfactory, Registrar do not use FN, Registrar do not use FS

CHEN 6391 Dissertation II 3 Credits
Department: College of Engineering
Continuous enrollment for at least six dissertation credit hours each
semester upon advancement to candidacy; direct supervised research.
Graded on a credit (CR) or no-credit (F) basis. Award of credit for the
final dissertation course is contingent upon successful defense of the
dissertation. Minimum of 18 credit hours is required.
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Satisfactory/Unsatisfactory, Registrar do not use FN,
Registrar do not use FS

CHEN 6680 Research 6 Credits
Department: College of Engineering
A Ph.D. student must enroll in at least 12 hours of research courses
(CHEN 6380) for conducting research project prior to admission to
candidacy.
May be Repeated for a maximum of 18 hours
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Thesis/Dissertation, Registrar do not use FN, Registrar do
not use FS, Standard Letter, Satisfactory/Unsatisfactory

CHEN 6690 Ph. D. Dissertation 6 Credits
Department: College of Engineering
A continuous enrollment for at least six dissertation credit hours each
semester upon advancement to candidacy; direct supervised research.
Graded on a credit (CR) or no-credit (F) basis. Award of credit for the
final dissertation course is contingent upon successful defense of the
dissertation. Minimum of 18 credit hours is required.
May be Repeated for a maximum of 18 hours
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Thesis/Dissertation, Registrar do not use FN, Registrar do
not use FS, Satisfactory/Unsatisfactory

CHEN 6691 Ph. D. Dissertation 6 Credits
Department: College of Engineering
Continuous enrollment for at least six dissertation credit hours each
semester upon advancement to candidacy; direct supervised research.
Graded on a credit (CR) or no-credit (F) basis. Award of credit for the
final dissertation course is contingent upon successful defense of the
dissertation. Minimum of 18 credit hours is required.
May be Repeated for a maximum of 18 hours
Restriction(s):
Undergraduate level students may **not** enroll.

Grade Mode(s): Satisfactory/Unsatisfactory, Registrar do not use FN,
Registrar do not use FS, Thesis/Dissertation