MISSION STATEMENT

1. To provide a high-quality education for undergraduate and graduate Chemical Engineering students through a comprehensive curriculum that emphasizes basic science, mathematics, engineering science, and engineering design. UH ChE faculty members are expected to maintain their reputations as superior teachers and to provide a stimulating educational environment.

2. To engage in research programs that train graduate students, procure support for this research on a continuous basis, and contribute to the development of fundamental knowledge in the field of chemical engineering. Our Department's varied and aggressively pursued research ensures that our faculty members remain at the technological forefront of their respective areas of specialization.

3. To be of service to the community at large and, in particular, to the State of Texas, and to provide the local engineering community opportunities for advanced and continuing education.

THE UNIVERSITY OF HOUSTON provides equal treatment and opportunity to all persons without regard to race, color, religion, national origin, sex, age, disability, veteran status or sexual orientation except where such distinction is required by law. This statement reflects compliance with Titles VI and VII of the Civil Rights Act of 1964, Title IX of the Educational Amendments of 1972 and all other federal and state regulations.

A special thanks to Mr. Toban Dvoretzky for compilation of this Report, as he has done in stellar fashion on a regular basis since he conceived and produced the inaugural issue in 1992.

Prepared by the University of Houston Department of Chemical Engineering, Toban Dvoretzky

Produced by the UH Cullen College of Engineering Office of Communications, Harriet Yim, Angie Shortt
CHAIRMAN’S SUMMARY

This is the 2000–2001 Annual Report of the University of Houston Department of Chemical Engineering. In it, we wish to introduce you to some of the facts and flair surrounding our people and program. We hope that you will find this report both informative and illuminating.

The evolution of the Department of Chemical Engineering has been closely coupled with the emergence of Houston as a world center for the chemical and petrochemical industries. Our Department was founded in 1947 by three engineers who worked in process plants in the area. Growth since that time has been dramatic. Over the years, our program has produced a significant number of undergraduate and graduate students who have risen to positions of prominence in industry and academia. Employers speak very highly of our graduates. We are confident that our recently graduated students will continue to add to our reputation and recognition.

Thanks in large measure to our productive and distinguished faculty, the Department has developed special research strengths in a broad range of areas. Our research specialties encompass traditional chemical engineering science and the emerging areas of advanced materials and biochemical engineering. Our laboratory facilities, dedicated to specific and general uses, afford excellent support for fundamental and novel research.

The Department has embarked on an important period of growth, with several faculty to be hired over the next few years. This past year, two new faculty joined our Department. Dr. Charles W. “Mickey” Rocks, recently retired from Monsanto and Solvay, is our newest Adjunct Professor. He is charged with reinventing our Undergraduate Practices Lab. Mickey brings with him many years of industrial research experience and an invaluable industrial perspective. This is of great benefit to the students. He will also participate in collaborative research in the area of catalytic reaction engineering. Prof. Peter G. Vekilov joins us for Fall 2001 from the faculty of the Chemistry Department of the University of Alabama at Huntsville. Peter, a leading expert in protein crystallization and structure, has developed a vigorous research program at UAH. His addition strengthens the Department in the biochemical science and engineering area, certainly a growing one for the field of chemical engineering.

Our Industrial Advisory Board first convened in April 1999, and semiannual meetings have occurred since. These valuable meetings generate much useful input from members of the group. We look forward to strengthening our interaction with the IAB members and the companies they represent. These relationships and the feedback are essential in helping us adjust our program to the ever-changing requirements of industry. The evolving needs in the chemical and oil industries affect all chemical engineers, and changes are required in the training of our graduates. While we must continue to provide our graduates a sound basis in the fundamentals of chemical engineering and a mastery of scientific tools, we need to prepare them to adjust to and succeed in a rapidly changing employment environment. We continue to welcome and solicit our IAB’s suggestions about what the appropriate changes should be.

We look forward to continued growth and mutually supportive interaction with you. We will appreciate any comments or suggestions that you have.

FACULTY & RESEARCH

The Department of Chemical Engineering comprises nine full professors, four associate professors, two professors emeriti, three affiliated faculty, two adjunct professors, three adjunct associate professors, and 21 lecturers.

Faculty Research Interests

PROFESSORS

AMUNDSON, NEAL R. (PhD Mathematics, Minnesota, 1945). Cullen Professor & Professor of Mathematics. Chemical reactions; transport; mathematical modeling.

BALKOATIAH, VEMURI (PhD ChE, Houston, 1984). Director of International Graduate Admissions. Chemical reaction engineering; environmental engineering; two-phase flow; dynamics of linear systems; applied mathematics.

ECONOMIDES, MICHAEL J. (PhD Physics, Stanford, 1984). University Professor. Petroleum production engineering; directional and multilateral wells; reservoir stimulation (fracturing, acidizing); petroleum research/management research; advanced reservoir exploitation strategies; well-completions.

ECONOMOU, DEMETRE J. (PhD ChE, Illinois, 1988). John and Rebecca Morrison Professor; Associate Department Chairman; Director of Undergraduate Admissions. Plasma- and field-emission; deposition of electronic material; atomic-layer-processing; composites and ceramics.


HAROLD, MICHAEL P. (PhD ChE, Houston, 1985). Dow Chair Professor & Department Chairman. Chemical reaction systems; multifunctional chemical reactors; reaction-separation materials and devices; catalytic and biocatalytic materials.

LUSS, DAN (PhD ChE, Minnesota, 1986). Cullen Professor. Chemical reaction engineering; pattern-formation in chemically reacting systems; dynamics and stability of chemical reactors; kinetics of solid-solid reactions; SHS of complex composites.

MOHANTY, KISHORE K. (PhD ChE, Minnesota, 1970). Director of MICH Program. Fluid flow; interfacial mechanics; porous-media transport; underground contaminants; oil recovery; fabrication of composite materials.

RICHARDSON, JAMES T. (PhD Physics/Chemistry, Rice, 1955). Heterogeneous catalysis and catalytic processes, reactor engineering, catalyst preparation and characterization, catalysis design, solid-state fuel cells, solar energy, solar-receiver design, solar-related chemical processes; catalytic processes for the destruction of hazardous wastes; high-temperature superconductivity; processing of ceramic superconductors.

ASSOCIATE PROFESSORS

KRISHNAOMOORTI, RAMANAN (PhD ChE, Princeton, 1994). Structural processing property relations for multiphase polymer; polymer crystallinity in bulk and thin films; thermodynamic interactions and miscibility of polymer blends and copolymers; macro- and nanocomposite structure and miscibility. Promoted effective Fall 2001.

NIKOLAOU, MICHAEL (PhD ChE, UCLA, 1989). Director of Domestic Graduate Admissions. Process simulation; process control; computer-aided process engineering; process optimization.


WILLSON, RICHARD C. (PhD ChE, MIT, 1980). Joint Associate Professor, Biochemical & Biophysical Sciences. Biochemical separations; molecular recognition.

PROFESSORS EMERITI

HENLEY, ERNEST J. (DSc, ChE, Columbia, 1953).

TILLER, FRANK M. (PhD ChE, Cincinnati, 1962). M.D. Anderson Professor; Joint Professor of Civil & Environmental Engineering. Fluid particle separation; ceramic processing; filtration, thickening, centrifugation; moisture transport in drying solids; CABC an analysis of solid-liquid systems; separation of biosolids from wastewater sludge; developing agricultural fibers as aids in solid/liquid separation and coalescence of oil/waters.

AFFILIATED FACULTY

BRIGGS, JAMES M. (PhD Chemistry, Rochester, 1989). Assistant Professor. Biochemical & Biophysical Sciences. Computational studies of protein structure and function; inhibitor design; investigations of possible inhibitor resistance pathways; development of methods for the above.

FOX, GEORGE E. (PhD Chemistry, Syracuse, 1974). Professor, Biochemical & Biophysical Sciences. Structure, function, and evolution of RNA.


ADJUNCT PROFESSORS


ROOKS, CHARLES W. “Mickey” (PhD ChE, Oklahoma, 1973). Director, Undergraduate Practices Laboratory.

ADJUNCT ASSOCIATE PROFESSORS

FLEISCHER, MICKY T. (PhD ChE, Houston, 1978).

MARPLE, STANLEY JR. (PhD ChE, MIT, 1943).

OLIGNEY, RONALD E. (BSc, MSci summa cum laude, Alaska-Rutgers, 1985). Director, Petroleum Institute.

LECTURERS

OH, Dr. Ye-Min Chen, Dr. John J. Crump, Mark Depuy, Faud Khir, Dr. Joseph M. Lee, Dr. Jagdish C. Maheshri, Dr. Jeffrey Smith, Dr. Raymond D. Steele, Albert Issett.

PEI, K. Jeffrey F. App, Dr. Jon Burger, Dr. Akhil Data-Gupta, Dr. Arvind David, Dr. Beld Onnink, Dr. J. Robert Gochnauer, Dr. J. Richard Hurd, Ross Kaste, John Martinez, David Murphy, Mike R. Fakie, Dean L. Fatur, Dr. Grant E. Robertson.
Departmental Research Activities

Prof. Vemuri Balakotaiah’s research involves the mathematical modeling and analysis of the interactions between the transport processes and reactions in various systems of engineering interest. The objective of the research is to elucidate the complex behavior of these nonlinear interactions and use this understanding to practical advantage. His group’s current research projects include modeling and analysis of catalytic monoliths (for pollution-reduction in automobiles, oxidation of VOCs, power generation, and removal of NOx from exhaust gases); bifurcation analysis of chemical reactors and reacting flows (developing analytical and computational techniques for reacting flows in order to explore and classify the different types of behaviors in the parameter space); studies of wavy films in liquid-liquid two-phase flows; and studies of these flows through packed beds under normal and microgravity conditions.

The research performed by Prof. Jim Briggs focuses on computational studies of protein structure and function, inhibitor design, investigations of possible inhibitor-resistance pathways, and development of methods for the above work. Targets for these studies include those important in the treatment of AIDS, cancer, tuberculosis, and other disease states.

Prof. Michael Economides’ research focuses on various aspects of petroleum engineering. Current research projects include next-generation high-intensity designs; complex well architecture in petroleum production; advanced petroleum-exploration strategies; and near-well states of stress in elastic and plastic rocks.

The research of Prof. Demetre Economou involves: [a.] Plasma etching and deposition: large-scale numerical simulations of plasma flow and chemistry in complex multidimensional geometries; fluid and direct simulation Monte Carlo (DSMC) approaches; parallel computing; plasma diagnostics, involving laser-induced fluorescence, mass spectrometry, in situ real-time multichannel laser interferometry, and ion-energy and angular-distribution detectors. [b.] Plasma physics, including electron velocity distribution functions; plasma heating; and new plasma sources and chemistries for advanced integrated-circuit manufacturing. [c.] Chemical vapor deposition, specifically metallicorganic chemical vapor deposition (MOCVD) of thin films, and photo-assisted and plasma-assisted MOCVD. [d.] Atomic-layer processing, involving nanofabrication, and experimental realization of atomic-layer etching and molecular-dynamics simulation of the interaction of energetic beams with crystal surfaces. Prof. Economou also performs computational/experimental studies of microwave-assisted chemical vapor infiltration (CVI) for the manufacture of composite materials.

The unifying theme behind the projects in the laboratory of Prof. George Fox is seeking an understanding of the role of RNA in the early evolution of life. Bioinformatics studies are performed on ribosomal components in bacterial genomes et al., and multiple bacterial species are monitored in spacecraft environments. Artificial RNAs are used as a possible monitoring system for genetically modified bacteria.

Prof. Mike Harold performs research in the areas of reactive separation devices and materials; multifunctional chemical reactor synthesis, analysis, and design; microfabricated chemical system devices and materials; selective-oxidation chemistry, kinetics, and reactors; and multiphase transport and reaction.

The specific research by Prof. Dan Luss involves the dynamic features of chemically reacting systems, such as reverse-flow reactors, hot-spot formation in packed-bed reactors, and the dynamics of polyolfin reactor polymerization via metalloene catalysts. Prof. Luss’ group also studies the use of membrane reactors to produce synthesis gas; the destruction of nitrogen oxides in reverse-flow reactors; and the formation of electrical and magnetic fields during high-temperature solid reactions.

Prof. Kishore Mohanty’s research is conducted in the area of colloid and interfacial science, specifically transport in microstructured media; improved oil recovery; remediation of underground contaminants; and multiphase flow. The oil-recovery studies involve seismic studies, logs (how tools respond), analysis of core samples, geologic analysis of chips, fluid analysis, routine core analysis, thin sections, and mineralogy. Actual samples are studied for relative permeability and the potential for oil recovery. His group designs geological and simulation models to see how production can be optimized. Specific projects have included 3-D porous media reconstruction by simulated annealing method; NMR response; impact of capillary and bond numbers on relative permeability; application of centrifuge techniques; studies of gas-condensate reservoirs during deep drilling; oil recovery via fracture reservoirs; near-miscible gas injection; and surfactants and foams to make vehicles that are good drug-delivery vehicles.

Prof. Mike Nikolaou focuses on computer-aided process engineering (design and operation) and the theory and application of process control in the chemical, oil and gas, food, and microelectronics industries. His research group screens candidate technologies, develops new approaches, and develops proofs of concepts or working prototypes. Recent topics of interest include model predictive control, nonlinear control, adaptive control, monitoring, development of new methods for the numerical solution of partial differential equations, and modeling of air pollution near roadways. Prof. Nikolaou’s group has recently begun collaborating with other investigators in the areas of control of microelectronics processes, and acceleration of in situ bioremediation processes using process control.
Prof. Jim Richardson conducts research in the areas of heterogeneous catalysis and catalytic processes; reactor engineering; catalyst preparation and characterization, and catalyst design. His interests also include solar energy, solar-receiver design, solar-related chemical processes, catalytic processes for the destruction of hazardous wastes, gas-to-liquid conversion processes, high-temperature superconductivity and processing of ceramic superconductors, solid oxide fuel cells, and ceramic membrane reactors.

Prof. Frank Tiller performs theoretical and experimental research into many aspects of fluid/particle separation, including environmental and agricultural applications. Areas include thickening, filtration, centrifugation, CATscan analysis of solid/liquid systems, sedimentation, flocculation, and surface phenomena. Additional focus includes separation of biosolids from wastewater sludge, processing of solids, stagewise drying, and new theories of supercompactibility. Prof. Tiller is also interested in developing agricultural fibers as aids in solid/liquid separation and coalescence of oily waters; insights into growth conditions and mechanisms may shorten the time of production of such diffraction-quality crystals. [c.] Formation and evolution of step patterns. During layer-growth of crystals, steps do not remain equidistant; quantitative data and numerical modeling will help design control strategies. [d.] Thermodynamics of protein solutions, including DUO and non-DUO molecular interactions and their control, plus kinetics of the phase transitions and control of their rates.

Prof. Peter Vekilov’s research involves four primary areas: [a.] Control of the polymerization of sickle-cell hemoglobin, wherein ultrafast image-capture, direct visualization of Hb polymers in vitro, monitoring of polymerization in cells, understanding of nucleation control via the dense liquid phase, and understanding and control of intermolecular interactions by low-concentration reagents lead to models for numerous protein-condensation diseases. [b.] Rational optimization of crystallization conditions of macromolecules—whereas 95% of proteins studied by structural biologists yield crystals after automated screening, and 60% yield crystals of sufficient quality, many of the important proteins are not in the 60%; insight into growth conditions and mechanisms may shorten the time of production of such diffraction-quality crystals. [c.] Formation and evolution of step patterns. During layer-growth of crystals, steps do not remain equidistant; quantitative data and numerical modeling will help design control strategies. [d.] Thermodynamics of protein solutions, including DUO and non-DUO molecular interactions and their control, plus kinetics of the phase transitions and control of their rates.

Molecular recognition and adsorption characterizes Prof. Richard Wilson’s research. He specifically investigates ion-exchange chromatography of proteins and nucleic acids; antibody affinity and selectivity; biophysical characterization of driving forces, equilibria, and kinetics of interactions involving biological macromolecules; directed mutagenesis of critical residues to test their contributions to association; environmental biotechnology; detection of mutagenic and DNA-damaging agents through luciferase-reporter systems; microbial degradation and modification of hydrocarbons, and isolation of enzymes responsible for these activities; DNA-probe monitoring of microbial populations in complex environments; combinatorial chemistry and catalysis; phase-surface display for improvement of affinity-separations ligands; enzyme engineering through phase display; and solid-phase combinatorial libraries.

Prof. Tiller is also interested in developing agricultural fibers as aids in solid/liquid separation and coalescence of oily waters; insights into growth conditions and mechanisms may shorten the time of production of such diffraction-quality crystals.
LUSS, DAN

National Science Foundation

- $291,948.00
  - $289,399.00
  - $289,399.00
  - MOPH 2 (1999–2001)
  - $289,399.00
  - Periodic & Chaotic Temperature-Patterns on Catalytic Surfaces (1999–2001)
  - $135,000.00
  - U.S./Israel Binational Science Foundation
  - Control of Patterned States in Chemical Reactors (1999–2001)
  - $135,000.00
  - Mobil Foundation, Inc.
  - $85,000.00
  - Materials Research Science & Engineering Center
  - "SHS & Membrane Reactors" (1999–2002)
  - $80,000.00
  - Various Private-Profit Agencies
  - $73,900.00
  - Mobil Foundation, Inc.
  - $47,000.00
  - U.S. Civilian Research & Development Foundation
  - $10,750.00
  - Environmental Institute of Houston
  - $9,400.00
  - U.S. Civilian Research & Development Foundation

Mohanty, Kishore K.

- $637,010.00
  - U.S. Department of Energy
  - "Yield Mod. Characterization & Interactions in MRM Wall-Logging" (1999–2002)
  - $471,983.00
  - U.S. Department of Energy
  - $265,351.00
  - University of Tulsa
  - $127,000.00
  - Texas Higher Education Coordinating Board (ATP)
  - "Computum of Transport Properties from Petrographic Images" (2000–2001)
  - $44,601.00
  - Gulf Coast Hazardous-Substances Research Center
  - "Bioresistant Produced From Used Vegetable Oil for Removal of Metals from Wastewaters & Soils" (2000–2001)
  - $40,000.00
  - Mobil Research and Development Corporation
  - $32,151.00
  - Texas Hazardous-Waste Research Center
  - "VOC Emission Control at Oil-Loading Terminals" (2000–2001)
  - $25,000.00
  - Mobil Oil Corporation
  - $20,000.00
  - British Petroleum Exploration, Inc.
  - "Reservoir Mechanisms & Scale-up" (1996–2000)

Nikolaou, Michael

- $324,631.38
  - Halliburton Energy Services
  - "Development of a Novel Methodology for Stress & Stability-related Measurements in Boreholes" (1999–2001)
  - $143,207.00
  - National Science Foundation
  - $55,000.00
  - Equilon Enterprises, LLC—"Process Control" (unrestricted, renewable annually)

Richardson, James T.

- $185,800.00
  - Texas Higher Education Coordination Board (ATP)
  - "Improved Catalytic Membrane Reactors for Synthesis-Gas Generation" (2000–2001)
  - $80,000.00
  - Materials Research Science & Engineering Center
  - "SHS & Membrane Reactors" (1999–2000)
  - $77,700.00
  - Various Private-Profit Agencies
  - "Development of Heterogeneous Catalysis" (1991–2000)
  - $75,437.00
  - South-Chemine, Inc.
  - "Screening of Carbon Formation on Steam-Reforming Catalysts" (2000–2001)
  - $40,000.00
  - Mobil Research and Development Corporation
  - $32,151.00
  - Texas Hazardous-Waste Research Center
  - "VOC Emission Control at Oil-Loading Terminals" (2000–2001)
  - $25,000.00
  - Mobil Oil Corporation
  - $20,000.00
  - British Petroleum Exploration, Inc.
  - "Reservoir Mechanisms & Scale-up" (1996–2000)

Wilson, Richard C.

- $270,000.00
  - National Science Foundation
  - $225,810.00
  - National Science Foundation
  - "Acquisition of a Raman Laser" (1999–2001)
  - $150,000.00
  - National Space Biomedical Research Institute
  - $14,700.00
  - Kellogg Brown & Root
  - $13,500.00
  - Halliburton Energy Services
  - "Improved Sabaatier Processors" (2001)
  - $111,000.00
  - Gulf Coast Hazardous-Substances Research Center
  - $90,199.50
  - Robert A. Welch Foundation
  - "Physical Chemistry of Biomolecular Recognition" (1999–2001)
  - $61,745.00
  - Baylor College of Medicine
  - "NASA National Space Biomedical Research Institute Microorganisms in the Spacecraft Environment" (2000–2001)
  - $55,000.00
  - Gulf Coast Hazardous-Substances Research Center
  - $52,180.00
  - Gulf Coast Hazardous-Substances Research Center
  - $15,000.00
  - U.S. Institute for Space Systems Operation

Frito-Lay, Inc.

- $11,460.00
  - U.S. Civilian Research & Development Foundation

Robert A. Welch Foundation

- $28,387.00
  - U.S. Civilian Research & Development Foundation
  - "Model Predictive Control" (2000–2002)

Robert A. Welch Foundation

- $22,000.00
  - U.S. Civilian Research & Development Foundation
  - "Model Predictive Control" (2000–2002)

Robert A. Welch Foundation

- $9,000.00
  - U.S. Civilian Research & Development Foundation
VEKLOV HIRED: Prof. Peter G. Veklov was hired as Associate Professor, effective Fall 2000. Prof. Veklov has continued a research program in polymer nanocomposite synthesis and design since his hire in August 1994.

C. ECONOMIDES HIRED: Dr. Christne Dhig-Economides joined the Department as Adjunct Professor in January 2000. She holds a faculty position in the Department of Chemical Engineering at the University of Alabama in Huntsville, where she developed an innovative research program in protein crystallization. Her addition strengthens the Department's research in biochemical science and engineering.

In 2000, PROF. RICHARD WILLSON was promoted to Professor of Chemical Engineering, effective Fall 2000. He has served on the editorial board of the Special Issue of the ACS Division of Biochemical Technology at the 2000 ACS National Meeting. Prof. Willson serves on the editorial board of the journal of Medical & Biological Engineering. His PhD student Phillip Gibbs won the W.M. Petterson Award for best research-poster presentation from the ACS Division of Biochemical Technology and, as a member of the Chicago Vision 2000 Committee on Bioprocessing, he serves as co-editor for "New Biocatalytic Tools for a Sustainable 21st-Century Chemical Industry." He is a member of the NSF Environmental Biotechnology panel and the NASA Space Biotechnology panel. Prof. Willson serves on the Program Committee of the ACS Division of Biochemical Technology, as well as the editorial board of the journal of Medical & Biological Engineering.

ROOKS HIRED: Dr. Charles W. "Mickey" Rooks joined the Department as Adjunct Professor of Chemical Engineering, effective April 2001. Recently retired from Monsanto and Solutia after many years of significant industrial research experience, he is tasked with reinvigorating our undergraduate programs, attracting additional faculty in collaborative research in the area of catalytic reaction engineering.

In 2000, VEKLOV HIRED: Prof. Peter G. Veklov was hired as Associate Professor, effective Fall 2000. Prof. Veklov has continued a research program in polymer nanocomposite synthesis and design since his hire in August 1994.

ROOKS HIRED: Dr. Charles W. "Mickey" Rooks joined the Department as Adjunct Professor of Chemical Engineering, effective April 2001. Recently retired from Monsanto and Solutia after many years of significant industrial research experience, he is tasked with reinvigorating our undergraduate programs, attracting additional faculty in collaborative research in the area of catalytic reaction engineering.

In 2000, VEKLOV HIRED: Prof. Peter G. Veklov was hired as Associate Professor, effective Fall 2000. Prof. Veklov has continued a research program in polymer nanocomposite synthesis and design since his hire in August 1994.

ROOKS HIRED: Dr. Charles W. "Mickey" Rooks joined the Department as Adjunct Professor of Chemical Engineering, effective April 2001. Recently retired from Monsanto and Solutia after many years of significant industrial research experience, he is tasked with reinvigorating our undergraduate programs, attracting additional faculty in collaborative research in the area of catalytic reaction engineering.
Institute for Improved Oil Recovery (IIOR)

The Institute for Improved Oil Recovery (IIOR) conducts its university research via a research consortium that is funded by major oil and gas producers, service companies, the U.S. Department of Energy, and the state of Texas. After research has been conducted through cooperative university and industrial projects, results are presented in conferences and workshops around the United States.

Research areas include:
- Advanced computing technology applied to reservoir engineering
- Three-dimensional imaging of flow through porous media
- Gas-flooding methods (CO₂, hydrocarbon, N₂)
- Displacement mechanisms
- Foams
- Fractured reservoirs
- Production evaluation
- Environmental engineering/containment technologies
- Particle transport, surface chemistry, wettability.

THE SIGNIFICANCE OF IMPROVED OIL-RECOVERY TECHNOLOGY: The U.S. Department of Energy and other entities have estimated that less than one-third of the original oil in place can be produced with existing technologies. Hence, recovery of the remaining two-thirds constitutes the target for development of improved technologies. Approximately 341 billion barrels of mobile and immobile oil will remain bypassed or trapped in known U.S. reservoirs at the conclusion of conventional production. Of this remaining oil, it is estimated that an additional 76 billion barrels are recoverable by currently identified technologies with the application of well-designed R&D and technology-transfer strategies. This would sustain current levels of U.S. production for several decades, which is necessary for an orderly transition to alternative transportation fuels. Improved technology allows producers to work more efficiently and to extract more oil than otherwise.

The natural-gas supply from conventional resources is estimated to be approximately 800 trillion cubic feet (Tcf), of which 160 Tcf are proven reserves and 640 Tcf are inferred or undiscovered reserves. Half the conventional undiscovered gas is considered economical to produce, with improved recovery methods being necessary to convert this gas to reserves. The remaining 50% is also expected to require improved drilling, completion, and gathering technology. A reduction in imported oil could be one near-term payoff when new reserves are developed via improved exploration and extraction techniques. Fuel-switching in stationary markets could enable the replacement of two million barrels/day of oil (25% of imports) with 4 Tcf/year of gas. Technology can make a difference.

THE MISSION OF THE INSTITUTE FOR IMPROVED OIL RECOVERY (IIOR).

The mission of the Institute for Improved Oil Recovery (IIOR) is to improve recovery of crude oil and natural gas under present-day economics, apply improved oil-recovery technology to the in situ clean-up of hazardous wastes, and transfer technology to industry and national laboratories. The scope of the program encompasses R&D and field demonstration, testing, and evaluation.

DEPARTMENTAL SUPPORT/GRADUATE FELLOWSHIPS

As of June 2001, the UH CHE research program comprised 53 full-time graduate students, four postdoctoral fellows, 31 Petroleum Engineering students, and 71 part-time Master of Chemical Engineering students (the industrially employed professionals who are attracted to our non-thesis terminal-degree option). The program is supported by the following sources:

- State Budget for 2000–2001: $1,431,369
- Federal Research Grants: $544,659
- State and University Grants: $342,519
- Private Grants: $272,460
- Industrial Grants, Fellowships: $226,775
- TOTAL: $2,817,782

OUTSTANDING ALUMNI

These graduates of the UH Chemical Engineering program have received the UH Engineering Alumni Association’s “Distinguished Alumnus” Award:

- Robert Baldwin, BS, 1949
- William Brookshire, BS, 1957
- Robert M. Zoch, Jr., BS, 1968
- J.C.M. “Jimmy” Lee, PhD, 1970
- Ravi Singhania, PhD

Dr. Charles R. Cutler of Houston (PhD CHE) was elected to the National Academy of Engineering in 2000. His election citation reads: “For invention, development, and commercial implementation of a new-generation digital process-control technology.” Dr. Cutler serves on the Department’s Industrial Advisory Board.

DONOR ORGANIZATIONS

The Department of Chemical Engineering is most grateful for the support contributed by these industrial, educational, and nonprofit organizations:

- American Institute of Chemical Engineers
- BASF Corporation
- BP/Amoco
- CACHE Corp.
- Chevron U.S.A. Inc.
- Council for Chemical Research
- The Dow Chemical Company Foundation
- The Dow Chemical Company
- E.I. DuPont de Nemours & Company
- ExxonMobil
- Fluor Corp.
- Halliburton Foundation, Inc.
- Hoechst-Celanese Chemical Group
- The Lubrizol Foundation
- Marathon Oil Company
- Pennzoil Products Company
- Rohm and Haas Company
- Shell Oil Company Foundation

DEPARTMENTAL FUNDING, SUPPORT, RANKINGS, & TRENDS

Contact:
Prof. Kishore K. Mohanty, Director
University of Houston
Department of Chemical Engineering
S 222 Engineering Bldg., 1st Floor, Houston, TX 77204-4004
713-743-4323 fax
713-743-4331

In the University of Houston Department of Chemical Engineering
INDUSTRIAL ADVISORY BOARD

The Chemical Engineering Department has an Industrial Advisory Board (IAB). The IAB provides the Chemical Engineering chairman and faculty an industrial perspective on important strategic and operational issues. With input and advice, the IAB addresses such salient topics as faculty hiring, student recruitment, curriculum content, and graduate research programs. The IAB members also provide a network through which fundraising efforts, student recruiting and internships, and engagement of alumni are enhanced.

Members of the IAB are:

- Air Products & Chemicals, Inc. (Houston, TX)
  - Steve Hensler, Area Manager
- Aspen Technology, Inc. (Houston, TX)
  - John Ayala, Senior Vice-President, Global Solutions Practice
- ATOFINA Petrochemicals, Inc. (Deer Park, TX)
  - Dr. Michel Daumerie, Vice-President of Research & Technology
- BASF Corporation (Freeport, TX)
  - Jim Saccamano, Operations Director
- Bechtel Corp. (Houston, TX)
  - Lance Murray, Principal VP Manager of Refining Center of Excellence
- Celanese Ltd. (Pasadena, TX)
  - Dieter Peters, Site Director
- Conoco Inc. (Houston, TX)
  - Alok Jain, Manager, Project Engineering & Management, EPT
- DuPont LyondellBasell (Wilmington, DE)
  - Dr. Bill Hill, Global Technology Manager - Terathane®
- ExxonMobil Chemical (Baytown, TX)
  - Joe Carey, Manager, Polypropylene Technology
- Fluor Corp. (Sugar Land, TX)
  - Dr. Ron Morgan, Technical Excellence Leader, Research
- Halliburton Energy Services (Duncan, OK)
  - Keil Logan Brown & Root (Houston, TX)
  - Tim Channell, Vice-President, Global Engineering
- The Lubrizol Corporation (Deer Park, TX)
  - Harold Smith, Technology Manager for the Texas Plants
- Marathon Ashland (Texas City, TX)
  - Milt Armbruster, Division Manager
- M.A. Ehrin & Associates (Austin, TX)
  - Dr. Mike Ehrin, President
- Ethyl Corporation (Pasadena, TX)
  - Kang Bong, Plant Manager
- ExxonMobil Chemical (Baytown, TX)
  - Joe Carey, Manager, Polypropylene Technology
- Fluor Corp. (Sugar Land, TX)
  - Mike Pawer, Vice-President, Process Engineering
- Halliburton Energy Services (Duncan, OK)
  - Dr. Ron Morgan, Technical Excellence Leader, Research
- The Lubrizol Corporation (Deer Park, TX)
  - Harold Smith, Technology Manager for the Texas Plants
- Marathon Ashland (Texas City, TX)
  - Milt Armbruster, Division Manager
- Celanese Ltd. (Pasadena, TX)
  - Dieter Peters, Site Director
- Conoco Inc. (Houston, TX)
  - Alok Jain, Manager, Project Engineering & Management, EPT
- The Dow Chemical Company (Freeport, TX)
  - Tim Channell, Vice-President, Global Engineering
- Fluor Corp. (Sugar Land, TX)
  - Mike Pawer, Vice-President, Process Engineering
- Tim Challand, Vice-President, Global Engineering
- The Lubrizol Corporation (Deer Park, TX)
  - Harold Smith, Technology Manager for the Texas Plants
- Marathon Ashland (Texas City, TX)
  - Milt Armbruster, Division Manager
- Dow/Vinyl, L.P. (Deer Park, TX)
  - Ken Carlson, Engineering Services Manager
- Bechtel Corp. (Houston, TX)
  - Lance Murray, Principal VP Manager of Refining Center of Excellence
- Pennzoil-Quaker State Co. (The Woodlands, TX)
  - Dr. Ahmed Alim, Senior VP of Research & Development and Chief Technology Officer
- Phillips 66 Co. (Sweeny, TX)
  - Rob Mitchell, Refining Process Engineering Manager
- Rohm and Haas Texas Incorporated (Deer Park, TX)
  - Bob Brink, President & Plant Manager
- Schumacher—Offield Chemicals (Sugar Land, TX)
  - Dr. Keith Demmke, Department Head
- Shell Chemical Company (Houston, TX)
  - Dr. Carlos Garcia, Technical Manager

RELATIVE RANKINGS FOR RESEARCH-DOCTORATE PROGRAMS IN CHEMICAL ENGINEERING

<table>
<thead>
<tr>
<th>OVERALL RANKING</th>
<th>INSTITUTION</th>
<th>NRC SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>University of Minnesota</td>
<td>4.86</td>
</tr>
<tr>
<td>2</td>
<td>Massachusetts Institute of Technology</td>
<td>4.73</td>
</tr>
<tr>
<td>3</td>
<td>University of California, Berkeley</td>
<td>4.63</td>
</tr>
<tr>
<td>4</td>
<td>University of Wisconsin-Madison</td>
<td>4.62</td>
</tr>
<tr>
<td>5</td>
<td>University of Illinois (Urbana-Champaign)</td>
<td>4.42</td>
</tr>
<tr>
<td>6</td>
<td>California Institute of Technology</td>
<td>4.41</td>
</tr>
<tr>
<td>7</td>
<td>Stanford University</td>
<td>4.35</td>
</tr>
<tr>
<td>8</td>
<td>University of Delaware</td>
<td>4.34</td>
</tr>
<tr>
<td>9</td>
<td>Princeton University</td>
<td>4.14</td>
</tr>
<tr>
<td>10</td>
<td>University of Texas at Austin</td>
<td>4.08</td>
</tr>
<tr>
<td>11</td>
<td>University of Pennsylvania</td>
<td>3.97</td>
</tr>
<tr>
<td>12</td>
<td>Carnegie Mellon University</td>
<td>3.87</td>
</tr>
<tr>
<td>13</td>
<td>Cornell University</td>
<td>3.86</td>
</tr>
<tr>
<td>14</td>
<td>University of California, Santa Barbara</td>
<td>3.82</td>
</tr>
<tr>
<td>15</td>
<td>Northwestern University</td>
<td>3.75</td>
</tr>
<tr>
<td>16</td>
<td>Purdue University</td>
<td>3.67</td>
</tr>
<tr>
<td>17</td>
<td>UNIVERSITY OF HOUSTON</td>
<td>3.66</td>
</tr>
<tr>
<td>18</td>
<td>University of Michigan</td>
<td>3.52</td>
</tr>
<tr>
<td>19</td>
<td>City University of New York</td>
<td>3.46</td>
</tr>
<tr>
<td>20</td>
<td>University of Washington</td>
<td>3.44</td>
</tr>
<tr>
<td>21</td>
<td>University of Massachusetts at Amherst</td>
<td>3.35</td>
</tr>
<tr>
<td>22</td>
<td>Rice University</td>
<td>3.35</td>
</tr>
<tr>
<td>23</td>
<td>Pennsylvania State University</td>
<td>3.34</td>
</tr>
<tr>
<td>24</td>
<td>University of Notre Dame</td>
<td>3.30</td>
</tr>
<tr>
<td>25</td>
<td>North Carolina State University</td>
<td>3.20</td>
</tr>
<tr>
<td>26</td>
<td>University of Colorado</td>
<td>3.18</td>
</tr>
<tr>
<td>27</td>
<td>Lehigh University</td>
<td>3.13</td>
</tr>
<tr>
<td>28</td>
<td>University of California, Davis</td>
<td>3.11</td>
</tr>
<tr>
<td>29</td>
<td>State University of New York at Buffalo</td>
<td>3.08</td>
</tr>
<tr>
<td>T30</td>
<td>University of Virginia</td>
<td>3.01</td>
</tr>
<tr>
<td>T30</td>
<td>Georgia Institute of Technology</td>
<td>3.01</td>
</tr>
</tbody>
</table>

Graduate Ranking: The Gourman Report


Undergraduate Ranking: The Gourman Report

A Rating of Undergraduate Programs in American Universities (1995)

**CHEMICAL ENGINEERING—THE TOP 30 U.S. PROGRAMS, IN RANK ORDER:**

<table>
<thead>
<tr>
<th>RANK</th>
<th>INSTITUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>University of Minnesota</td>
</tr>
<tr>
<td>2</td>
<td>University of Wisconsin, Madison</td>
</tr>
<tr>
<td>3</td>
<td>California Institute of Technology</td>
</tr>
<tr>
<td>4</td>
<td>University of California, Berkeley</td>
</tr>
<tr>
<td>5</td>
<td>Stanford University</td>
</tr>
<tr>
<td>6</td>
<td>University of Delaware</td>
</tr>
<tr>
<td>7</td>
<td>Massachusetts Institute of Technology</td>
</tr>
<tr>
<td>8</td>
<td>University of Illinois (Champaign/Urbana)</td>
</tr>
<tr>
<td>9</td>
<td>Princeton University</td>
</tr>
<tr>
<td>10</td>
<td>UNIVERSITY OF HOUSTON</td>
</tr>
</tbody>
</table>

**CHEMICAL ENGINEERING—THE TOP 40 U.S. PROGRAMS, IN RANK ORDER:**

<table>
<thead>
<tr>
<th>RANK</th>
<th>INSTITUTION</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>University of Minnesota</td>
<td>4.91</td>
</tr>
<tr>
<td>2</td>
<td>University of Wisconsin (Madison)</td>
<td>4.90</td>
</tr>
<tr>
<td>3</td>
<td>University of California, Berkeley</td>
<td>4.88</td>
</tr>
<tr>
<td>4</td>
<td>California Institute of Technology</td>
<td>4.85</td>
</tr>
<tr>
<td>5</td>
<td>Stanford University</td>
<td>4.82</td>
</tr>
<tr>
<td>6</td>
<td>University of Delaware</td>
<td>4.80</td>
</tr>
<tr>
<td>7</td>
<td>Massachusetts Institute of Technology</td>
<td>4.79</td>
</tr>
<tr>
<td>8</td>
<td>University of Illinois (Champaign/Urbana)</td>
<td>4.75</td>
</tr>
<tr>
<td>9</td>
<td>Princeton University</td>
<td>4.74</td>
</tr>
</tbody>
</table>

10 UNIVERSITY OF HOUSTON 4.73

11 Northwestern University
12 University of Pennsylvania
13 University of Texas at Austin
14 Carnegie Mellon University
15 Purdue University
16 University of Michigan
17 University of Washington
18 Cornell University
19 University of Notre Dame
20 Rice University
21 North Carolina State University
22 University of Massachusetts, Amherst
23 Iowa State University
24 University of Florida
25 University of Rochester
26 State University of New York at Buffalo
27 Pennsylvania State University
28 Case Western Reserve University
29 University of Colorado
30 Washington University in St. Louis
31 Lehigh University
32 Texas A&M University
33 City College of the City University of New York
34 Ohio State University
35 Georgia Institute of Technology
36 North Carolina State University
37 Yale University
38 Rensselaer Polytechnic Institute
39 Virginia Polytechnic Institute & State University
40 University of Tennessee, Knoxville


Enrollment Trends & Degrees Conferred

UNDERGRADUATE ENROLLMENT & DEGREES CONFERRED:


Fall Enrollment 545 483 440 462 383 373 317 295
BS Degrees: 36 38 46 43 40 36 40 29

GRADUATE ENROLLMENT & DEGREES CONFERRED:


Fall Enrollment 129 107 135 113 98 95 103 94
MS Degrees: 8 – – – – – – –
MS Degrees in ChemE: – – 11 7 12 9 16 14 9
MS Degrees in Petroleum: – 10 13 16 7 8 6 7 6
PhD Degrees: 10 17 10 16 7 12 7 6 6
MCHE Degrees: 5 5 13 6 6 7 6 7

STUDENTS RECEIVING DEGREES:

2000–2001 BS ChE Graduates with Honors and/or Membership in the Honors College:

- Foladi A. Anyelu (cum laude)
- Mari N. Cheremisoff (magna cum laude)
- Jacob A. Collins (cum laude)
- Randell L. Collum, Jr. (summa cum laude)
- Monica M. Lossy (magna cum laude)
- Cynthia Malia (magna cum laude)
- Nile A. Mead (magna cum laude)
- Brian E. Moore (cum laude)
- Michael J. Moreno (cum laude)
- Clayleys Dioglan (magna cum laude)
- Arti A. Patel (magna cum laude)

Recipients (since Fall 2000):

- Master of Chemical Engineering
  - Nile P. Barrios
  - Jorge J. Delgado-Acevedo
  - Johnny L. Gipson
  - Philip J. Hsueh
  - M.S. in Chemical Engineering
  - Bryan C. Baeder
  - Bliz V. Cherian
  - Raphael J. Gurnthoudt
  - Shirley Indriati
  - David L. Jowell

- Master of Petroleum Engineering
  - Chiulsoyo Delano
  - Ayen J. Haan
  - Dana J. Jacob
  - William F. Miao

PhD in Biomedical Engineering

- Philip K. Gibbs, Studies in Biocatalysis

- John T. Ritchie, Ceramic-Alumina Reactor for Synthesis Gas Production

- Leonidas Kappos, Modeling and Bifurcation Analysis of Catalytic Reactions in Monoliths

- Hani A. Gadalla, Two-dimensional Heat-Transfer Properties of Ceramic Foams in the Presence of Chemical Reactions

- Nikunj Gupta, Modeling and Bifurcation Analysis of Catalytic Reactions in Monoliths

- Lauren D. Kappos, Movable and Immovable Displacements in Porous Media

- Balakotaiah, Venuri


BOOKS:


BOOK CHAPTER:


ECONOMIDES, MICHAEL J.


NONPUBLISHED PUBLICATIONS:

- Economides, M.J. and M.J. Economides, “Pushing the Boundaries of Cased Tubing Application,” SPE 64610 (2001).

REPRINT, by phone or by e-mail (v. Section 9.0).
The Color Reservoir's 2000 Annual Report
33
122
9
(2000);
46
(accepted for publication, 2001).
104
(R.
(accepted for publication, 2001).
13
(2000).
(accepted for publication, 2001).
The
(2000).
(accepted for publication, 2001).

ECONOMOU, DEMETRE J.

Economides, M.J. and K.G. Nolte,


BOOKS:

Economides, M.J. and K.G. Nolte, Reservoir Stimulation, 3rd ed. (to be published, 2001).

ECONOMOU, DEMETRE J.


Ramamurthi, B.N. and D.J. Economou, "Two-Dimensional Simulation of Pulsed-Power Electroplating Processes," J. de Physique (accepted for publication, 2001).


NONREFERRED PUBLICATIONS:

L. T. RANDALL


LANDS

Luss, D.

Matsui, B., J. Annamalai and D. Luss, "Hot-Zone Formation during Carbon Monoxide


SHORT COURSE: Computer- and Sensor-Based Applications of Heterogeneous Catalysis, University of Houston, with J.T. Richardson et al., semiannually in 2000 and 2001.

MOHANTY, KISHORE K.


Nikolaou, Michael


NonREFereRed PUBLICATIONS:


BOOK:


Richardson, James T.


CONFERENCE PROCEEDINGS:


SHORT COURSE:

Co-director and lecturer, Applications of Heterogeneous Catalysis, University of Houston, with D. Luss et al., semiannually in 2000 and 2001.

Rooks, Charles W.

PATENT:

“Method of Rapidly Converting an Acrylic Resin to Methanol Feed and Back to Polyline Feed,” patent application (in process, 2001).

VEKILOV, Peter G.


THE UNDERGRADUATE PROGRAM

Che UNDERGRADUATE ADMISSION

Students seeking admission as freshmen to the Cullen College of Engineering should refer to www.uh.edu/enroll/admis/freshman_req.html for the current and complete requirements.

Students aspiring toward undergraduate Chemical Engineering study at the University of Houston may request applications from:
Undergraduate Admissions Office
122 E. Cullen Bldg.
Houston, TX 77204-2023, U.S.A.

Transfer applicants who have earned fewer than 15 semester hours of college credit must meet the engineering requirements for high-school graduates. Applicants who have earned between 15 and 29 semester hours of college credit must meet all of these requirements:
1. A grade-point average (GPA) of 2.50 or higher for all college-level work attempted.
2. A GPA of 2.50 or higher for all college-level mathematics courses attempted.
3. A GPA of 2.50 or higher for all college-level chemistry and physics courses attempted.
4. A GPA of 2.50 or higher for all college-level English courses attempted; international students must have a TOEFL score of 550.
5. A GPA of 2.50 or higher for all college-level engineering courses attempted.
6. Must have attempted at least one college-level mathematics course and at least one college-level physics or chemistry course.

Transfer applicants who have earned 30 or more semester hours of college credit must meet all of these requirements:
1. A GPA of 2.25 or higher for all college-level work attempted.
2. A GPA of 2.25 or higher for all college-level mathematics courses attempted.
3. A GPA of 2.25 or higher for all college-level chemistry and physics courses attempted.
4. A GPA of 2.25 or higher for all college-level English courses attempted; international students must have a TOEFL score of 550.
5. A GPA of 2.25 or higher for all college-level engineering courses attempted.
6. Must have attempted at least one college-level mathematics course and at least one college-level physics or chemistry course.

Applicants with special questions about the undergraduate Chemical Engineering program may contact:
Mrs. Sharon Gates, Undergraduate-Admissions Analyst
University of Houston, Chemical Engineering
S 222 Engineering Bldg. 1
Houston, TX 77204-4004, U.S.A.
Phone: 713-743-4325
E-mail: SMGates@uh.edu

ENROLLMENT TRENDS:

<table>
<thead>
<tr>
<th>Year</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>237</td>
</tr>
<tr>
<td>1980</td>
<td>356</td>
</tr>
<tr>
<td>1981</td>
<td>423</td>
</tr>
<tr>
<td>1982</td>
<td>470</td>
</tr>
<tr>
<td>1983</td>
<td>596</td>
</tr>
<tr>
<td>1984</td>
<td>322</td>
</tr>
<tr>
<td>1985</td>
<td>229</td>
</tr>
<tr>
<td>1986</td>
<td>167</td>
</tr>
<tr>
<td>1987</td>
<td>205</td>
</tr>
<tr>
<td>1988</td>
<td>202</td>
</tr>
<tr>
<td>1989</td>
<td>260</td>
</tr>
<tr>
<td>1990</td>
<td>313</td>
</tr>
<tr>
<td>1991</td>
<td>385</td>
</tr>
<tr>
<td>1992</td>
<td>479</td>
</tr>
<tr>
<td>1993</td>
<td>545</td>
</tr>
<tr>
<td>1994</td>
<td>480</td>
</tr>
<tr>
<td>1995</td>
<td>445</td>
</tr>
<tr>
<td>1996</td>
<td>460</td>
</tr>
<tr>
<td>1997</td>
<td>383</td>
</tr>
<tr>
<td>1998</td>
<td>373</td>
</tr>
<tr>
<td>1999</td>
<td>317</td>
</tr>
<tr>
<td>2000</td>
<td>295</td>
</tr>
</tbody>
</table>

Figures since 1991 include students registering as Postbaccalaureate. Enrollment figures have followed national trends.

The success of our program is due to the soundness of our undergraduate curriculum, the commitment of our faculty (all of whom teach undergraduate courses), and the support of local petroleum and petrochemical industries. We look forward to continued growth in the future and to the changes in chemical engineering education demanded by the 21st century.

The undergraduate Chemical Engineering program of the University of Houston is consistently rated among the top programs in the country (10th in the recent Gourman Report).
1131: Challenge of Chemical Engineering
Cr. 3 (3-0). Prerequisite: Science or Engineering major. The Chemical Engineering profession. Thrustfields and frontiers of Chemical Engineering. Career opportunities for chemical engineers. Communication skills; engineering ethics.

1331: Computing for Engineers (also CIVE 1331, PECE 1331) Cr. 3 (3-0). Prerequisite: MATH 1431. Credit cannot be received for more than one of CHEE 1331, CIEE 1331, or INGE 1331. Introduction to the computing environment, matrix arithmetic, programming essentials, spreadsheets, symbolic algebra tools, solution of typical engineering problems using computer tools.

2331: Chemical Processes Cr. 3 (3-0). Prerequisite: CHEE or CIVE 1331, MATH 1432, PHYS 1521, and credit for or concurrent enrollment in MATH 2433 and CHEM 1332. Introduction to chemical engineering, calculations, unit operations, process stoichiometry, material and energy balances, states of matter, case studies.

2332: Chemical Engineering Thermodynamics E.Cr. 3 (3-0). Prerequisite: CHEM 1332, MATH 2433, PHYS 1431, and concurrent enrollment in CHEE 2332. Multicomponent systems, phase equilibria, and prediction of thermodynamic properties. 3333: Chemical Engineering Thermodynamics II Cr. 3 (3-0). Prerequisite: CHEE 2332. Advanced study in chemical engineering thermodynamics with emphasis on process control.

3362: Fluid Mechanics for Chemical Engineers (formerly ECE 5070) Cr. 3 (3-0). Prerequisite: CHEE 2332, MATH 3321 or equivalent, MECE 3405, PHYS 1521, and credit for or concurrent enrollment in CHE 3364. Foundations of fluid mechanics, fluid statics, kinematics, laminar and turbulent flow, macroscopic balances; dimensional analysis and flow correlations.

3366: Topics in Physical Chemistry Cr. 3 (3-0). Prerequisite: CHEE 3333. Introduction to various physical-chemical topics: electrochemistry, chemical kinetics, colloidal and particle science, macromolecules.

3367: Process Modeling & Control Cr. 3 (3-0). Prerequisites: CHEE 3303, CHEE or ENSG 3363, MATH 3321, and PHYS 3322. Modeling techniques of chemical engineering problems, with emphasis on process control.

3369: Chemical Engineering Transport Processes Cr. 3 (3-0). Prerequisite: CHEE or ENSG 3363. Mass transfer in single- and multiphase systems and combined heat- and mass-transfer. Selected topics in heat and mass transfer, and in heat and momentum transfer.

3399-4399: Senior Honors Thesis Cr. 3 per semester. Prerequisite: senior standing. 3.00 cumulative grade-point average in chemical engineering and overall.

3462: Unit Operations Cr. 4 (3-1-0). Prerequisites: CHEE 3333, CHEE or ENSG 3363, and credit for or concurrent enrollment in CHEE 3360. Unit operations, with emphasis on distillation, absorption, extraction, and fluid-solid systems.

419E/429E/439E/449E: Special Problems Cr. 1-4 per semester, or more by consent of instructor. Prerequisite: approval of the Chairman.

432: Chemical Engineering Design Cr. 3 per semester (3-0). Prerequisite: CHEE 3333, 3462, 3369, and credit for or concurrent enrollment in CHEE 4367. Computer-aided design of chemical processes, with emphasis on process economics, profitability analysis, and optimal operating conditions.

4361: Chemical Engineering Practices Cr. 3 (1-0-2). Prerequisite: CHEE 3462, 3467, 3369, and credit for or concurrent enrollment in CHEE 4367. Design and execution of experiments, with emphasis on heat and mass transport, unit operations, process control, and reactors. Written reports.

4367: Chemical Reaction Engineering Cr. 3 (0-0-2). Prerequisites: CHEE 3300, 3369, and 3462. Chemical-reaction kinetics, mechanisms, and reactor design in static and flow systems; introduction to heterogeneous catalytic reactions in flow systems.

5360: Biochemical Engineering Fundamentals Cr. 3 (3-0). Prerequisite: credit for or concurrent enrollment in CHEE 4367. Analysis and design fundamentals for biochemical process, reactor design, transport phenomena, applications of enzymes and microbial populations.

5367: Advanced Process Control Cr. 3 (3-0). Prerequisite: CHEE 3367 or consent of instructor. Application of the use of high-speed computers in the control of chemical processes, reactors, and units.

5371: Pollution-Control Engineering Cr. 3 (3-0). Prerequisite: credit for or concurrent enrollment in CHEE 4321 and CHEE 4387. Pollution problems and remedies with the Earth as an environmentally closed system. Limitations of absorption and self-cleaning for tarryphase, hydrophases and atmosphere, and their interrelationship.

5373: Environmental Remediation Cr. 3 (3-0). Prerequisites: CHEE 5360, CHEE 4362, and credit for or concurrent enrollment in CHEE 4367. In situ and ex situ methods of remediation or restoration of contaminated environmental sites. Emphasis on slope contamination in soil, surface water, and groundwater.

5374: Reaction Kinetics for Industrial Processes Cr. 3 (3-0). Prerequisite: Credit for or concurrent enrollment in CHEE 4367. Methods for predicting product distribution in practical chemical reactors. Determination of thermo-chemical and kinetic constants from statistical mechanics and transition-state theory. Applications from superequilibrium processes to catalysis.

5375: Chemical Processing in Microelectronics Cr. 3 (3-0). Prerequisite: CHEE 4367 or consent of instructor. Chemical processing principles applied to microelectronic-device fabrication and processing.

5376: Solid-Liquid Separation—Environmental Processes Cr. 3 (3-0). Prerequisite: CHEE or ENSG 3363. Introduction to solid/liquid separation and processing. Particle characteristics, porous media; interfacial phenomena; flow through permeable and granular beds; sedimentation, clarification, filtration, centrifugation, expression, washing.

5377: Introduction to Polymer Science Cr. 3 (3-0). Prerequisite: consent of instructor. Introduction to the synthesis, characterization, physical properties, and processing of polymeric materials. The course thematically reaches around methods to measure, characterize, and tailor structure, processing, and property correlations for polymeric materials.

5380: Biochemical Separations Cr. 3 (3-0). Prerequisites: senior standing in Chemical Engineering, or consent of instructor. Producing cloned proteins in useful amounts; use of recombinant DNA methodologies to produce proteins; characterization methods.

5383: Advanced Unit Operations Cr. 3 (3-0). Prerequisite: senior standing in Chemical Engineering, or consent of instructor. Property prediction of multicomponent fluids. Advanced principles of heat-exchanger design, multi-component fractionation, absorption, stripping, and extraction.

5386: Air-Pollution Processes & Control Cr. 3 (3-0). Prerequisite: consent of instructor. Air-pollutant identification and control technology; estimation of pollutant transport, dispersion, and conversion; computer application for design of control units.

Undergraduate Chemical Engineering Curriculum

**University Core Curriculum**

**First year**
- HIS 1376 or 1377
- POLS 1306
- ENGL 1303
- CHEM 1111
- CHEM 1331
- ENGL 1304
- CHEM 1112
- CHEM 1332

**Second year**
- POLS 1337
- Humanities
- Social or Behav Science

**Third year**
- Social or Behav Science

**Fourth year**
- HIS 1378 or 1379
- Vis Perform Arts
- Social or Behav Science WI

**Chemistry**
- CHEM 3333
- CHEM 3332
- CHEM 3221
- CHEM 3331
- Chemistry elective

**Engineering**
- CHEE 1131 Chem Eng Chal
- CHEE 2331 Chem Proc
- CHEE 3334 Anal/Num Tech
- CHEE 3333 Thermodynamics
- CHEE 3332 Phys Chem
- CHEE 1331 Comp for Engrs
- MECE 3400 Proc Cont
- CHEE 3363 Fluid Mech
- CHEE 3367 Proc Core

**Math**
- MATH 1431
- MATH 1432
- MATH 3321
- MATH 1442
- MATH 2433
- MATH 1433

**Physics**
- PHYS 1321
- PHYS 1322
- MECE 3400

**Sem. Hours**
- First year: 17
- Second year: 15
- Third year: 16
- Fourth year: 18
- Total: 130

1. Arrow to top of box (C is prerequisite for B)
2. Arrow to side of box (credit or registration in A at the same time as B)
3. * From Approved Courses
UNDERGRADUATE SCHOLARSHIP RECIPIENTS

Our undergraduate program enjoys a robust level of support from industrial and organizational donors. Following are the 2000–2001 recipients of these undergraduate scholarships:

**BP/AMOCO FOUNDATION**
- Shane Mansur
- Joel Roberts
- Dany Tran
- Pamela Williams

**DOW OUTSTANDING JUNIOR**
- May Shik

**HALLIBURTON FOUNDATION, INC.**
- Mei Yee Khoo
- Olayemi O. Ogidan
- Joey Stowers

**LUBRIZOL FOUNDATION**
- Jacob A. Collins
- Jason P. Manthey

May Shik, junior CHE student, was awarded a Tau Beta Pi Scholar Award. Only 16 are given nationwide to Engineering students, and only four to Chemical Engineering students.

**AMERICAN INSTITUTE OF CHEMICAL ENGINEERS**
- Rachel Colton, Jr.
- Mei Yee Kho
- Olayemi O. Ogidan
- Joey Stowers

The Department has an active undergraduate chapter of the South Texas Section of the American Institute of Chemical Engineers (AICHE). The chapter is advised by Prof. Richard Wilson.

---

**Scholarships**

<table>
<thead>
<tr>
<th>FIRST YEAR</th>
<th>THIRD YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FALL SEMESTER</strong></td>
<td><strong>FALL SEMESTER</strong></td>
</tr>
<tr>
<td>Course #</td>
<td>Course</td>
</tr>
<tr>
<td>CHEME 1111</td>
<td>Fund. of Chemistry Lab</td>
</tr>
<tr>
<td>CHEME 1331</td>
<td>Fundam. of Chemistry</td>
</tr>
<tr>
<td>ENGL 1303</td>
<td>English Composition I</td>
</tr>
<tr>
<td>HIST 1376</td>
<td>U.S. History to 1877</td>
</tr>
<tr>
<td>MATH 1431</td>
<td>Calculus I</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SPRING SEMESTER</strong></td>
<td><strong>SPRING SEMESTER</strong></td>
</tr>
<tr>
<td>Course #</td>
<td>Course</td>
</tr>
<tr>
<td>CHEME 1331</td>
<td>Chem. Engng. Challenges</td>
</tr>
<tr>
<td>CHEME 1331</td>
<td>Chemical Processes</td>
</tr>
<tr>
<td>ENGL 1304</td>
<td>English Composition II</td>
</tr>
<tr>
<td>MATH 1433</td>
<td>Calculus III</td>
</tr>
<tr>
<td>PHYS 1321</td>
<td>Engineering Physics I</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SECOND YEAR</strong></td>
<td><strong>FOURTH YEAR</strong></td>
</tr>
<tr>
<td><strong>FALL SEMESTER</strong></td>
<td><strong>FALL SEMESTER</strong></td>
</tr>
<tr>
<td>Course #</td>
<td>Course</td>
</tr>
<tr>
<td>CHEME 1331</td>
<td>Computing for Engineers</td>
</tr>
<tr>
<td>CHEME 2331</td>
<td>Chemical Processes</td>
</tr>
<tr>
<td>MATH 2433</td>
<td>Calculus III</td>
</tr>
<tr>
<td>PHYS 1337</td>
<td>U.S. Government</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>SPRING SEMESTER</td>
<td>SPRING SEMESTER</td>
</tr>
<tr>
<td>Course #</td>
<td>Course</td>
</tr>
<tr>
<td>CHEME 2532</td>
<td>Chem. Eng. Thermo. I</td>
</tr>
<tr>
<td>CHEME 3232</td>
<td>Fund of Org. Chem. Lab</td>
</tr>
<tr>
<td>CHEME 3332</td>
<td>Fund of Organic Chem. II</td>
</tr>
<tr>
<td>MATH 3232</td>
<td>Engineering Mathematics</td>
</tr>
<tr>
<td>MECE 3400</td>
<td>Intro to Mechanics</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL UNDERGRADUATE HOURS: 130**
On November 15, 1998, the University of Houston established the Frank M. and Martha R. Tiller Scholarship Endowment Fund. This endowment account was established with a gift from Prof. and Mrs. Tiller. The Cullen College of Engineering is the beneficiary of the remainderment of a gift annuity established by the Tillers.

The annual distributed income from this endowment provides scholarship funding for undergraduate students in the Chemical Engineering Department of the Cullen College of Engineering. The recipient(s) of the scholarship are determined by the Dean of Engineering and a selection committee. Recipients are designated as “Tiller Chemical Engineering Scholars.”

The scholarship monies are distributed in accordance with these criteria:
1. Scholarship recipients must be undergraduate students currently enrolled in the Department of Chemical Engineering of the Cullen College of Engineering.
2. Scholarship recipients must exhibit academic excellence and leadership qualities as determined by the Selection Committee.
3. Recipients must be full-time, degree-seeking students at the University of Houston.
4. Recipients must enroll for a minimum of 12 credit hours during each semester of award.
5. Recipients must maintain a GPA of 3.0 or better.

The Dean of Engineering has administrative control over the annual distributed income from this endowment.

The Chemical Engineering graduate program at the University of Houston is among the top 20 in the nation (17th in the 1995 National Research Council ratings). Our doctoral program is among the highest-rated doctoral programs in the entire University. This is due to the excellence of our faculty in research, the international reputation of our professors, and the success of our graduates. On the average, our faculty members receive $1 million of support each year, and the Department generally has total overall annual expenditures of approximately $3.5 million for graduate research activities.
Full-Time Graduate Programs in ChE

The Department offers four graduate programs:

1. **FULL-TIME MS/PHD**: This program supports the research activity of the faculty and is designed for full-time graduate students receiving financial support. Most students pursue the PhD degree, which may be completed (without an intermediate MS) in four years of study.

2. **PART-TIME MS (NON-THESIS OPTION)**: Intended for part-time students from local industry who have a BS ChE degree, this program requires 30 semester hours of coursework, including the same core required for full-time MS students.

3. **PART-TIME MChE**: This is a separate Master’s program that emphasizes advanced engineering and business management. Admission and graduation requirements are the same as for the MS degree, but mastery of advanced engineering is the main goal. Approximately 25 students enroll annually. The MChE degree may be completed in four semesters (two years).

4. **MASTERS OF PETROLEUM ENGINEERING**: Similar to the MChE degree, this program offers advanced thesis or non-thesis studies in petroleum engineering. Annual enrollments range from 40 to 80 students, with an additional number of postbaccalaureate students involved in the coursework.

Details of these programs, and descriptions of the coursework offered, appear on the pages following.

**FULL-TIME PROGRAMS OF STUDY (REQUIRING A THESIS)**

The Department of Chemical Engineering offers Master of Science (MS) and Doctor of Philosophy (PhD) degree programs, both of which focus on advanced engineering fundamentals and research.

Recipients of the MS degree are qualified for employment in industry or for continued studies toward the PhD degree. Coursework for the MS degree includes four specific classes (Engineering Mathematics, Reaction Engineering, Transport Processes, and Classical & Statistical Thermodynamics) and two electives of the student’s choice. The student also completes a research project and writes a Master’s thesis describing the work. Candidates entering the program with a Bachelor of Science in Chemical Engineering can complete all requirements in 12 to 18 months.

Candidates for the PhD degree enjoy intensive exposure to a specific field of engineering research in addition to continued study of engineering fundamentals. Individual research is the major focal point for these students, who will learn, absorb, and otherwise experience the general philosophy, methods, and concepts of research and scholarly inquiry. After graduation, UH ChE PhD recipients will be qualified to contribute to the solution of significant problems related or unrelated to their doctoral research. For students considering an academic career, instructorships are available. Coursework for the PhD degree includes six specific courses (Engineering Mathematics II, Transport Processes II, and the four courses listed in the preceding paragraph) and six elective courses, which allow for specialization in the student’s research area. In addition, all students undertake a doctoral research project and dissertation to expand the frontier of knowledge in their research areas. Acceptance into this full-time program is generally accompanied by Departmental financial support. Candidates with a BS in Chemical Engineering can complete all requirements in about four years.

A student must pass the PhD Qualifying Exam to be formally accepted as a doctoral candidate. To be eligible to take this examination, a student must have completed the six specifically required PhD courses with a minimum cumulative GPA of 3.040. There is no foreign-language requirement. Highly qualified students may bypass the MS degree and pursue the doctorate directly.

The ratio of graduate students to faculty is low, typically four to six students per research advisor. After new students have spent their first semester in the Department, the ChE faculty make presentations of their research programs and interests to better enable the students to submit their requests for choices of research advisor. Every reasonable effort is made to accommodate students’ first choice of advisor.
RESEARCH AREAS & EQUIPMENT

The department’s research programs are broad and innovative, encompassing traditional and emerging chemical engineering disciplines. Departmental research equipment includes an X-ray diffractometer with a hot stage, a pulsed-excitation pumped dye laser, a quasielastic laser-light-scattering spectroscopy unit, a computerized axial tomographic scanner (CATscan) system, rheometers, a fluorescence-polarization stopped-flow kinetics apparatus, and a titration microcalorimeter. Additionally, the Department houses numerous workstations and personal computers for graduate research. Access to a university VAX network and Hitachi AS/9000 mainframe is also available. For large computations, many faculty have reserved time on various national supercomputers.

ENTRANCE REQUIREMENTS (U.S. STUDENTS)

Admission to the Department’s graduate programs is competitive, based on GPAs from undergraduate and graduate studies, GRE scores, and letters of recommendation. The U.S. applicant must generally have achieved a minimum undergraduate GPA of 3.04.0 and a minimum GRE score (Verbal + Quantitative) of 1100. Students with undergraduate degrees in fields other than Chemical Engineering may apply, but these students may need to take preparatory courses before admission to the graduate program.

All applicants (U.S. and international) must also submit a complete University of Houston application form and a Chemical Engineering Department application form. Transcripts and all other documents should be mailed directly to one of the two addresses below, as application requests or components addressed to the UH Office of Admissions frequently fail to reach the Chemical Engineering Department in timely fashion. Note: Incoming UH Chem graduate students are admitted for Fall semesters only. Fall semester applications that are received by the preceding February 1 are most favorably considered, although later applications may also be considered.

Qualified U.S. and international students may request a complete application package for the full-time, thesis-option MS or PhD programs from the appropriate agent below:

U.S. CITIZENS/PERMANENT RESIDENTS:
Graduate Studies Coordinator
University of Houston, Department of Chemical Engineering
5-222 Engineering Bldg 1, Houston, TX 77204-4004

INTERNATIONAL CITIZENS:
International Graduate Coordinator
University of Houston, Department of Chemical Engineering
5-222 Engineering Bldg 1, Houston, TX 77204-4004, U.S.A.

FINANCIAL AID

Fellowships that typically consist of a stipend, tuition and fees are available for qualified PhD and full-time MS candidates. These fellowships are awarded on a competitive basis. Applicants may apply for financial assistance when requesting admission to the graduate program.

MASTER OF CHEMICAL ENGINEERING (MChE) DEGREE

The MChE degree is a non-thesis program for the working professional. This program has been designed for those persons who plan careers in plant operations, design, and management. It is intended to be competitive neither with the Master of Science degree (which is specifically research-oriented) nor with an MBA degree. Rather, the goal of this program is to permit earlier productive use of young engineers’ technical skills and to impart broad concepts of systems analysis, advanced process economics, and technical management. The program is aimed at improving opportunities for chemical engineers in chemical-process and related industries.

The program comprises a core of six required courses, plus four elective courses selected to meet the student’s interests in the areas of process control, management and business economics, biochemical and environmental engineering, and petroleum engineering. The courses are available in the late afternoon and evenings, and the degree program can be completed in two to three years of part-time study.

Entrance requirements include a Bachelor’s degree in Chemical Engineering, industrial employment, and approval of the MChE Program Director, the Chairman of the Chemical Engineering Department, and the Dean of Engineering. Unconditional admission may be granted for a minimum undergraduate GPA of 3.0 (4.0 scale) and a minimum GRE score (verbal + quantitative) of 1100. Conditional admission may be granted for a minimum undergraduate GPA of 2.64.0 and a minimum GRE of 1000, with special permission of the Program Director and the Dean of Engineering. Achievement of a grade of “B” or better in the first 12 hours of coursework removes the conditional status.

Required courses are: CHEE 6350, 6368, 6369, 6383, 6387 (for descriptions, see p. 39, Chemical Engineering course listings); and INDE 6372 (Operations Research & Analysis of Systems). Elective courses include: CHEE 6330, 6331, 6332, 6333, 6334, 6335, 6336, 6360, 6365, 6370, 6371, 6375, 6386, 6388 (q.v); INDE 6332 (Engineering Project Management), 6334 (Statistical Decision Analysis & Design), 6335 (Engineering Administration), 6350 (Design of Artificial-Intelligence Systems), 6364 (Advanced Engineering Statistics), 6370 (Operations Research, Digital Simulation), and 6371 (Operations Research, Optimization Methods); and ENGI 6302, 6304, 6308, 6312, 6320, 6322, 6324, 6326 (for descriptions, see Petroleum Engineering course listings).

For complete information, prospective students should contact the MChE Program Director:
Prof. Kishore K. Mohanty
University of Houston, Chemical Engineering
5-222 Engineering Bldg 1, Houston, TX 77204-4004
CHEMICAL ENGINEERING (CHEE)

6111: Graduate Seminar Cr 1 (3-0). May be repeated for credit.
6197-6297: 6397: Selected Topics Cr. 1-3 per semester (1-0; 2-0; 3-0). May be repeated for credit.
6198-6298: 6398: 6498-6598: Research Cr. 1-5 per semester, or by consent of instructor. Prerequisite: approval of Chairman.
6289-6389: Chemical Engineering Project Cr. 1-5 per semester (3-0). Prerequisite: approval of instructor. May be repeated for credit.
6331-6332: Mathematical Methods in Chemical Engineering Cr. 3 per semester (3-0). Prerequisite: approval of Department. Linear methods applied to chemical engineering matrices, transformation, series, complex variable method, Laplace, or Fourier transforms.
6333-6334: Transport Processes Cr. 3 per semester (3-0). Prerequisite: CHEE 3309. Advanced principles of fluid mechanics and heat transfer, with applications to problems in research and design. Emphasis on unified point of view to transport processes in laminar and turbulent flow situations.
6335-6336: Chemical and Statistical Thermodynamics Cr. 3 per semester (3-0). Prerequisite: CHEE 3460. Advanced methods.
6337: Advanced Reactor Engineering Cr. 3 (3-0). Prerequisite: undergraduate kinetics or reactor design course. Introduction to modern concepts and techniques of chemical-reactor analysis and design.
6350: Finance & Accounting for Industrial & Chemical Processes Cr. 3 (3-0). Prerequisite: graduate standing or consent of instructor. Economic analysis and design fundamentals for bio-chemical processes; introduction to biotechnology, microbiology, biological kinetics, reactor design, transport phenomena, applications of enzymes and single mixed microbial populations.
6365: Fundamentals of Catalysis Cr. 3 (3-0). Prerequisite: CHEE 4387 or equivalent. Theories and experimental procedures in modern heterogeneous catalysis; catalyst preparation and properties, absorption, surface mechanics, catalyst design, and catalytic processes.
6367: Advanced Process Control Cр 1-5 per semester (3-0). Prerequisite: CHEE 3367 or equivalent, or consent of instructor. Application of high-speed computers in the control of chemical processes, reactors, and units.
6368: Chemical Process Economics I Cr 3 (3-0). Prerequisite: CHEE 3309. Managerial economics of chemical processes and products; development of decision-making methods using examples from the chemical industry.
6369: Chemical Process Economics II Cr 3 (3-0). Prerequisite: ENGE 3350, 6388. Study of profitability, process-comparison, and risk analysis from an advanced viewpoint, followed by extensive case-history studies of managed economics in process industries.
6370: Advanced Topics in Biochemical Engineering Cr. 3 (3-0). Prerequisite: CHEE 3309, or consent of instructor. Mathematical modeling and optimization of separation-unit operations in biochemical engineering, including chromatography, filtration, centrifugation, and flocculation. Engineering analysis and design of mammalian-cell bioreactors.
6371: Pollution-Control Engineering Cr. 3 (3-0). Prerequisite: Credit for or concurrent enrollment in CHEE 4321 and 4387 or equivalent. General survey of problems and remedies with the Earth as an environmentally closed system. Limitations of absorption and self-cleaning of the terepsphere, hydrosphere and atmosphere, and their interaction and interrelationship.
6372: Fluid-Particle Separation Cr. 3 (3-0). Prerequisite: ENGE 3303 or equivalent. Introduction to homogeneous, fluid-particle, multiphase systems. Development of fundamental principles of flow through compactable beds. Application to solid/liquid separation. Brief survey of aerosols, coalescence, and flotation.
6373: Environmental Remediation Cr. 3 (3-0). Prerequisite: ENGE 3303, CHEE 4362, and credit for or concurrent enrollment in CHEE 4367. In situ and ex situ methods of remediation or renovation of contaminated environmental sites. Emphasis on in-hydration contaminants in soil, surface water, and groundwater.
6374: Reaction Kinetics for Industrial Processes Cr. 3 (3-0). Prerequisite: credit for or concurrent enrollment in CHEE 4367. Fundamental methods for predicting product distributions in practical chemical reaction. Determination of thermokinetic and kinetics constants from statistical mechanics and transition-state theory. Applications from vapore-phase processes to catalysis.
6375: Chemical Processing for Microelectronics Cr. 3 (3-0). Prerequisite: ENGE 3367 or equivalent, or consent of instructor. Chemical Engineering principles applied to microelectronics-device fabrication and processing.
6376: Solid-Liquid Separation—Environmental Processes Cr. 3 (3-0). Prerequisite: ENGE 3363. Introduction to solid/liquid separation and processing. Particulate characteristics, porous media, interfacial phenomena, flow through permeable and porous beds; sedimentation, clarification, filtration, centrifugation, dispersion, washing.
6377: Introduction to Polymer Science Cr. 3 (3-0). Prerequisite: consent of instructor. Introduction to the synthesis, characterization, physical properties, and processing of polymer materials. Methods to measure, characterize, and tailor structure-processing-property correlations for polymer materials.
6378: Safety & Reliability Cr. 3 (3-0). Prerequisite: CHEE 3361, 3367, 3369. Overview of risks, safeguards, and hazards associated with chemical process engineering. Layers of protection, based identification, probabilistic models, risk assessment, source-term models, toxic release and dispersion models, fire and explosions, probabilistic analysis, fault-tree analysis, designs to prevent accidents, safety computer systems, and safety-related standards and regulations.
6380: Biochemical Separations Cr. 3 (3-0). Prerequisite: Senior standing in Chemical Engineering, or consent of instructor. Producing a cloned protein in useful amounts; uses of recombinant DNA methodologies to produce polysaccharide characterization methods.
6383: Advanced Unit Operations Cr. 3 (3-0). Prerequisite: CHEE 3462. Property prediction of multicomponent fluids. Advanced principles of heat-exchanger design, multicomponent fractionation, absorption, stripping, and extraction from a unified point of view.
6386: Air-Pollution Problems & Control Cr. 3 (3-0). Prerequisite: consent of instructor. Air-pollutant identification and control technology, estimation of pollutant transport, dispersion, and conversion; computer application for design of control units.
6396: Catalytic Processes Cr. 3 (3-0). Prerequisite: Credit for or concurrent enrollment in CHEE 4321 and 4387. Project-oriented survey.

For application forms, contact the Program Director. All correspondence and supporting documents (official transcripts and test scores) should also be mailed to this address:

Dr. Christine A. Economides
University of Houston
Chemical Engineering
522 Engineering Bldg 1
Houston, TX 77204-4004
7375: Petroleum-Production Operations Cr. 3 (3-0). Prerequisites: ENGI 5371, 5380, or consent of instructor. Design and operation of hydrocarbon reservoirs and production facilities; natural and artificial lift; oilfield equipment, systems, gas compression, corrosion control, and procedures for cost-effective casing design; principles and procedures of reservoir characterization; evaluation of costs and risks vs. minimum cost for drilling; directional drilling. 

7376: Advanced Oil-Field Facilities Design & Operation Cr. 3 (3-0). Prerequisites: ENGI 5361, 5363, and 5367. Design and operation of petroleum production facilities; principles and procedures for cost-effective design; oilfield materials, design, and procedures for cementing; nuclear-energy mechanisms in petroleum reservoirs; reservoir characterization; modeling of well performance; artificial lift; and production logging; well stimulation by use of cross-sections and areal models. 

7377: Petroleum Engineering Thesis Cr. 3 per semester (3-0). Prerequisites: senior, postbaccaularam, or graduate standing in Engineering or Geology. Petroleum reservoirs, migration, major oil and gas fields, drilling and production systems, gas compression, corrosion control, and procedures for cost-effective casing design; principles and procedures of reservoir characterization; evaluation of costs and risks vs. minimum cost for drilling; directional drilling. 

7378: Petroleum-Production Operations Cr. 3 (3-0). Prerequisite: senior, postbaccaularam, or graduate standing in Engineering or Geology. Petroleum reservoirs, migration, major oil and gas fields, drilling and production systems, gas compression, corrosion control, and procedures for cost-effective casing design; principles and procedures of reservoir characterization; evaluation of costs and risks vs. minimum cost for drilling; directional drilling. 

7379: Enhanced Oil-Recovery Processes Selected Topics Cr. 3 (3-0). May be repeated for credit when topics vary. 

6289: Enhanced Oil-Recovery Processes Selected Topics Cr. 3 (3-0). May be repeated for credit when topics vary. 

6302: Reservoir Engineering I Cr. 3 (3-0). Prerequisites: ENGI 5367 and 5362, or consent of instructor. Characterization of reservoirs by use of petrophysical and geophysical examinations, evaluation of reservoirs by use of core, seismic, and well-log testing; and combined interpretation. 

6304: Evaluation of Petroleum-Producing Formations Cr. 3 (3-0). Prerequisites: ENGI 5361, 5363, and 5370, or consent of instructor. Review of waterflooding: calculation methods, extension to polymer flooding, caustic flooding, and carbon dioxide flooding. 

6306: Oilfield Facilities Design & Operation I Cr. 3 (3-0). Prerequisite: ENGI 5380 and 5382, or consent of instructor. Review of waterflooding: calculation methods, extension to polymer flooding, caustic flooding, and carbon dioxide flooding. 

6308: Advanced Petroleum-Production Operations Cr. 3 (3-0). Prerequisites: ENGI 5361, 5363, and 5370, or consent of instructor. Fracture propagation; wellbore stability; artificial lift systems; fluid flow in porous media. 

6310: Petroleum-Production Operations I Cr. 3 (3-0). Prerequisites: ENGI 5361, 5362, and 6302, or consent of instructor. Estimation of fluid initial contents and forecasts of production of crude oil and natural gas by primary, secondary, and tertiary recovery. 

6312: Evaluation of Petroleum-Producing Formations II Cr. 3 (3-0). Prerequisites: ENGI 5361, 5362, and 5370, or consent of instructor. Review of waterflooding: calculation methods, extension to polymer flooding, caustic flooding, and carbon dioxide flooding. 

6314: Pressure-Transient Testing Cr. 3 (3-0). Prerequisites: ENGI 5362 and 5364. Theory and application of pressure-transient testing of oil and gas wells for determination of reservoir properties and well damage or stimulation. 

6316: Well-Drilling & Completion I Cr. 3 (3-0). Prerequisites: ENGI 5361 and graduate standing in petroleum engineering. Principles and procedures for cost-effective use of design, materials, design, and procedures for cementing; optimization of bits, weight, and R.P.M. for minimum cost for drilling; directional drilling. 

6317: Artificial Lift Cr. 3 (3-0). Prerequisites: ENGI 5361, 5363, and 5367. Design theory and practice for facilities for unusual situations as may be required for practitioners; adaptations for offshore and other hostile environments. 

6320: Advanced Oil-Field Facilities Design & Operation II Cr. 3 (3-0). Prerequisites: ENGI 5361, 5363, and 5367. Theory and practice for facilities for unusual situations as may be required for practitioners; adaptations for offshore and other hostile environments. 

6322: Reservoir Simulation Cr. 3 (3-0). Prerequisites: ENGI 5362, 5364, and 6302, or consent of instructor. Review of reservoir simulation: mean, streamline simulator, finite-difference, finite-element, and collocation methods. Theory of finite-difference simulations; formulation of equations and resulting alternatives, alternative solution methods. 

6323: Reservoir Simulation Cr. 3 (3-0). Prerequisites: ENGI 5362, 5364, and 6302, or consent of instructor. Review of reservoir simulation: mean, streamline simulator, finite-difference, finite-element, and collocation methods. Theory of finite-difference simulations; formulation of equations and resulting alternatives, alternative solution methods. 

6338: Petroleum Engineering Project Cr. 3 per semester (3-0). Prerequisites: ENGI 5361, 5362, and 5370, or consent of the project advisor. May be repeated once for credit. 

6370: Petroleum-Production Operations Cr. 3 (3-0). Prerequisites: senior, postbaccaularam, or graduate standing in Engineering or Science. Subsurface and surface facilities for production of oil, gas, and oil-water-separation and measuring systems; gathering systems; gas-processing facilities; injection systems for gas or water. 

6371: Selected Topics in Petroleum Engineering Cr. 3 (3-0). May be repeated for credit. 

6372: Selected Topics in Petroleum Engineering Cr. 3 (3-0). May be repeated for credit. 

6373: Petroleum-Production Operations Cr. 3 (3-0). Prerequisites: senior, postbaccaularam, or graduate standing in Engineering or Science. Subsurface and surface facilities for production of oil, gas, and oil-water-separation and measuring systems; gathering systems; gas-processing facilities; injection systems for gas or water. 

6374: Selected Topics in Petroleum Engineering Cr. 3 (3-0). May be repeated for credit. 

6375: Petroleum-Production Operations Cr. 3 (3-0). Prerequisites: senior, postbaccaularam, or graduate standing in Engineering or Science. Subsurface and surface facilities for production of oil, gas, and oil-water-separation and measuring systems; gathering systems; gas-processing facilities; injection systems for gas or water. 

6376: Selected Topics in Petroleum Engineering Cr. 3 (3-0). May be repeated for credit. 

6377: Selected Topics in Petroleum Engineering Cr. 3 (3-0). May be repeated for credit. 

6378: Petroleum Engineering Project Cr. 3 per semester (3-0). Prerequisites: ENGI 5361, 5362, and 5370, or consent of the project advisor. May be repeated once for credit. 

6379: Selected Topics in Petroleum Engineering Cr. 3 (3-0). May be repeated for credit. 

7370: Petroleum-Production Operations Cr. 3 (3-0). Prerequisites: senior, postbaccaularam, or graduate standing in Engineering or Science. Subsurface and surface facilities for production of oil, gas, and oil-water-separation and measuring systems; gathering systems; gas-processing facilities; injection systems for gas or water. 

7371: Evaluation of Petroleum-Producing Formations II Cr. 3 (3-0). Prerequisites: ENGI 5361, 5362, and 5370, or consent of instructor. Advanced well-log interpretation and logging-theory Application of ENGI 5361 (Evaluation of Petroleum-Producing Formations I). 

7372: Evaluation of Petroleum-Producing Formations II Cr. 3 (3-0). Prerequisites: ENGI 5361, 5362, and 5370, or consent of instructor. Advanced well-log interpretation and logging-theory Application of ENGI 5361 (Evaluation of Petroleum-Producing Formations I). 

7373: Plasma Processing: Principles & Applications Cr. 3 (3-0). Prerequisite: senior, postbaccaularam, or graduate standing in Engineering or Geology. Plasma processing: glow-discharge plasma; plasma generation and optimization. 

7374: Origin & Development of Oil & Gas Cr. 3 (3-0). Prerequisites: ENGI 3738, 5370, and 6302, or consent of instructor. Development of petroleum-borne oil and gas reservoirs. 

7375: Petroleum-Production Operations Cr. 3 (3-0). Prerequisites: senior, postbaccaularam, or graduate standing in Engineering or Science. Subsurface and surface facilities for production of oil, gas, and oil-water-separation and measuring systems; gathering systems; gas-processing facilities; injection systems for gas or water. 

7376: Advanced Oil-Field Facilities Design & Operation I Cr. 3 (3-0). Prerequisites: ENGI 5381, 5380, and 5370, or consent of instructor. Review of waterflooding: calculation methods, extension to polymer flooding, caustic flooding, and carbonated-water flooding. 

7377: Advanced Oil-Field Facilities Design & Operation II Cr. 3 (3-0). Prerequisites: ENGI 5361, 5363, and 5367. Design theory and practice for facilities for unusual situations as may be required for practitioners; adaptations for offshore and other hostile environments.
SEMINARS & CONTINUING EDUCATION

Weekly Seminar Series

The Department attracts renowned speakers to address our graduate students on virtually a weekly basis. These speakers provide lecture abstracts that are distributed not just intradepartmentally, but to key industrial and academic figures statewide who may wish to attend. Unless exceptional circumstances apply, all CHChem seminars are held on Fridays at 10:30 a.m. in room W122 of Bldg. D3, Cullen College of Engineering.

These seminars were presented in 2000–2001:

**SPRING SEMESTER 2000**

<table>
<thead>
<tr>
<th>Date</th>
<th>Speaker</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>JANUARY 21</td>
<td>Prof. Michael Trapatsis</td>
<td>Chemical Engineering Department, University of Massachusetts (Amherst, MA)</td>
</tr>
<tr>
<td>FEBRUARY 16</td>
<td>Dr. Ahmed Alim</td>
<td>Department, Pencor-Quaker State Co. (The Woodlands, TX)</td>
</tr>
<tr>
<td>FEBRUARY 18</td>
<td>Dr. Ching-Hwa Klang</td>
<td>Department of Chemistry/Biochemistry, University of California (Los Angeles, CA)</td>
</tr>
<tr>
<td>FEBRUARY 25</td>
<td>Prof. Daniel J. Lacks</td>
<td>Chemical Engineering Department, Tulane University (New Orleans, LA)</td>
</tr>
<tr>
<td>MARCH 3</td>
<td>Matthias Koffas</td>
<td>Chemical Engineering Department, Massachusetts Institute of Technology (Cambridge, MA)</td>
</tr>
<tr>
<td>MARCH 10</td>
<td>Dr. Efronisi Kokkoli</td>
<td>Materials Research Laboratory, University of California (Santa Barbara, CA)</td>
</tr>
<tr>
<td>MARCH 24</td>
<td>Prof. Michael W. Doan</td>
<td>Chemical Engineering Department, University of California (Los Angeles, CA)</td>
</tr>
<tr>
<td>MARCH 31</td>
<td>Dr. John A. Morgan</td>
<td>Chemical Engineering Department, University of Georgia (Berkely, CA)</td>
</tr>
</tbody>
</table>

**FALL SEMESTER 2000**

<table>
<thead>
<tr>
<th>Date</th>
<th>Speaker</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUGUST 25</td>
<td>Prof. Akhil Datta-Gupta</td>
<td>Petroleum Engineering Department, Texas A&amp;M University (College Station, TX)</td>
</tr>
<tr>
<td>SEPTEMBER 1</td>
<td>Dr. Herbert McKea</td>
<td>Industrial Consultant (Houston, TX)</td>
</tr>
<tr>
<td>SEPTEMBER 8</td>
<td>Dr. Grigorios Kolios</td>
<td>Chemical Engineering Department, University of Houston</td>
</tr>
<tr>
<td>SEPTEMBER 15</td>
<td>Prof. John A. Pijman</td>
<td>Department of Chemistry &amp; Biochemistry, University of Southern Mississippi (Hattiesburg, MS)</td>
</tr>
<tr>
<td>SEPTEMBER 22</td>
<td>Prof. Fernando Muzzio</td>
<td>Chemical Engineering Department, Rutgers University (Piscataway, NJ)</td>
</tr>
<tr>
<td>OCTOBER 6</td>
<td>Prof. Matteo Pasquali</td>
<td>Chemical Engineering Department, Rice University (Houston, TX)</td>
</tr>
<tr>
<td>OCTOBER 13</td>
<td>Prof. Larry W. Lake</td>
<td>Department of Petroleum &amp; Geosystems Engineering, University of Texas (Austin, TX)</td>
</tr>
<tr>
<td>OCTOBER 20</td>
<td>Prof. Eric J. Beckman</td>
<td>Chemical Engineering Department, University of Pittsburgh (Pittsburgh, PA)</td>
</tr>
<tr>
<td>OCTOBER 27</td>
<td>Prof. Toshiaki Makabe</td>
<td>Department of Electronics &amp; Electrical Engineering, Kaise University (Yokohama, Japan)</td>
</tr>
</tbody>
</table>

**SPRING SEMESTER 2001**

<table>
<thead>
<tr>
<th>Date</th>
<th>Speaker</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>JANUARY 9</td>
<td>Dr. James Wei</td>
<td>Dean of Engineering &amp; Applied Sciences, Princeton University (Princeton, NJ)</td>
</tr>
<tr>
<td>JANUARY 21</td>
<td>Prof. Andreas Acrivos</td>
<td>Department, University of Pittsburgh (Pittsburgh, PA)</td>
</tr>
<tr>
<td>JANUARY 27</td>
<td>Dr. James Wei</td>
<td>Department, University of Alabama (Huntsville, AL)</td>
</tr>
<tr>
<td>FEBRUARY 16</td>
<td>Prof. Peter G. Vekilov</td>
<td>Department, Rice University (Houston, TX)</td>
</tr>
<tr>
<td>FEBRUARY 23</td>
<td>Dr. Alan W. Mahoney</td>
<td>School of Chemical Engineering, Purdue University (West Lafayette, IN)</td>
</tr>
</tbody>
</table>

**NOVEMBER 3** 15th-Annual OChemG Symposium (q.v.)

**NOVEMBER 9-10** 16th CHChem Industrial Advisory Board Meeting

**DECEMBER 1** Prof. David T. Allen, Chemical Engineering Department, University of Texas (Austin): “The Texas Air-Quality Study: State of the Science of Air Quality in Texas & Implications for Air-Quality Policy”

**DECEMBER 2-3** Prof. Toshiaki Makabe, Chemical Engineering Department, University of Pittsburgh (Pittsburgh, PA): “Inverse-Problem Modeling of Particulate Dynamics”

**MARCH 2** Dr. Victor M. Uzup, Chemical Engineering Department, University of Michigan (Ann Arbor, MI): “Investigation of the Interplay between Structure & Rheology in Model Thermotropic Liquid Crystal Polymers using in situ X-ray Scattering Techniques”

**MARCH 9** Emmanouil S. Tzanakakis, Chemical Engineering & Materials Science Department, University of Minnesota (Minneapolis, MN): “Tissue Engineering through Hepatocyte Spheroid Self-Assembly”

**MARCH 23** Dr. Michael R. King, Chemical Engineering Department, University of Pennsylvania (Philadelphia, PA): “The Dynamics of Leukocyte Adhesion in a Multicellular Environment”

**MARCH 30** Prof. Gilbert F. Froment, Chemical Engineering Department, Texas A&M University (College Station, TX): “Synthesis-Gas Production by Steam-CO2 Reforming & Catalytic Partial Oxidation of Natural Gas”

**APRIL 6** Maria I. Klapa, Chemical Engineering Department, Massachusetts Institute of Technology (Cambridge, MA): “High-Resolution Flux Determination using Stable Isotopes & Mass Spectrometry”

**APRIL 22** Aaron J. Golumbfskie, Chemical Engineering Department, University of Miami (Miami, FL): “Simulation of Biomimetic Recognition between Polymers & Surfaces”

**JUNE 11** Prof. J.B. Joshi, Department of Chemical Technology, University of Mumbai (Matunga, Mumbai, India): “Computational Flow Modeling & Design” (cancelled due to the local flooding from Tropical Storm Allison).

**SEPTEMBER 8** Dr. Grigorios Kolios, Chemical Engineering Department, University of California (Los Angeles, CA): “Molecular-Sieve Nanoparticles, Wires & Films; & II. Spontaneous Cullen College of Engineering. Transitions in Protein Solutions: Structures, Dynamics, & Control Strategies”

**SEPTEMBER 22** Prof. Fernando Muzzio, Chemical Engineering Department, Rutgers University (Piscataway, NJ): “Frontal Polymerization: From Microgravity to New Materials”

**SEPTEMBER 27** Prof. Toshiaki Makabe, Department of Electronics & Electrical Engineering, Kaise University (Yokohama, Japan): “Vertically Integrated CAD for Microelectronic-Device Fabrication”

**SEPTEMBER 29** Inaugural Neal R. Amundson Lecture: “Industrial Career… Go for It!”

**SEPTEMBER 30** Prof. John A. Pojman, Department of Chemistry & Biochemistry, University of Southern Mississippi (Hattiesburg, MS): “Estimating True Dispersivity”

**OCTOBER 1** Dr. Victor M. Uzup, Chemical Engineering Department, University of Michigan (Ann Arbor, MI): “Investigation of the Interplay between Structure & Rheology in Model Thermotropic Liquid Crystal Polymers using in situ X-ray Scattering Techniques”

**OCTOBER 3** Dr. Alan W. Mahoney, School of Chemical Engineering, Purdue University (West Lafayette, IN): “Inverse-Problem Modeling of Particulate Dynamics”

**OCTOBER 6** Dr. Janis M. Bugg, Department of Chemistry & Biochemistry, University of Southern Mississippi (Hattiesburg, MS): “Estimating True Dispersivity”

**OCTOBER 20** Prof. Eric J. Beckman, Chemical Engineering Department, University of Pittsburgh (Pittsburgh, PA): “Chemical Processing using CO2”

**OCTOBER 28** Prof. Auke W. Mahoney, Chemical Engineering Department, Pennzoil-Quaker State Co. (The Woodlands, TX): “Powder Mixing & Segregation: From Pharmacy to Physics… and Back to Pharmacy”

**OCTOBER 30** Prof. Toshiaki Makabe, Department of Electronics & Electrical Engineering, Kaise University (Yokohama, Japan): “Vertically Integrated CAD for Microelectronic-Device Fabrication”

**NOVEMBER 1** Dr. Donald Dabdub, Mechanical & Aerospace Engineering Department, University of California (Irvine, CA): “Mathematical Modeling of Size- & Chemically Resolved Urban Atmospheric Aerosols”

**NOVEMBER 13** Prof. Toshiaki Makabe, Chemical Engineering Department, University of California (Los Angeles, CA): “Spheroid Self-Assembly”

**NOVEMBER 20** Prof. Donald Dabdub, Mechanical & Aerospace Engineering Department, University of California (Irvine, CA): “Mathematical Modeling of Size- & Chemically Resolved Urban Atmospheric Aerosols”

**NOVEMBER 26** Prof. Jennifer L. West, Chemical Engineering & Bioengineering Department, Rice University (Houston, TX): “Synthetic ECM Analogs: New Biomaterials for Use in Tissue Engineering”

**FEBRUARY 23** Prof. Michael V. Pishko, Chemical Engineering Department, Texas A&M University (College Station, TX): “Microporous & Nanoporous Hydrogels for Chemical Sensing”

**FEBRUARY 27** Prof. Toshiaki Makabe, Department of Electronics & Electrical Engineering, Kaise University (Yokohama, Japan): “Vertically Integrated CAD for Microelectronic-Device Fabrication”

**FEBRUARY 27** Dr. Alan W. Mahoney, School of Chemical Engineering, Purdue University (West Lafayette, IN): “Inverse-Problem Modeling of Particulate Dynamics”

**MARCH 2** Dr. Victor M. Uzup, Chemical Engineering Department, University of Michigan (Ann Arbor, MI): “Investigation of the Interplay between Structure & Rheology in Model Thermotropic Liquid Crystal Polymers using in situ X-ray Scattering Techniques”

**MARCH 9** Emmanouil S. Tzanakakis, Chemical Engineering & Materials Science Department, University of Minnesota (Minneapolis, MN): “Tissue Engineering through Hepatocyte Spheroid Self-Assembly”

**MARCH 23** Dr. Michael R. King, Chemical Engineering Department, University of Pennsylvania (Philadelphia, PA): “The Dynamics of Leukocyte Adhesion in a Multicellular Environment”

**MARCH 30** Prof. Gilbert F. Froment, Chemical Engineering Department, Texas A&M University (College Station, TX): “Synthesis-Gas Production by Steam-CO2 Reforming & Catalytic Partial Oxidation of Natural Gas”

**APRIL 6** Maria I. Klapa, Chemical Engineering Department, Massachusetts Institute of Technology (Cambridge, MA): “High-Resolution Flux Determination using Stable Isotopes & Mass Spectrometry”

**APRIL 22** Aaron J. Golumbfskie, Chemical Engineering Department, University of Miami (Miami, FL): “Simulation of Biomimetic Recognition between Polymers & Surfaces”

**JUNE 11** Prof. J.B. Joshi, Department of Chemical Technology, University of Mumbai (Matunga, Mumbai, India): “Computational Flow Modeling & Design” (cancelled due to the local flooding from Tropical Storm Allison).
Continuing Education

The following fee-basis Continuing Education course is presented semiannually (generally in May and December) by a team of UH CHE professors and outside experts:

"APPLICATIONS OF HETEROGENEOUS CATALYSIS"

INSTRUCTORS:
- Prof. Dan Luss (University of Houston)
- Prof. James T. Richardson (University of Houston)
- Prof. Vern W. Weakman, Jr. (Retired Director, Central Research, Mobil R&D Corporation)

HIGHLIGHTS OF THE COURSE DESCRIPTION:
Successful applications of the principles of catalysis to process design require a combination of physics, chemistry and engineering, together with state-of-the-art “know-how.” Contemporary catalysis has made significant progress in recent years toward the scientific design of optimal catalyst systems for specific process requirements. The purpose of this course is to cover current knowledge for both the researcher in catalysis and the engineer interested in process applications. It will serve as a review for those knowledgeable in the subject and as an introduction to newcomers to the field.

The course considers how to select, prepare, characterize, test, and use a catalyst. Both laboratory and commercial methods of catalyst preparation are reviewed, with emphasis on practical applications. Modern instrumental methods for the characterization of catalysts’ physical and chemical properties are also included. Techniques for the measurement of surface areas, pore properties, diffusivities, crystal size, acidity, etc. are discussed. All aspects of catalytic kinetics, both chemical and diffusional, and are considered with reference to specific problems. Common mechanisms and their relationship to catalyst properties are outlined fully.

To inquire about course dates, registration, and fees, contact:

Patricia A. Cooks
University of Houston, Department of Chemical Engineering
S 222 Engineering Bldg 1
Houston, TX 77204-4004, U.S.A.
Phone: 713-743-4321
Fax: 713-743-4323
E-mail: PatCooks@uh.edu

Faculty

Amundson, Neal R. 713-743-3492
Balakotaiah, Vemuri Bala@uh.edu 713-743-4318
Economides, Christine A. CCEE@slb.com 713-743-4328 or 713-743-4300
Economides, Michael J. MJE@uh.edu 713-743-4330
Economou, Demetre J. Economou@uh.edu 713-743-4320
Flumerfelt, Raymond W. Dean RWF@uh.edu 713-743-4200 (office)
Harold, Michael P. Chairman MHarold@uh.edu 713-743-4307
Henley, Ernest J. EHenley@bayou.uh.edu 713-743-4326
Krishnamoorti, Ramanan Ramanan@mail.uh.edu 713-743-4312
Luss, Dan DLuss@uh.edu 713-743-4305
Mohanty, Kishore K. Mohanty@uh.edu 713-743-4311
Nikolaou, Michael Nikolaou@uh.edu 713-743-4309
Richardson, James T. JTR@uh.edu 713-743-4324
Rooks, Charles W. CWRooks@uh.edu 713-743-4302
Tiller, Frank M. FTiller@uh.edu 713-743-4322
Vekilov, Peter G. Peter.Vekilov@mail.uh.edu 713-743-4315
Willson, Richard C. Willson@uh.edu 713-743-4308

Staff

Cooks, Patricia A. Department Business Manager PatCooks@uh.edu 713-743-4321
Dvoretzky, Toban Assistant to the Chairman, et al. TBlone@uh.edu 713-743-4304
Moses, Pamela J. Accounting Specialist PMosse@uh.edu 713-743-4303

Information

Phone: 713-743-4300
Fax: 713-743-4323

Mailing Address
Department of Chemical Engineering
University of Houston
Cullen College of Engineering
5222 Engineering Bldg 1
Houston, TX 77204-4004, USA

Web Addresses
Chemical Engineering www.ch.ee.uh.edu
Cullen College of Engineering www.cit.eh.edu