

# GRADUATE PROGRAM IN CHEMICAL ENGINEERING

## MASTER OF SCIENCE IN CHEMICAL ENGINEERING DOCTOR OF PHILOSOPHY IN CHEMICAL ENGINEERING

### SCHOOL OF CHEMICAL, BIOLOGICAL AND MATERIALS ENGINEERING THE UNIVERSITY OF OKLAHOMA

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We offer both masters and doctoral degrees in chemical engineering. Research can be in a variety of areas, including advanced energy systems, biochemical and biomedical engineering, catalysis, process optimization, nanotechnology, novel separation methods, polymers, reaction kinetics, surface science, thermodynamics, and thin films.

Any student with an undergraduate degree in chemical engineering or its equivalent from an accredited school and a grade point average (GPA) of at least 3.0 (on a 4.0 scale) during the last 60 hours of undergraduate course work may be admitted as a student in full standing.

#### MASTER OF SCIENCE

The Master of Science degree program can be readily completed in two years. A thesis is required.

Course work requirements for the M.S. degree in Chemical Engineering are:

3 Required Graduate-level Chemical Engineering Courses: (CH E 5183 Graduate Transport Phenomena, CH E 5843 Advanced Chemical Engineering Thermodynamics, and CH E 6723 Advanced Kinetics and Reaction Engineering)	9 hours
2 Graduate-level Chemical Engineering Electives	6 hours
2 Graduate-level Science, Math, or Engineering Electives	6 hours
Seminar in Chemical Engineering Research (1 hour/semester)	3-4 hours
Masters Thesis Course Hours	<u>6 hours</u>
<b>TOTAL</b>	<b>30-31 HOURS</b>

A special curriculum for students with undergraduate degrees in a field such as chemistry, physics, or mechanical engineering is available.

#### DOCTOR OF PHILOSOPHY

Nine hours of course work beyond the Master of Science are required for the Ph.D. degree in chemical engineering to make a total of 90 post-baccalaureate hours. Research credit hours make up the balance of the 90 hours with a minimum of 46 and a maximum of 59. The additional course work hours must include CH E 5523, Advanced Mathematical Methods in Science and Engineering, plus two courses selected from advanced math, science, and engineering courses in consultation with the student's research supervisor.- It is possible for a good student with a M.S. degree to complete the requirements for the Ph.D. in a period of four years.

A student working towards a Ph.D. degree must pass a qualifying exam and a general exam before being admitted as a candidate for this degree. The qualifying exam consists of written exams in 1) thermodynamics, 2) transport phenomena, and 3) kinetics and reaction engineering. The general examination involves writing a paper on the student's research project. The general examination also includes an oral presentation on the written report.

The following is a list of courses in Chemical Engineering and related disciplines (on back) that are available for graduate credit.

#### CHEMICAL ENGINEERING (CH E)

CH E G4153 - Process Dynamics and Control	CH E G5563 - Properties and Applications of Porous Materials
CH E G4253 - Process Design and Safety	CH E G5643 - Natural Gas Utilization
CH E G4262 - Chemical Engineering Design Laboratory	CH E G5673 - Colloid and Surface Science
CH E G4273 - Advanced Process Design	CH E G5693 - Cellular Aspects in Tissue Engineering
CH E G4473 - Kinetics	CH E G5703 - Biology for Engineers
CH E G5163 - Heterogeneous Catalysis	CH E G5723 - Biosensors
CH E G5183 - Graduate Transport Phenomena	CH E G5823 - Advanced Numerical Methods
CH E G5203 - Bioengineering Principles	CH E G5843 - Advanced Chemical Engineering Thermodynamics
CH E G5243 - Biochemical Engineering	CH E G5960 - Directed Readings
CH E G5293 - Transport in Biological Systems	CH E G5970 - Special Topics/Seminar
CH E G5373 - Tissue Engineering	CH E G5971 - Seminar in Chemical Engineering Research
CH E G5453 - Polymer Science	CH E G5980 - Research for Master's Thesis
CH E G5463 - Polymer Processing	CH E G5990 - Independent Study
CH E G5480 - Seminar in Selected Topics in Chemical Engineering	CH E G6723 - Advanced Kinetics and Reaction Engineering
CH E G5513 - Surface Characterization	CH E G6960 - Directed Reading
CH E G5523 - Advanced Mathematical Methods in Science and Engineering	CH E G6970 - Special Topics/Seminar
CH E G5533 - Materials Design for Energy Applications	CH E G6990 - Research for Doctoral Dissertations
	CH E G6990 - Special Chemical Engineering Problems

## RELATED COURSES AVAILABLE FOR GRADUATE CREDIT

### AEROSPACE AND MECHANICAL ENGINEERING (AME)

AME G5213 Biomechanics I  
 AME G5223 Biomechanics II  
 AME G5233 Biomaterials  
 AME G5253 Implantable Devices  
 AME G5293 Transport in Biological Systems  
 AME G5333 Thermodynamics and Combustion  
 AME G5573 Advanced Engineering Analysis  
 AME G5710 Topics in Solid Mechanics  
 AME G5720 Topics in Fluid Mechanics  
 AME G5803 Principles of Heat Transfer  
 AME G5973 Computational Heat and Fluid Flow

### BIOMEDICAL ENGINEERING (BME was BIOE)

BME G5203 Bioengineering Principles  
 BME G5213 Biomechanics I  
 BME G5223 Biomechanics II  
 BME G5233 Biomaterials  
 BME G5243 Biomedical Engineering  
 BME G5253 Implantable Devices  
 BME G5293 Transport in Biological Systems  
 BME G5373 Tissue Engineering  
 BME G5393 Introduction to Computer- Aided Tissue Engineering  
 BME G5693 Cellular Aspects in Tissue Regeneration  
 BME G5703 Biology for Engineers  
 BME G5723 Biosensors  
 BME G5853 Biomedical Signals and Systems  
 BME G5960 Directed Readings  
 BME G5970 Special Topics/Seminar (Various topics)  
 BME G6970 Advanced Topics in Bioengineering

### CHEMISTRY AND BIOCHEMISTRY (CHEM)

CHEM G3653 Introduction to Biochemistry  
 CHEM G4033 Instrumental Methods of Chemical Analysis Laboratory  
 CHEM G5100 Instrumental Methods of Analysis  
 CHEM G5110 Spectroscopic Chemical Analysis  
 CHEM G5120 Separation Methods  
 CHEM G5160 Special Topics in Analytical Chemistry: Instrumentation  
 CHEM G5170 Special Topics in Analytical Chemistry: Methodology  
 CHEM G5180 Practicum in Analytical Chemistry  
 CHEM G5200 Principles of Biochemistry  
 CHEM G5210 Molecular Biology  
 CHEM G5240 Biochemical and Biophysical Methods  
 CHEM G5260 Special Topics in Biochemistry I  
 CHEM G5270 Special Topics in Biochemistry II  
 CHEM G5280 Practicum in Biochemistry  
 CHEM G5300 Intermediate Inorganic Chemistry

CHEM G5330 Advanced Inorganic Chemistry  
 CHEM G5360 Frontiers in Inorganic Chemistry  
 CHEM G5380 Practicum in Inorganic Chemistry  
 CHEM G5400 Organic Chemistry I: Mechanisms and Reactivity  
 CHEM G5430 Organic Chemistry II: Reactions and Synthesis  
 CHEM G5450 Structural Characterization of Organic Compounds  
 CHEM G5460 Special Topics in Chemical Reactivity and Physical Organic Chemistry  
 CHEM G5470 Special Topics in Bioorganic and Specialized Organic Compounds  
 CHEM G5480 Practicum in Organic Chemistry  
 CHEM G5500 Topics in Quantum Chemistry  
 CHEM G5510 Topics in Molecular Symmetry  
 CHEM G5520 Topics in Physical Chemistry Kinetics  
 CHEM G5530 Topics in Statistical Thermodynamics  
 CHEM G5550 Colloid and Surface Science  
 CHEM G5560 Topics in Nanotechnology and Bionanotechnology  
 CHEM G5570 Selected Topics in Physical Chemistry  
 CHEM G5580 Practicum in Physical Chemistry  
 CHEM G5730 Macromolecular Crystallography  
 CHEM G5740 Biological NMR Spectroscopy  
 CHEM G5750 Macromolecular Structure and Function  
 CHEM G5760 Special Topics in Structural Biology  
 CHEM G5780 Practicum in Structural Biology

### CIVIL ENGINEERING AND ENVIRONMENTAL SCIENCE (CEES)

CEES G5114 Aquatic Chemistry  
 CEES G5244 Physiochemical Water Treatment Process  
 CEES G5283 Environmental Organic Chemistry  
 CEES G5324 Environmental Biology and Ecology  
 CEES G5624 Biological Waste Treatment  
 CEES G5833 Ground Water Quality Protection  
 CEES G5853 Groundwater and Seepage  
 CEES G5943 Air Quality Management

### ELECTRICAL AND COMPUTER ENGINEERING (ECE)

ECE G5033 Neural Networks  
 ECE G5043 Fuzzy Logic  
 ECE G5063 Pattern Recognition and Computer Vision  
 ECE G5213 Digital Signal Processing

### INDUSTRIAL ENGINEERING (I E)

I E G5323 Advanced Production Systems and Operation  
 I E G5343 Reliability in Engineering Design  
 I E G5623 Linear Programming  
 I E G5643 Engineering Optimization

### MATHEMATICS (MATH)

MATH G3333 Linear Algebra I  
 MATH G3413 Physical Mathematics I  
 MATH G3423 Physical Mathematics II  
 MATH G4163 Introduction to Partial Differential Equations  
 MATH G5163 Partial Differential Equations

### MICROBIOLOGY (MBIO)

MBIO G4833 Basic Immunology  
 MBIO G4853 Physiology of Microorganisms  
 MBIO G5843 Introduction to Molecular Biology  
 MBIO G6873 Microbial Ecology

### PETROLEUM ENGINEERING (P E)

P E G4033 Oil, Gas and Environmental Law  
 P E G4521 Reservoir Fluid Mechanics Laboratory  
 P E G5143 Fluid Flow in Porous Media  
 P E G5243 Introduction to Rock Mechanics  
 P E G5423 Advanced Stimulation  
 P E G5533 Petroleum Reservoir Development  
 P E G5603 Introduction to Natural Gas Engineering and Management  
 P E G5613 Natural Gas Engineering  
 P E G5623 Natural Gas Processing  
 P E G6153 Transport Phenomena in Porous Media

### PHYSICS (PHYS)

PHYS G3223 Modern Physics for Engineers  
 PHYS G3803 Introduction to Quantum Mechanics I  
 PHYS G5013 Mathematical Methods in Physics  
 PHYS G5163 Statistical Mechanics  
 PHYS G5243 Solid State Physics  
 PHYS G5393 Quantum Mechanics I  
 PHYS G5403 Quantum Mechanics II  
 PHYS G5573 Electrodynamics I  
 PHYS G5583 Electrodynamics II

### ZOOLOGY

ZOO G3103 Principles of Physiology  
 ZOO G5153 Endocrinology  
 ZOO G5364 Transmission Electron Microscopy  
 ZOO G5374 Scanning Electron Microscopy  
 ZOO G5843 Introduction to Molecular Biology



**The UNIVERSITY of OKLAHOMA**  
*Gallogly College of Engineering*  
 School of Chemical, Biological and Materials Engineering