

# Wayne H. King Department of Chemical Engineering and Natural Gas Engineering

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## Contact Information

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## Chemical Engineering Program Educational Objectives

The Chemical Engineering Program seeks to prepare graduates who, after the first few years of their professional career, have:

1. Established themselves either as practicing chemical engineers, or by gaining additional formal education through enrollment in either an engineering or business graduate school program.
2. Adapted to ever-changing demands by updating their core knowledge and abilities through on-the-job training and continuing education courses.
3. Functioned successfully in their professional responsibilities, which include safety, health, environmental, and ethical aspects.
4. Established themselves as critical, flexible thinkers with demonstrated potential as further technology experts or technology managers in their professional and in society.

## Natural Gas Engineering Program Educational Objectives

The Natural Gas Engineering Program seeks to prepare graduates who, after the first few years of their professional career, have:

1. Established themselves either as practicing natural gas engineers, or have gained additional formal education through enrollment in either an engineering or business graduate school program.
2. Adapted to ever-changing, demands by updating their core knowledge and abilities through on-the-job training and continuing education courses.
3. Functioned successfully in their professional responsibilities, which include safety, health, environmental, and ethical aspects.
4. Established themselves as critical, flexible thinkers with demonstrated potential as future technology experts or technology managers in their profession and in society.

## Department Faculty

**Alexander, Matthew L** Associate Professor, Wayne H. King Department of Chemical and Natural Gas Engineering; B.S., Trinity University; M.S., Georgia Institute of Technology; Ph.D., Purdue University.

**Amaya, Joseph** Visiting Assistant Professor, Wayne H. King Department of Chemical and Natural Gas Engineering; B.S., Texas A&M University-Kingsville; M.S., Texas A&M University-Kingsville; Ph.D., Texas A&M University-Kingsville.

**Cabezas, Jose** Professor of Practice, Wayne H. King Department of Chemical and Natural Gas Engineering; B.S., Escuela Superior Politécnica del Litoral (Ecuador); M.S., Texas A&M University-Kingsville; Ph.D., Texas A&M University-Kingsville.

**Duarte, Horacio** Associate Professor, Wayne H. King Department of Chemical and Natural Gas Engineering; B.S., Instituto Tecnológico Regional de Durango (Mexico); M.Eng., Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico); Ph.D., Texas A&M University.

**Fan, Zhaoqi** Associate Professor, Wayne H. King Department of Chemical and Natural Gas Engineering; B.Sc., China University of Petroleum (China); Ph.D., China University of Petroleum (China); Ph.D., University of Regina (Canada).

**Mills, Sr., Patrick** Professor, Wayne H. King Department of Chemical and Natural Gas Engineering; B.S., Tri-State University; M.S., Washington University in St. Louis; D.Sc., Washington University in St. Louis.

**Pilehvari, Ali** Professor, Wayne H. King Department of Chemical and Natural Gas Engineering; Chair; B.S., Tehran Polytechnique (Iran); M.E., University of Tulsa; Ph.D., University of Tulsa.

**Rahmani, Nazmul** Professor of Practice, Wayne H. King Department of Chemical and Natural Gas Engineering; B.Sc., Bangladesh University of Engineering and Technology (Bangladesh); M.Sc., University of North Dakota; Ph.D., University of Alberta (Canada).

**Xiao, Chongwei** Associate Professor, Wayne H. King Department of Chemical and Natural Gas Engineering; B.A., Hubei University (China); M.E., Beijing Institute of Technology (China); Ph.D., University of Wyoming.

## Chemical Engineering (CHEN)

### **CHEN 2371** Conservation Principles I **3 SCH (3-0)**

Applications of the conservation laws of mass to the solution of chemical engineering problems. Prerequisites: CHEM 1312 or PHYS 2325/PHYS 2125.

### **CHEN 2372** Conservation Principles II **3 SCH (3-0)**

Applications of the conservation laws of energy to the solution of chemical engineering problems. Prerequisite: CHEN 2371.

### **CHEN 3305** Intro to ChE for Non-Majors **3 SCH (3-0)**

A comprehensive introduction to the basic principles and technologies used by chemical engineers in industry today. Includes an introduction to basic quantitative principles in the fundamental chemical engineering topics of mass and energy balances, fluid and heat transport, and thermodynamics. Credit for this course is not allowed if the student has declared chemical engineering as their major. This course is required for non-majors pursuing the Chemical Process Industries certificate. Pre-requisites: CHEM 1312, MATH 2414, and PHYS 2326.

### **CHEN 3310** Heat Transport Phenomena **3 SCH (3-0)**

Fundamentals of energy transport and system applications involving this operation including computer applications to heat exchanger design. Prerequisites: CHEM 3323/CHEM 3123, CHEN 3392, CHEN 3347 or MEEN 3347.

### **CHEN 3315** Chemical Process Design I **3 SCH (3-0)**

Basic principles and techniques of economic analysis and cost engineering with applications to problems in chemical process and equipment design. Prerequisites: CHEN 2372 and credit for or registration in CHEN 3310.

### **CHEN 3321** Process Simulation **3 SCH (3-0)**

Basic numerical methods used in chemical process simulation. An introduction to the use of commercial process simulators, with hands-on applications. Prerequisite: MATH 3320, credit or registration in CHEN 3310.

### **CHEN 3347** Chem Eng Thermodynamics I **3 SCH (3-0)**

Theory and applications of the first and second laws of thermodynamics to mechanical, chemical, magnetic and electrical interactions for both reversible and irreversible processes. Prerequisite: MATH 2414. Corequisites: PHYS 2326/PHYS 2126.

### **CHEN 3371** Chemical Thermodynamics II **3 SCH (3-0)**

Procedures for deciding when and to what extent chemical reactions and phase changes may be expected to occur according to the basic principles of physical chemistry and the laws of thermodynamics. Application of computers to advanced thermodynamic problems. Prerequisites: CHEM 3325/ CHEM 3125, CHEM 3331, and CHEN 3347.

### **CHEN 3392** Fluid Transport Phenomena **3 SCH (3-0)**

Fundamentals of momentum transport, including fluid statics, flow of compressible and incompressible fluids, pumps, turbines, and compressors, with computer applications. Prerequisites: MATH 3320 and credit or registration in MEEN 2302 or MEEN 2355.

### **CHEN 4120** Seminar in CHEN **1 SCH (1-0)**

Seminar on contemporary issues in Chemical Engineering. Prerequisite: junior standing.

### **CHEN 4130** Service Learning in CHEN **1 SCH (1-0)**

Service learning experience in a project that engages a community agency and raises awareness of chemical engineering professional issues. Prerequisite: junior standing.

### **CHEN 4278** Unit Operations **2 SCH (0-6)**

Selected laboratory experiments on fluid flow and heat transfer. Prerequisite: CHEN 3310.  
Fee: \$5.00

### **CHEN 4279** Unit Operations Lab **2 SCH (0-6)**

Selected laboratory experiments on heat and mass transfer. Prerequisite: CHEN 4378 and CHEN 4389.  
Fee: \$5.00

### **CHEN 4311** Biochemical Engineering **3 SCH (3-0)**

Principles involved in the processing of biological materials using biological agents such as cells, enzymes or antibodies. Prerequisites: BIOL 1306, CHEM 3325/CHEM 3125 and CHEN 4373.

### **CHEN 4316** Chemical Process Design II **3 SCH (3-0)**

The application of chemical engineering principles to a sequence of design problems utilizing computer software, such as SIMSCI. Prerequisites: CHEN 3315, CHEN 3371 and CHEN 3310.

### **CHEN 4317** Chem Process Design III (WI) **3 SCH (3-0)**

The application of chemical engineering principles, including economic criteria to a comprehensive design problem. Computer software is utilized as a design aid. Prerequisites: CHEN 4316, CHEN 4373, CHEN 4389 and credit for or registration in CHEN 4392.

### **CHEN 4335** Special Problems **1-3 SCH (1-3)**

Individual solution of selected problems in chemical engineering conducted under direct supervision of a faculty member. May be repeated for up to six hours. Prerequisite: senior standing.

**CHEN 4341 Chemical Process Safety 3 SCH (3-0)**

A comprehensive overview of safety topics in the design, construction, startup, operation, and shutdown of chemical plants and refineries. Pre-requisite: CHEN 3310.

**CHEN 4342 Chem Process Sustainability 3 SCH (3-0)**

A study of sustainability topics applied to the chemical process industry, focusing on energy conservation, process and utility water conservation, hazardous chemical replacement or minimization, and process substitution at chemical process plants and refineries. Pre-requisites: CHEM 3310.

**CHEN 4343 Envr Treatment Chem Processes 3 SCH (3-0)**

A study of the different processes used to treat air, water, and solid waste streams associated with the chemical process industry and refineries. Pre-requisites: CHEN 3310 and CHEN 4389.

**CHEN 4373 Chemical Reactor Engineering 3 SCH (3-0)**

Chemical reaction rates and design of chemical reactors. Applications of computers to chemical kinetics and the design of chemical reactors. Prerequisites: CHEM 3332, CHEN 3310, CHEN 3321 and CHEN 3371.

**CHEN 4386 Air Pollution Control 3 SCH (3-0)**

A fundamental approach to air pollution testing, control and design of control systems. Introduction to dispersion modeling via computer. Prerequisite: CHEN 3392 and senior standing.

**CHEN 4389 Mass Transport Phenomena 3 SCH (3-0)**

Fundamentals of mass transport, including gas absorption, extraction, membrane separation, binary and multicomponent distillation, with computer design applications. Prerequisites: CHEM 3331, CHEN 3321, CHEN 3371 and credit or registration in CHEN 3310.

**CHEN 4392 Process Dynamics and Control 3 SCH (2-3)**

Basic operating theory of control instruments and their application to industrial chemical process. Applications of computers to process control. Prerequisites: CHEN 4373 and CHEN 4389.

Fee: \$5.00

**CHEN 4399 Internship in CHEN 1-3 SCH (1-3)**

Internships in industry, government, or consulting companies in career-based practical activities to broaden the skills obtained through curricular education. Prerequisite: junior standing.

**Natural Gas Engineering (NGEN)****NGEN 3122 Reservoir Engineering Lab 1 SCH (0-3)**

Experimental study of various petroleum reservoir properties including porosity, permeability, pore pressure, rock compressibility, rock resistivity, and capillary pressure. Prerequisite: Junior standing in engineering. Credit for or current registration in CHEN/NGEN 3322.

**NGEN 3193 Drilling Engineering Lab 1 SCH (0-3)**

Standard laboratory testing of drilling fluids including density, marsh viscosity, rheology, retort kit separation, API filter press-static filtration, lubricity and electrical stability. Prerequisite: Junior standing in engineering. Credit for or current registration in CHEN 3393 required.

**NGEN 3322 Fund of Reservoir Engineering 3 SCH (3-0)**

Physical properties of petroleum reservoir rocks, lithology, porosity, fluid saturations, permeability and capillary characteristics as they relate to the production of oil and gas. Properties of hydrocarbon systems. Material balance methods. Flow of fluids in porous media. Prerequisites: Credit or registration in CHEN/NGEN 3392, GEOL 1303/1103 and CHEM 3323. Corequisite: CHEM 3123.

Fee: \$5.00

**NGEN 3373 Nat Gas Property Evaluation 3 SCH (3-0)**

The course is designed to give an overview on the definition of resources/reserves, formation evaluation (production forecast and reserves estimate), and petroleum economics. The students acquire the background of basic economics in evaluating an oil and gas property. The requirement also includes the engineering calculations that are needed for estimating cost and profit associated with a project. Prerequisite: NGEN 3392.

**NGEN 3392 Fluid Transport Phenomena 3 SCH (3-0)**

Fundamentals of momentum transport including fluid statics, flow of compressible and incompressible fluids, pumps, turbines, and compressors, with computer applications. Prerequisite: MATH 3320; credit or registration in MEEN 2355 or MEEN 2302. (Credit may not be obtained in both NGEN 3392 and CHEN 3392.)

**NGEN 3393 Natural Gas Drilling Engg 3 SCH (3-0)**

Introduction to drilling equipment and methods, drilling fluids, casing and cementing of wells. Application of computers to the drilling of wells. Contemporary methods of well completion. Prerequisites: NGEN 3322 and CHEN 3392 or NGEN 3392.

**NGEN 4178 Hydrocarbon Measurements Lab 1 SCH (0-3)**

Experimental study of hydrocarbon gas and liquid properties and flow rates measurements under different conditions. Several of the experiments are gas flow studies through pipes made of different materials, various types of valves and fittings. Experiments also include Heat Exchanges, Distillation Column, and Gas-Liquid Absorption. Pre-requisite: Senior Standing. Credit or current enrollment in NGEN 4378.

**NGEN 4279 Unit Operations Laboratory 2 SCH (0-6)**

Selected laboratory experiments in heat and mass transfer. Prerequisite: CHEN 4389. (Credit may not be obtained in both NGEN 4279 and CHEN 4279.)

Fee: \$5.00

**NGEN 4297 Capstone Design I 2 SCH (2-0)**

Principles of design from conception to completion, and various constraints of designs including economics, safety, and ethics and environment. The economics will cover time value of money and its application to oil and gas property evaluation. Prerequisites: NGEN 3321 and senior standing in Engineering. Credit for or enrollment in NGEN 4396.

**NGEN 4375 Natural Gas Distribution 3 SCH (3-0)**

Pipeline and compressor station design. Pipeline integrity and environmental issues associated with pipeline placement and design. Prerequisite: CHEN 3392 or NGEN 3392.

**NGEN 4378 Hydrocarbon Measurement 3 SCH (3-0)**

Theory and practice of measurement of hydrocarbon gas and liquid properties and flow. Prerequisites: NGEN/CHEN 3392 and NGEN 4375.

**NGEN 4382 NG Cryogenics and Storage 3 SCH (3-0)**

This course provides a comprehensive technical review of the compressed and liquefied Natural Gas (LNG) industry. The course objectives are to describe - the cryogenic flow process of natural gas, LNG specific properties, equipment and technical processes, hazards associated with operations, hazard prevention and mitigation measures, LNG storage, loading/offloading and transportation. Use of computer aided simulation and economic evaluation of LNG facilities design. Prerequisite: NGEN 4389.

**NGEN 4383 Natural Gas Processes 3 SCH (3-0)**

The design, operation and economics of systems for the utilization of hydrocarbon gases and liquids, the concentration of their components by absorption and fractionation procedures. Use of computer aided design

and economic evaluation of facility designs. Prerequisite: CHEN 4389.  
(Credit may not be obtained in both NGEN 4383 and CHEN 4383.)

**NGEN 4387 Seismic Interp & Well-Logging 3 SCH (3-0)**

Theory and methods of modern seismic and well log interpretation.  
Prerequisite: NGEN 3493 or GEOL 3431.

**NGEN 4389 Separation Processes 3 SCH (3-0)**

Fundamentals of separation processes in petroleum industry, including sedimentation, filtration, centrifugation, thermodynamic phase equilibrium flash calculations, gas absorption, and distillation with computer design applications. Pre-requisites: CHEN 3310 and CHEN 3321.

**NGEN 4396 Natural Gas Production 3 SCH (3-0)**

Theory, design and methods of gas well testing and production forecasting. Estimating the value of gas and oil properties. Environmental issues and professional responsibility.  
Prerequisites: NGEN 3322 / CHEN 3392.

**NGEN 4398 Capstone Design II (WI) 3 SCH (3-0)**

In teams, students complete significant design projects that include two or more aspects of natural gas engineering. Prerequisite: NGEN 4297, and student has 6 or fewer credit hours of of NGEN courses to complete in subsequent terms.

**NGEN 4478 Hydrocarbon Measurement 4 SCH (3-3)**

Theory and practice of measurement of hydrocarbon gas and liquid properties and flow. Prerequisites: NGEN/CHEN 3392 / NGEN 4375.

**Majors**

- Chemical Engineering, B.S.
- Natural Gas Engineering, B.S.

**Minors**

- Cyber Intelligence, Minor
- Natural Gas Midstream Engineering, Minor

**Certificates**

- Chemical Process Industry, Certificate