8-foot acoustic window and inert acoustic door facing the acoustic chamber. Up to sixteen channels of audio can be carried in or out of the chamber to the control room. Experiments to be conducted in the Multimedia Systems Laboratory include blind source separation, deconvolution and dereverberation. Several of the undergraduate courses in Electrical Engineering use sound and music to motivate system-level design and signal processing applications. The Multimedia Systems Laboratory will be used in these activities to develop data sets for use in classroom experiments and laboratory projects for students to complete.

High-speed Wireless Communications Laboratory. The laboratory provides a multitier network testbed for research purposes and also serves as a facility for conducting lab courses on wireless communications and networking. The infrastructure in the lab includes: a) GSM based cellular network that provides wide range connectivity at medium data rates, b) 802.11 based WLAN offering high data rates in an office environment, and c) Bluetooth networks that offers low cost, short range, and low data rate connections. One of the research focus areas is on investigating total power efficiency of these heterogeneous networks.

Semiconductor Processing Clean Room. The 2,800 square-foot, class 10,000 clean room, consisting of a 2,400 square-foot, class 10,000 room and a class 1,000 lithography area of 400 square feet, is located in the Jerry R. Junkins Engineering Building. A partial list of equipment in this laboratory includes acid and solvent hoods, photoresist spinners, a scanning electron microscope, two contact mask aligners, a thermal evaporator, a plasma asher, a plasma etcher, a turbo-pumped methane hydrogen reactive ion etcher, a four-target sputtering system, a plasma-enhanced chemical vapor deposition reactor, a diffusion-pumped four pocket e-beam evaporator, an ellipsometer, and a profilometer. Other equipment includes a boron-trichloride reactive ion etcher, a chemical-assisted ion-beam etcher, and an e-beam evaporator for dielectric deposition. The clean room is capable of processing silicon and compound semiconductors for microelectronic, photonic, nanotechnology devices.

Submicron Grating Laboratory. This is dedicated to holographic grating fabrication and has the capability of sub tenth-micron lines and spaces. Equipment in this laboratory includes a floating air table, an argon ion laser (ultraviolet lines) and an Atomic Force Microscope. This laboratory is used to make photonic devices with periodic features such as distributed feedback, distributed Bragg reflector, grating-outcoupled and photonic crystal semiconductor lasers.

Photonic Devices Laboratory. This laboratory is dedicated to characterizing the optical and electrical properties of photonic devices. Equipment in this laboratory program includes optical spectrum analyzer, an optical multimeter, visible and infrared cameras, an automated laser characterization system for edge-emitting lasers, a manual probe test system for surface-emitting lasers, a manual probe test system for edge-emitting laser die and bars, and a near- and far-field measurement system.

Photonics Simulation Laboratory. This laboratory has specific computer programs that have been developed and continue to be developed for modeling and designing semiconductor lasers and optical waveguides, couplers and switches. These programs include WAVEGUIDE (calculates near-field, far-field, and effective indices of dielectric waveguides and semiconductor lasers with up to 500 layers. Each layer can contain gain or loss), GAIN (calculates the gain as a function of energy, carrier density and current density for strained and unstrained quantum wells for a variety of material systems), GRATING (uses the Floquet Bloch approach and the boundary element method to calculate reflection, transmission and outcoupling of dielectric waveguides and laser structures with any number of layers), and FIBER (calculates the fields, effective index, group velocity and dispersion for fibers with a circularly symmetric index of refraction profiles). Additional software is under development to model the modulation characteristics of photonic devices.

Photonic Architectures Laboratory. This laboratory is in the process of being set up. When complete, it will have a fully equipped opto-mechanical and electrical prototyping facility, supporting the activities of faculty and graduate students in experimental and analytical tasks. The lab is ideally suited for the packaging, integration, and testing of devices, modules, and prototypes of optical systems. It will have two large vibration isolated tables, a variety of visible and infrared lasers, single element 1-D and 2-D detector arrays and a large compliment of optical and opto-mechanical components and mounting devices. In addition, the laboratory will have extensive data acquisition and analysis equipment, including a 1394 (Firewire) capable image capture and processing workstation, specifically designed to evaluate the electrical and optical characteristics of smart pixel devices and FSOI modules. Support electronics hardware includes various test instrumentation, such as arbitrary waveform generators and a variety of CAD tools for optical and electronic design.

CURRICULUM IN ELECTRICAL ENGINEERING

The undergraduate curriculum in electrical engineering provides the student with basic principles through required courses, and specialization through a guided choice of elective courses.

Areas of Specialization

Due to the extensive latitude in course selection and to the wide variety of courses available within the Department of Electrical Engineering and within the University as a whole, it is possible for the electrical engineering student to concentrate his or her studies in a specific professional area. The areas available include the following:

- Control Systems
- Biomedical Engineering
- Communications
- Computer Engineering
- Digital Signal Processing
- Electromagnetics and Optics
- Electronic Circuits
- Electronic Devices and Materials
- Networks
- Systems
- Telecommunications Engineering

In most cases, the concentration is satisfied by systematically taking a specified group of electrical engineering courses at the advanced level. However, the telecommunications engineering, computer engineering, and biomedical options are more specialized. Their requirements are described later.

Bachelor of Science in Electrical Engineering

The electrical engineering curriculum is administered by the Department of Electrical Engineering and is accredited by the Accreditation Board of Engineering and Technology (ABET).

The term credit hours within this curriculum are distributed as follows:

		TCH
College Requirements:	ENGL 1301, 1302, Perspectives including ECO 1311, Cultural Formations, and Wellness	23
Mathematics*:*	MATH 1337, 1338, 2339, 2343, and a three-hour elective course at the 3000 or above level	15
Science:	CHEM 1303 or 1305; PHYS 1303, 1304, and 1105; and a three-hour elective in physics or chemistry	13

		TCH
Computer Science:	CSE 1341 and one of CSE 2341, or 2353	6
Engineering Leadership:	Two of EMIS 3308, ENCE 3302, EMIS 3309 or CSE 4360	6
Engineering Elective:	One of ME 2310, 2320, 2331, 2342, CSE 2341, 2353, EMIS 2360, EE 3311, 3330, or 3372	3
Core Electrical Engineering:	EE 1382, 2122, 2170, 2181, 2322, 2350, 2370, 2381 and 3360	21
Junior Electrical Engineering Electives:	EE 3122, 3181, 3322, 3381, 3311, 3330, and 3372	20
Advanced Electrical Engineering Electives		12
Electrical Engineering Senior Design Sequence:	EE 4311 and 4312	6
Minimum total hours required		125

Three hours of advanced electrical engineering electives must be selected in each of the three areas listed below:

EE 5360, 5362, 5370, 5371, 5372, 5373, 5374, 5375; and 5376
EE 5356, 5357, 5380, 5381, and 5385;
EE 5310, 5312, 5314, 5321, 5330, 5332, and 5333.

The remaining three hours of advanced electrical engineering electives may be chosen from any of the above three areas or advanced (5000-level) CSE courses offered by the CSE Department. Please note that EE 8000-level courses are primarily for graduate students but may be taken by highly qualified undergraduates with the approval of the adviser and the instructor. Special topics courses also are available.

Each student is expected to complete and file a plan of study with his or her academic adviser. The plan should state specific choices to meet the foregoing requirements and develop an area of specialization when this is desired. This should be done as soon as possible; however, for many students, it is a process that continues from term to term as the individual becomes better acquainted with the discipline of electrical engineering and with the choices available.

Specializations are offered in four important areas: premedical or biomedical engineering, computer engineering, a dual degree in physics, and telecommunications engineering. Each student may select one of these specializations or may personalize his or her degree by a particular choice of advanced major electives.

Bachelor of Science in Electrical Engineering
(Biomedical Engineering Specialization)

The Department of Electrical Engineering offers a B.S.E.E. degree with a specialization in biomedical engineering. This program enables students to satisfy requirements for admission to medical school, and it is carried out in cooperation with the Baylor University Medical Center in Dallas. Students may also work on projects under faculty supervision at the University of Texas Southwestern Medical School.

The term credit hours within this curriculum are distributed as follows:

		TCH
College Requirements:	ENGL 1301, 1302, Perspectives including ECO 1311, Cultural Formations, and Wellness	23

		TCH
Mathematics:	MATH 1337, 1338, 2339, 2343, and a three-hour elective course at the 3000 level or above	15
Science:	BIOL 1401, 1402, 3304, and 3350; CHEM 1303, 1304, 1113, 1114, 3117, 3118, 3371, and 3372; and PHYS 1303 and 1304*	36
Computer Science:	CSE 1341	3
Core Electrical Engineering:	EE 1382, 2122, 2170, 2181, 2322, 2350, 2370, 2381, 3181, 3360 and 3381	25
Engineering Leadership:	One of EMIS 3308, EMIS 3309, ENCE 3302 or CSE 4360	3
Junior Electrical Engineering:	EE 3372 and two of 3311, 3322, 3330	9
Advanced Electrical Engineering Elective		3
Biomedical Engineering:	EE 5340 and 5345	6
Electrical Engineering Senior Design Sequence:	EE 4311, 4312	6
Minimum total hours required		129

Bachelor of Science in Electrical Engineering
(Computer Engineering Specialization)

The Department of Electrical Engineering offers a B.S.E.E. degree with a computer engineering specialization, which brings together aspects of electrical engineering and computer science with the aim of developing state-of-the-art digital computer systems. Students in the Computer Engineering specialization receive training in a variety of areas ranging from C programming, assembly language, and data structures, to logic design, microprocessor interfacing, and computer architecture.

The term credit hours within this curriculum are distributed as follows:

		TCH
College Requirements:	ENGL 1301, 1302, Perspectives including ECO 1311, Cultural Formations, and Wellness	23
Mathematics:	MATH 1337, 1338, 2339, 2343, and one of MATH 3315/CSE 3365, MATH 3337 or 3353	15
Science:	CHEM 1303 or 1305, PHYS 1303, 1304, 1105 and a three-hour elective in physics or chemistry	13
Computer Science:	CSE 1341, 2341, 2353, and 3358	12
Engineering Leadership:	Two of EMIS 3308, ENCE 3302, EMIS 3309, or CSE 4360	6
Core Electrical Engineering:	EE 1382, 2122, 2170, 2181, 2322, 2350, 2370, 2381 and 3360	21

* Students who plan to attend medical school are recommended to also take PHYS 1105 and 1106.

		TCH
Junior Electrical Engineering Electives:	EE 3122, 3181, 3322, 3381 and three of 3311, 3330, or 3372	17
Advanced Electrical Engineering Electives:	EE 5381, 5385 and two of 5357, 5380	12
Senior Design Sequence:	EE 4311 and 4312	6
Minimum total hours required		125

Bachelor of Science in Electrical Engineering and Bachelor of Science With a Major in Physics

The Electrical Engineering Department and the Physics Department offer an integrated curriculum that enables a student to obtain both a Bachelor of Science in Electrical Engineering (B.S.E.E.) degree and a Bachelor of Science (B.S.) degree with a major in Physics.

The term credit hours within this curriculum are distributed as follows:

		TCH
College Requirements:	ENGL 1301, 1302, Perspectives including ECO 1311, Cultural Formations, and Wellness	23
Mathematics:	MATH 1337, 1338, 2339, 2343, and a three-hour elective course at the 3000 level or above	15
Science:	CHEM 1303 or 1305; PHYS 1105, 1303, 1304, 3305, 3344, 3345, 4211, 5337, 5382, and 5383; and PHYS 3374 or ME 3341	33
Computer Science:	CSE 1341	3
Engineering Leadership:	Two of EMIS 3308, ENCE 3302, EMIS 3309 or CSE 4360	6
Core Electrical Engineering:	EE 1382, 2122, 2170, 2181, 2322, 2350, 2370, 2381 and 3360	21
Junior Electrical	EE 3122, 3181, 3322, 3381, either 3330 or PHYS 4392; and two of EE 3311, or 3372	17
Advanced Electrical Engineering Electives		12
Senior Design Sequence:	EE 4311 and 4312	6
Minimum total hours required		136

Bachelor of Science in Electrical Engineering *(Communication and Signal Processing Specialization)*

Signal processing, in particular digital signal processing (DSP), has come to play a significant role in our daily lives. Literally, DSP involves the processing of various signals such as speech, music, video, and others in digital form. Such processing is usually done with a digital signal processor, a programmable semiconductor device designed to rapidly process digital data. The DSP is an integral component of any system in which information is processed or transmitted, whether over a conventional telephone network, a cellular phone, or the Internet.

The explosive growth of the telecommunications industry and the Internet has generated a tremendous demand for electrical engineers who are versed in the language of DSP. The Communication and Signal Processing specialization is designed to meet this need. Students learn the fundamental principles of DSP during the first year. Concepts and techniques in signal processing and communications are covered in greater depth in each successive year, culminating in a senior-year capstone course in which students design and develop signal processing algorithms and software for a communications system application.

The term credit hours within this curriculum are distributed as follows:

		TCH
College Requirements:	ENGL 1301, 1302, Perspectives including ECO 1311, Cultural Formations, and Wellness	23
Mathematics:	MATH 1337, 1338, 2339, 2343, and a three-hour elective course at the 3000 level or above	15
Science:	CHEM 1303 or 1305; PHYS 1303, 1304, and 1105 and a three-hour elective course at the 3000 level	13
Computer Science:	CSE 1341, 2341, and 2353 and one of 3358	12
Engineering Leadership:	Two of EMIS 3308, EMIS 3309, ENCE 3302, or CSE 4360	6
Core Electrical Engineering:	EE 1382, 2122, 2170, 2181, 2322, 2350, 2370, 2381, 3330, 3360, and 3372	27
Junior Electives	Two of EE 3311, 3322 or 3381/3181	6/7
Advanced Communication and Signal Processing Courses:	EE 5176, 5370, 5372, 5373, 5376 and one of EE 5371, 5374, 5375 or 5377	17
Electrical Engineering Senior Design Sequence:	EE 4311, 4312	6
Minimum total hours required		125/126

Bachelor of Science in Electrical Engineering
(Telecommunications Specialization)

Telecommunications includes any type of communication of information at a distance by electronic means. This communication may be between humans, machines, businesses, government entities, computers, or any combination thereof. Example information formats include speech and audio, computer data, facsimile, imaging and video, wire and cable, radio, satellite, Internet, microwave, optical fiber, and others.

Today's intelligent networks, created by embedding computers in telecommunications systems, have given rise to an information society. Corporations, institutions, and government agencies cannot operate effectively in a competitive world without using telecommunications systems efficiently to communicate that information.

All areas of the telecommunications profession need telecommunications engineers. In manufacturing, they work as creators and designers of products. In the service category, they create efficient and cost-effective systems for telephone service providers, Internet and online computer services, and cellular service providers. At the corporate-user end of the profession, they ensure that their companies have the very best telecommunications systems to give their businesses a competitive edge.

Telecommunications engineers face challenges requiring specialized training in electrical engineering, plus breadth that includes regulatory law, economics, management science, and computer science. To ensure their success, SMU candidates for the degree of Bachelor of Science in Electrical Engineering with a telecommunications engineering specialization are grounded in all of these areas. To accomplish this within the context of a four-year program, students take a uniquely formulated curriculum of electrical engineering and telecommunications courses, plus specially selected courses relating to the multiple disciplines mentioned above. In this way, graduates are prepared to face information-age challenges and opportunities, whether in a corporate, institutional, or government environment.

SMU's long historic relationship with local industry provides a wealth of educational opportunities for students in terms of design projects, laboratories, field trips, and, at the student's option, cooperative education. SMU's Bachelor of Science in Electrical Engineering program with a telecommunications engineering specialization prepares students for careers with a large variety of producers, service providers, and users of telecommunications systems. Graduates of the program should have little difficulty finding employment in the immediate Dallas area or elsewhere.

This 124-term-credit-hour program has several distinctive features:

1. Early development of research skills using computers and the Internet, allowing students to use these important tools throughout their college experience.
2. Participation in student teams that work on a variety of industry-sponsored real-world laboratory projects under the joint guidance of faculty and industry representatives.
3. Option of entering the Cooperative Education Program as explained in the Cooperative Education section to get more than a year of industry experience and income before graduation.

The term credit hours within this curriculum are distributed as follows:

		TCH
College Requirements:	ENGL 1301, 1302, Perspectives including ECO 1311, Cultural Formations, and Wellness	23
Mathematics:	MATH 1337, 1338, 2339, 2343, and 3308	15
Science:	CHEM 1303 or 1305; PHYS 1303, 1304, and 1105 and a three-hour elective in physics or chemistry	13
Computer Science:	CSE 1341, 2341	6
Engineering Leadership:	Two of EMIS 3308, EMIS 3309, ENCE 3302, or CSE 4360	6
Electrical Engineering:	EE 1382, 2122, 2170, 2181, 2322, 2350, 2370, 2381, 3122, 3181, 3322, 3330, 3360, 3372 and 3381	35
Junior Elective	EE 3311	3
Advanced Electrical Engineering:	EE 5370 and one of EE 5332, 5373, or 5381	6
Telecommunications:	EETS 5301 and 5302	6
Advanced Electives:	Six hours of advanced electrical engineering or telecommunications engineering electives approved by adviser	6
Senior Design Sequence:	EE 4311 and 4312	6
Minimum total hours required		125

Bachelor of Science in Electrical Engineering
(Microelectronics and Photonics Specialization)

Microelectronics and Photonics represent the foundation of electrical engineering upon which modern society with its vast spectrum of electronic systems and instrumentation has been built. The microelectronics and photonics specialization develops a fundamental understanding of the principles of electronic and photonic devices and systems. Almost all modern machinery has a significant part of its functionality based in electronic and optical components. The microelectronics revolution of the '60s saw transistors combined into integrated circuits through the vision of Nobel Laureate Jack Kilby of Texas Instruments, invented here in Dallas. The evolution in integrated circuits has resulted in millions of transistors being put to work in a space about the size of a fingernail producing powerful and affordable computers and other conveniences that have fueled the economy and revolutionized human life. The evolution in microelectronics promises to continue at a rapid pace to produce faster, more functional, and cheaper electronics. Mechanical machines are being fabricated with electronic devices in integrated circuits referred to as microelectromechanical systems. Photonics involves the processing and movement of information with light. Fiber optic communications is dominating high volume communications. At present, individual photonic devices such as lasers are starting to be combined into "integrated" optical devices and circuits much like Jack Kilby combined transistors to form integrated microelectronic and photonic devices and systems upon which students can build their careers. With this knowledge, an imaginative mind could also change the world.

The term credit hours within this curriculum are distributed as follows:

		TCH
College Requirements:	ENGL 1301, 1302, Perspectives including ECO 1311, Cultural Formations, and Wellness	23
Mathematics:	MATH 1337, 1338, 2339, 2343, and one of MATH 3308 MATH 3315/CSE 3365, MATH 3337 and MATH 3353	15
Science:	CHEM 1303, PHYS 1303, 1304, 1105 or 1106 and one of CHEM 1304, PHYS 3305, 4392, 5337, 5380 and 5382	13
Engineering Leadership:	Two of EMIS 3308, EMIS 3309, ENCE 3302, or CSE 4360	6
Engineering Electives:	CSE 1341, and one of CSE 2341, or 2353; ME 2310 2320, 2331, 2342; EMIS 2360	9
Core Electrical Engineering:	EE 1382, 2122, 2170, 2181, 2322, 2350, 2370, 2381 and 3360	21
Junior Electrical Engineering:	EE 3122, 3181, 3311, 3322, 3330, 3372, and 3381	20
Advanced Electrical Engineering:	EE 5310, 5312 and two of EE 5314, 5321, 5330, 5332, 5333 or PHYS 5382	12
Senior Design Sequence:	EE 4311 and 4312	6
Minimum total hours required		125

Bachelor of Science in Electrical Engineering
(Engineering Leadership Specialization)

This specialization prepares graduates to be highly educated engineers with the appropriate interdisciplinary knowledge to assume important management and leadership positions and to become technical entrepreneurs in a globally competitive world.

The term credit hours within this curriculum are distributed as follows:

		TCH
College Requirements:	ENGL 1301, 1302, Perspectives including ECO 1311, Cultural Formations, and Wellness	23
Mathematics:	MATH 1337, 1338, 2339, 2343, and a three-hour elective course at the 3000 or above level	15
Science:	CHEM 1303 or 1305; PHYS 1303, 1304, and 1105; and a three-hour elective in physics or chemistry	13
Computer Science:	CSE 1341 and one of CSE 2341, or 2353	6
Engineering Leadership:	EMIS 3308, ENCE 3302, EMIS 3309 and CSE 4360	12
Engineering Elective:	One of ME 2310, 2320, 2331, 2342, CSE 2341, EMIS 2360, EE 3311, 3315, 3330, or 3372	3
Core Electrical Engineering:	EE 1382, 2122, 2170, 2181, 2322, 2350, 2370, 2381 and 3360	21
Junior Electrical Engineering Electives:	EE 3122, 3181, 3322, 3381 and two of 3311, 3330, or 3372	14
Advanced Electrical Engineering Electives		12
Electrical Engineering Senior Design Sequence:	EE 4311 and 4312	6
Minimum total hours required		125

Three hours of advanced electrical engineering electives must be selected in each of the three areas listed below:

EE 5360, 5362, 5370, 5371, 5372, 5373, 5374, 5375; and 5376
EE 5356, 5357, 5380, 5381, and 5385;
EE 5310, 5312, 5314, 5321, 5330, 5332, and 5333.

The remaining three hours of advanced electrical engineering electives may be chosen from any of the above three areas or advanced (5000-level) CSE courses offered by the CSE Department.

Minor in Electrical Engineering

For information on a minor in electrical engineering, the student should consult the department. A total of 18 TCH in electrical engineering courses is necessary to meet the following requirements:

Requirements

EE 2322 Electronic Circuits I
EE 3322 Electronic Circuits II
EE 2350 Circuit Analysis I
EE 2370 Design and Analysis of Signals and Systems

Elective Courses

Six TCH of electrical engineering courses at the 3000 level or above

The Courses (EE)

The third digit in a course number designator is representative of the subject area represented by the course. The following designators are used:

XX1X Electronic Materials

XX2X Electronic Devices

XX3X Quantum Electronics and Electromagnetic Theory

XX4X Biomedical Science

XX5X Network Theory and Circuits

XX6X Systems

XX7X Information Science and Communication Theory

XX8X Computers and Digital Systems

XX9X Individual Instruction, Research, Seminar, and Special Project

EETS XX0X Telecommunications

1301. Modern Electronic Technology. A lecture and laboratory course examining a number of topics of general interest including the fundamentals of electricity, household electricity and electrical safety, an overview of microelectronics, concepts of frequency and spectrum, the phonograph and the compact disc, bar codes, and communication by radio and television. Meets the Science/Technology laboratory course requirement of the General Education Curriculum. The course is designed for nontechnical students who want to be more knowledgeable. (Not open to EE majors.)

1382. Fundamentals of Electrical Engineering. Introduces engineering students to the fundamentals of modern electrical engineering. The material covers the basics of the creation, manipulation, storage, and transmission of information in electronic form. Topics will include time and frequency domain signal analysis, mathematics and physics of basic building blocks of electrical systems, sampling, filtering, data coding for compression and reliability, communications, digital imaging, and storage technologies. Weekly laboratory assignments will be an integral part of the course.

2122. EE Laboratory: Electronic Circuits I. Experimental study of basic MOS and bipolar transistors in analog and digital applications. Logic gates and linear and nonlinear applications of operational amplifiers. *Prerequisite:* EE 2350 (Grade of C- or better), concurrent registration in EE 2322.

2170. EE Laboratory: Design and Analysis of Signals and Systems. This course introduces students to various techniques for analyzing real signals and designing various linear time-invariant continuous-time systems. The labs incorporate both software-based simulations and actual circuit implementations. Web authoring tools are used for the production of multimedia lab reports. *Prerequisite:* CSE 1341, concurrent registration in EE 2370.

2181. EE Laboratory: Digital Computer Logic. Analysis and synthesis of combinational and sequential digital circuits. Basic digital computer logic circuits are designed, simulated using Verilog HDL and implemented using a Digi-Designer kit and integrated circuits. Concurrent registration in EE 2381.

2305. Creating Interactive Internet Web Sites. Covers programming languages and techniques for two-way communications via the World Wide Web. Goes beyond HTML (Hypertext Markup Language), which is one-way distribution of information for the Web. The techniques covered in this course allow information gathering, such as responses to surveys and conference or seminar registration data, and credit card information needed to create Web sites for electronic commerce. Students are required to attend lectures and labs and will create an e-commerce Web site for a term project. Topics include architecture of the Internet, database software, intermediate and advanced HTML programming techniques, style sheets, frames, pixel mapping, Java Script and Java applets, and other topics as appropriate for the Internet generation. *Prerequisite:* Any approved SMU Information Technology course.

2322. Electronic Circuits I. An introduction to nonlinear devices used in electronic circuits.

The course will cover the DC analysis of circuits employing diodes, bipolar junction transistors, MOSFETs, and JFET. Introduction to AC analysis will be covered. Topics include device I-V characteristics, biasing, transfer characteristics, power dissipation, aspects of transient analysis, SPICE, and the mid-band analysis and design of amplifier circuits and logic circuits. *Prerequisite:* EE 2350 (Grade of C- or better), concurrent registration in EE 2122.

2350. Circuit Analysis I. Analysis of resistive electrical circuits, basic theorems governing electrical circuits, power consideration, analysis of circuits with energy storage elements. Transient and sinusoidal steady-state analysis of circuits with inductors and capacitors. . *Corequisite:* PHYS 1304 and MATH 2343.

2370. Design and Analysis of Signals and Systems. This course introduces students to standard mathematical tools for analyzing and designing various continuous-time signals and systems. Frequency domain design and analysis techniques are studied as well as the Fourier and Laplace Transforms. Applications to be studied include modulation and demodulation in communications and processing audio signals. *Prerequisites:* EE 2350 (Grade of C- or better) and MATH 2343. Concurrent registration in EE 2170.

2381. Digital Computer Logic. Digital computers and information; combinational logic circuits; combinational logic design; sequential circuits including finite-state machines; registers and counters; memory and programmed logic design. Design and simulation of digital computer logic circuits are studied. Concurrent registration in EE 2181.

3(1-3)90. Junior Project.

3122. EE Laboratory: Electronic Circuits II. Experiments in analog electronic circuit design. *Prerequisite:* EE 2122 (Grade of C- or better), EE 2322 (Grade of C- or better) and concurrent registration in EE 3322.

3181. EE Laboratory: Microprocessors. Fundamentals of microprocessor design and assembly-language programming. An introduction to the 6811 Motorola Evaluation Board, 6811 Assembler, microprocessor-based system design, assembly programming, and hardware interfacing. *Prerequisite:* EE 2181 (Grade of C- or better), EE 2381 (Grade of C- or better) and concurrent registration in EE 3381.

3304. History and Future of Documents in the Digital Era. A look at the omnipresent and diverse documents that fill our lives from sticky notes to e-mail, contracts to digital signatures, encyclopedias to the World Wide Web. Explores the failure of the paperless society and the future of the document. In this period of digital transition from sedentary text to hypertext, what is the future of the book, the library, the copyright, education? *Prerequisite:* Junior standing.

3311. Solid-State Devices. This laboratory-oriented elective course introduces undergraduates to the working principles of semiconductor devices by fabricating and testing silicon MOSFET transistors and III-V based semiconductor lasers in the SMU clean room. Lectures will explain the basic operation of diodes, bipolar transistors, field effect transistors, light-emitting diodes, semiconductor lasers, and other photonic devices. Additional lectures will discuss the basics of device processing which include photolithography, oxidation, diffusion, ion-implantation, metalization and etching. Laboratory reports describing the fabrication and testing of devices will account for a major portion of the course grade. *Prerequisites:* EE 2322 and CHEM 1303 or permission of the instructor.

3322. Electronic Circuits II. Introduction to MOSFET analog electronic circuits. The course is designed to provide the student with a background for understanding modern electronic circuits such as digital-to-analog and analog-to-digital converters, active filters, switched-capacitor circuits and phase-locked loops. Topics include MOSFET SPICE models, basic MOSFET, single-stage amplifiers, current-mirrors, differential amplifier stages, source-follower buffer stages, high-gain common-source stages, operational amplifiers, and comparators. *Prerequisites:* EE 2322 (Grade of C- or better), 2122 (Grade of C- or better), 2350 (Grade of C- or better) and concurrent registration in EE 3122.

3330. Electromagnetic Fields and Waves. Vector analysis applied to static electric and magnetic fields, development of Maxwell's equations, elementary boundary-value problems, and determination of capacity and inductance. Introduction to time-varying fields, plane waves, and transmission lines. *Prerequisites:* EE 2350 (Grade of C- or better) and MATH 2339.

3360. Statistical Methods in Electrical Engineering. This course is an introduction to probability, elementary statistics, and random processes. Topics include fundamental concepts of probability, random variables, probability distributions, sampling, estimation, elementary hypothesis testing, basic random processes, stationarity, correlation functions, power-spectral-density functions, and the effect of linear systems on such processes. *Prerequisite:* EE 2370 (Grade of C- or better), 2170 (Grade of C- or better).

3372. Introduction to Digital Signal Processing. This course is designed to give juniors a thorough understanding of techniques needed for the analysis of discrete-time signals. Topics include Fourier methods and Z-Transform techniques, discrete Fourier transform, fast Fourier transform and applications, and digital filters. *Prerequisite:* EE 2370 (Grade of C- or better) and 2170 (Grade of C- or better).

3381. Microprocessors. An introduction to microprocessors and microcomputers. The Motorola 68HC11 processors are used to introduce architecture, software, and interfacing concepts. Topics include number systems and arithmetic operations for computers, assembly language programming, microprocessor organization and operation, memory and I/O port interfacing, and microprocessor-based controller design. Students will write, assemble, and execute microprocessor programs. *Prerequisite:* EE 2381 (Grade of C- or better), and concurrent registration in EE 3181.

4(1-3)90. Senior Project.

4311. Senior Design I. Areas covered in this course will be tailored to the student's area of specialization. The design project segment of this course involves choosing a specific senior design project in electrical engineering from the available projects proposed by the faculty. Depending upon the specifics of the project, each student will design, construct, and test a solution and submit a formal report to the faculty in charge of the project. *Prerequisite:* EE Senior standing.

4312. Senior Design II. Areas covered in this course will be tailored to the student's area of specialization. The design project selected in this course may be a continuation of the project undertaken in 4311, a new project selected from the list of available projects offered by the faculty, or a project proposed by the student and approved by the faculty. Depending upon the specifics of the project, a team will design, construct, and test a solution and submit a formal report to the faculty in charge of the project. *Prerequisite:* EE 4311.

5(1-3)9(0-9). Special Topics. This special-topics course must have a section number associated with a faculty member. The second digit corresponds to the number of TCH, which ranges from 1 to 3. The last digit ranges from 0 to 9 and represents courses with different topics.

5176. Network Simulation Lab. Introductory hands-on course in simulations of computer networks, intended to be taken simultaneously with EE 5376 or other networks courses. Lab exercises use OPNET and other simulation software to visualize network protocols and performance. Students run a number of simulation exercises to set up various network models, specify protocols, and collect statistics on network performance. These exercises will be designed to complement classroom instruction. General familiarity with PCs is recommended. Concurrent registration in EE 5376 and senior standing.

5310. Introduction to Semiconductors. A study of the basic principles in physics and chemistry of semiconductors that have direct applications on device operation and fabrication. Topics include basic semiconductor properties, elements of quantum mechanics, energy band theory, equilibrium carrier statistics, carrier transport, and generation-recombination processes. These physical principles are applied to semiconductor devices. Devices studied include metal-semiconductor junctions, p-n junctions, LEDs, semiconductor lasers, bipolar junction transistors, field-effect transistors, and integrated circuits. The emphasis will be on obtaining the governing equations of device operation based on physical principles. *Prerequisites:* EE 3311 or equivalent, graduate standing or permission of the instructor.

5312. Semiconductor Processing Laboratory. This is a laboratory-oriented elective course for upper level undergraduates and graduate students providing in depth coverage of processing of InP and GaAs compounds in addition to silicon integrated circuit processing. Students without fabrication experience will fabricate and characterize MOSFETS and semiconductor lasers. Students with some previous fabrication experience (such as EE 3311) will fabricate and test an advanced device mutually agreed upon by the student(s) and the instructor. Examples of such devices include High Electron Mobility Transistors (HEMTs), Heterojunction Bipolar Transistors (HBTs), phase shifters, distributed Bragg reflector (DBR) lasers, grating assisted directional couplers and semiconductor lasers from developing materials such as GaInNAs. The governing equations of photolithography, oxidation, diffusion, ion-implantation, metalization, and etching will be derived from fundamental concepts. Silicon process modeling will use the CAD tool SUPREM. Optical components will be modeled using the SMU developed software WAVEGUIDE, GAIN and GRATING. A laboratory report describing the projects will be peer-reviewed before final submission. *Prerequisites:* EE3311 or equivalent, graduate standing or permission of the instructor. EE5315 and /or EE 5310 are recommended but not required.

5314. Introduction to Micromechanical Systems (MEMS) and Devices. Develops the basics for microelectromechanical devices and systems, including microactuators, microsensors, and micromotors; principles of operation; micromachining techniques (surface and bulk micromachining); IC-derived microfabrication techniques; and thin film technologies as they apply to MEMS. *Prerequisite:* EE 3311.

5321. Semiconductor Devices and Circuits. A study of the basics of analog electronic circuits. Topics include relevant characteristics of BJT and FET transistor characteristics, DC biasing, small-signal models, single- and multistage electronic amplifiers, amplifiers with feedback, and frequency response of electronic amplifiers. Both single- and two-power-supply amplifiers are considered, with emphasis on amplifiers based on the differential amplifier stage. *Prerequisites:* EE 3122 and 3322.

5330. Electromagnetics: Guided Waves. Application of Maxwell's equations to guided waves. Transmission lines, and plane wave propagation and reflection. Hollow waveguides and dielectric waveguides. Fiber optics. Cavity and dielectric resonators. *Prerequisite:* EE 3330.

5332. Electromagnetics: Radiation and Antennas. Polarization, reflection, refraction, and diffraction of EM waves. Dipole, loop, and slot/reflector antennas. Array analysis and synthesis. Self and mutual impedance. Radiation resistance. *Prerequisite:* EE 3330.

5333. Antennas and Radiowave Propagation for Personal Communications. Concerned with three important aspects of telecommunications: fixed site antennas, radiowave propagation, and small antennas proximate to the body. The topics include electromagnetics fundamentals; general definitions of antenna characteristics; electromagnetic theorems for antenna applications; various antennas for cellular communications including loop, dipole, and patch antennas; wave propagation characteristics as in earth-satellite communications, radio test sites, urban and suburban paths, and multipath propagation; and radio communication systems. *Prerequisite:* EE 3330.

5336/7336. Introduction to Integrated Photonics. This course is directed at the issues of integrated photonics. Four major areas are covered: 1) fundamental principles of electromagnetic theory; 2) waveguides; 3) simulation of waveguide modes, and 4) photonic structures. The emphasis is slightly heavier into optical waveguides and numerical simulation techniques because advances in optical communications will be based on nanostructure waveguides coupled with new materials. Topics include: Maxwell's equations; slab, step index, rectangular and graded index wave guides; dispersion; attenuations; non-linear effects; numerical methods; and coupled mode theory. Mathematica will be used extensively in this class. *Prerequisites:* C- or better in EE3311 & EE3330, or permission of instructor.

5340. Biomedical Instrumentation. Application of engineering principles to solving problems encountered in medicine and biomedical research. Topics include transducer principles, electrophysiology, and cardiopulmonary measurement systems. *Prerequisite:* EE 2122 (Grade of C- or better) and EE 2322 (Grade of C- or better).

5345. Medical Signal Analysis. A look at the analysis of discrete-time medical signals and images. Topics include the design of discrete-time filters, medical imaging and tomography, signal and image compression, and spectrum estimation. The course project explores the application of these techniques to actual medical data. *Prerequisite:* EE 3372.

5356. VLSI Design and Lab. Laboratory-oriented course for senior and master level graduate students will cover an overview of IC circuit design and fabrication process, basic design rule, and layout techniques. Emphasis will be on digital design. CMOS and NMOS technology will be covered. Each student must complete one or more design projects by the end of the first term. *Prerequisites:* EE 2181 (Grade of C- or better), 2381 (Grade of C- or better) and 3311.

5357. CAE Tools for Structured Digital Design. Concentrates on the use of CAE tools for the design and simulation of complex digital systems. Verilog, a registered trademark of Cadence Design Systems Inc., hardware description language will be discussed and used for behavioral and structural hardware modeling. Structured modeling and design will be emphasized. Design case studies include a pipelined processor, cache memory, UART, and a floppy disk controller. *Prerequisites:* EE 2181 (Grade of C- or better) and 2381 (Grade of C- or better).

5360. Analog and Digital Control Systems. Feedback control of linear continuous and digital systems in the time and frequency domain. Topics include plant representation, frequency response, stability, root locus, linear state variable feedback, and design of compensators. *Prerequisite:* EE 3372.

5362. (ME 5302). Linear Systems Analysis. State-space representation of continuous and discrete-time systems, controllability, observability, and minimal representations; linear-state variable feedback, observers, and quadratic regulator theory. *Prerequisite:* EE 3372.

5370. Communication and Information Systems. An introduction to communication in modulation systems in discrete and continuous time, information content of signals, and the transition of signals in the presence of noise. Amplitude, frequency, phase and pulse modulation. Time and frequency division multiplexing. *Prerequisite:* EE 3360 or equivalent.

5371. Analog and Digital Filter Design. Approximation and analog design of Butterworth, Chebyshey, and Bessel filters. Basic frequency transformations for designing low-pass, band-pass, band-reject, and high-pass filters. Concept of IIR digital filters using impulse-invariant and bilinear transformations. Design of FIR digital filters using frequency sampling and window methods. Canonical realization of IIR and FIR digital filters. Wave digital filters. Introduction to two-dimensional filters. *Prerequisite:* EE 3372.

5372. Topics in Digital Signal Processing. This course is intended to provide extended coverage of processing of discrete-time signals. Discrete-time signals and the analysis of systems in both the time and frequency domains are reviewed. Other topics covered will include multi-rate signal processing, digital filter structures, filter design and power spectral estimation. *Prerequisite:* EE 3372.

5373. DSP Programming Laboratory. Digital signal processors (DSPs) are programmable semiconductor devices used extensively in digital cellular phones, high-density disk drives, and high-speed modems. This laboratory course focuses on programming the Texas Instruments TMS320C55, a fixed-point processor. The emphasis is on assembly language programming, and the laboratories utilize a hands-on approach that will focus on the essentials of DSP programming while minimizing signal processing theory. Laboratory topics include implementation of FIR and IIR filters, the FFT, and a real-time spectrum analyzer. *Suggested:* Some basic knowledge of discrete-time signals and digital logic systems. *Prerequisite:* EE 3372.

5374. Digital Image Processing. Provides an introduction to the basic concepts and techniques of digital image processing. Topics covered will include characterization and representation of images, image enhancement, image restoration, image analysis, image coding, and reconstruction. *Prerequisite:* EE 5372.

5375. Random Processes in Engineering. An introduction to probability and stochastic processes as used in communication and control. Topics include probability theory, random variables, expected values and moments, multivariate Gaussian distributions, stochastic processes, autocorrelation and power spectral densities, and an introduction to estimation and queuing theory. *Prerequisite:* EE 3360.

5376. Introduction to Communication Networks. An introductory course that surveys basic topics in communication networks with an emphasis on layered protocols and their design. Topics include OSI protocol reference model, data link protocols, local area networks, routing, congestion control, network management, security, and transport layer protocols. Network technologies include telephony, cellular, Ethernet, Internet protocol (IP), TCP, and ATM. Assignments may include lab exercises involving computer simulations. Senior standing and concurrent registration in EE 5176.

5377. Wireless Communications and Lab. This course exposes students to a wide variety of real world experiences in wireless communications. Basic concepts of channel coding, modulation and power control will be studied using specific examples from cellular and wireless LAN systems. Diversity and multiple access aspects of these systems will also be covered. Lab experiments include: i) Study of signaling modes and transmission schemes in GSM and characterizing the performance, ii) Understanding the basic anatomy of a voice call in GSM, iii) Data throughput student in IEEE 802.11 based wireless LANs and iv) Device discovery, topology management and data transfer in Bluetooth networks. *Prerequisite*: EE 3360 or equivalent.

5380. Logic Design and Implementation. Covers the use of programmable logic devices (PLDs) for design and implementation of digital systems. Design and implementation using programmable read-only memories, programmable gate arrays, programmable logic sequencers, programmable array logic, and programmable generic array logic are discussed. The Altera MAX+plusII CAE tools will be used to model, simulate, and implement a design using modern PLD devices. *Prerequisites:* EE 2181 (Grade of C- or better), 2381 (Grade of C- or better), and EE 3381 and EE 3181.

5381. Digital Computer Design. Emphasizes design of digital systems and register transfer. Design conventions, addressing modes, interrupts, input-output, channel organization, high-speed arithmetic, hardwired and microprogrammed control. Central processor organization design and memory organization. *Prerequisite:* EE 2181 (Grade of C- or better) and EE 2381 (Grade of C- or better). Junior standing.

5385. Microprocessors in Digital Design. Intended to help prepare the digital design engineer for utilization of microprocessors as programmable logic components in digital systems design. Topics include: fundamentals of both hardware and software engineering and their interrelationship with the microprocessor; capabilities and limitations of the Motorola 68000 microprocessor family; use of hardware/software development systems; assembly language programming for the 68000; input-output interfacing; and concepts involved in real-time applications. Also, features of the 68332 will be covered. *Prerequisites:* EE 3181 and EE 3381.

Telecommunication Courses (EETS)

5301 (CSE 5376). Introduction to Telecommunications. Overview of public and private telecommunications systems, traffic engineering, switching, transmission, and signaling. Channel capacity, media characteristics, Fourier analysis and harmonics, modulation, electromagnetic wave propagation and antennas, modems and interfaces, and digital transmission systems. T1 carriers, digital microwave, satellites, fiber optics and SONET, and Integrated Services Digital Networks. *Restriction*: Junior standing.

5302. Telecommunications Management and Regulation. The managerial sequel to EETS 5301 (Introduction to Telecommunications.) Provides a historical review of the most significant regulation and management issues affecting the telecommunications industry over the past 100 years. Also explores the regulatory environment it operates in today through the study of current events, articles, and recent state and federal legislation. *Prerequisite:* EETS 5301 (formerly EE 5301).

5303. Fiber Optic Telecommunications. Introductory course designed to familiarize students with practical concepts involved in optical fiber communications systems. Basic optical principles are reviewed. Dielectric slab-waveguides, fiber waveguides, and integrated optics devices are discussed. The major components of a fiber communications link, including optical sources, detectors, and fibers, are covered. *Restriction*: Junior Standing.

5304. Internet Protocols. This course is an introductory course on the protocol architecture of the Internet, following a bottom-up approach to the protocol layers. The objective of this core course is to provide an understanding of the internetworking concepts in preparation for advance networking courses. The first part of the course covers networking technologies such as Local Area Networks, packet switching, and ATM. The second part of this course examines the Internet protocol (IP) and TCP/UDP in depth. The last part of the course is an overview of important application protocols such as HTTP, client/server computing, SMTP, FTP, and SNMP. Prerequisite: EETS 5301 (formerly EE 5301) or equivalent.

ENGINEERING MANAGEMENT, INFORMATION, AND SYSTEMS

Associate Professor Richard S. Barr**, Chair**

Professors: Jeffery L. Kennington, Stephen Szygenda, Margaret H. Duhnam **(Computer Science);** U. Narayan Bhat **(Statistics),** Marion Sobol **(Business)**; **Associate Professors:** Richard V. Helgason, Eli V. Olinick, Jeff Tian **(Computer Science); Scholar in Residence in EMIS:** Jerrell R. Stracener; **Senior Lecturer:** Thomas Siems; **Lecturers:** Leslie-Ann Asmus, Mary Alys Lillard, Gretchen Miller; **Adjunct Faculty:** Karl Arunski, John Baschab, Robert Bell, William David Bell, Jean Chastain, George Chollar, Dennis Delzer, Dennis Frailey, Ganesh L. Harpavat, James Hinderer, Gerard Ibarra, Jan Lyons, Riad A.K. Mohammad, James Norton, Robert Oshana, Augustyn Ortynski, David Peters, Oscar K. Pickels, Jon Piot, Mark Sampson, Steven P. Sanazaro, Vernon Smith, Gheorghe Spiride, Wendy Spring, William Swanson, John Via, John Yarrow, Hossam Zaki.

The Department of Engineering Management, Information, and Systems (EMIS) brings together the school's technical management and operations areas to offer a Bachelor of Science with a Major in Management Science. This academic program in *management science* focuses on computer models for decision-making and the application of engineering principles and techniques to enhance organizational performance. Faculty specializations include optimization, telecommunications network design and management, supply-chain systems, systems engineering, logistics, quality control, reliability engineering, information engineering, benchmarking, operations planning and management, network optimization, and mathematical programming.

The same systems-oriented, mathematical-model-based approach, which has been the cornerstone of engineering for decades, also has powerful application within organizations and their operations. This is the field of management science, the discipline of applying advanced analytical methods to help make better decisions.

Curriculum in Management Science

Management Science is the discipline of applying advanced analytical methods to help make better decisions. Management Science deals with the development of mathematically-based models for planning, managing operating, and decision-making. In our curriculum, these methods are also applied to the design and management of efficient production systems.

A management scientist at a major airline would be concerned with building models to decide the best scheduling of flights, routing of planes, assignment of pilots and crews to specific flights, and flight gate assignments, as well as deciding the best number of planes to own and operate, which cities to fly to, which cities to use as major hubs, how to lay out an airport terminal, which overbooking policy should be used, and related issues. Usable or optimal decisions for such issues can be uncovered through analysis using computer-based mathematical models. The management scientist uses the data collected and managed by the MIS department in building his or her models.

Because of its generality, Management Science has broad applications in all engineering disciplines and in the fields of computer science, economics, finance, marketing, medicine, logistics, production, information engineering, and statistics. Management Science methods are used extensively in both the public sector and industry and the Management Science program prepares the technically-oriented student to excel in today's competitive business environment.

Bachelor of Science with a Major in Management Science
(122 Term Credit Hours)

Curriculum Requirements

		TCH
Liberal Studies:	ENGL 1301, 1302	6
	Perspectives	15
	Cultural Formations	6
(One Perspectives course *or* one Cultural Formations course must satisfy the Human Diversity requirement.)		
Mathematics:	MATH 1337, 1338, 3353	9
Science:	3 TCH Natural Science from BIOL 1401, 1402, CHEM 1113/1303, 1114/1304, GEOL 1301, 1305, 1308, PHYS 1105/1303, 1106/1304	3
3 TCH Natural Science or Technology from	ANTH 2315, 2363; BIOL 1303, 1304, 1305, 1401, 1402; CHEM 1113/1303, 1114/1304; GEOL 1301, 1305, 1307, 1308, 1315; PHYS 1403, 1404; EE 1301; ME 1301, 1303	3
9 TCH Natural Science, Technology, and/or Social	Science including ANTH, ECO, PSYC, or SOCI	9
Major Concentration:	EMIS 1360, 2360, 3360, 4340 (or 5370), 4395, 5362; CSE 1341, 2341, 3365	27
	3 TCH from EMIS courses at the 3000 level or above	3
Engineering Leadership courses:	EMIS 3308, 3309; CSE 4360, ENCE 3302	12
Business:	ACCT 2311, MKTG 3340, MNO 3370	9
Electives:	Adviser must approve electives	18
Wellness:		2
		122

Note: All Management Science majors must receive a grade of at least C- in all EMIS courses taken in fulfillment of the requirements for the major.

Minor in Management Science

For information on a minor in management science, the student should consult the department. A total of 18 TCH in management and computer science courses is necessary to meet the following requirements:

EMIS 1360 Introduction to Management Science
EMIS 2360 Engineering Economy
EMIS 3360 Operations Research
EMIS 5362 Production and Operations Management
CSE 1341 Principles of Computer Science I
Plus one (1) of the following:
EMIS 4340 Statistical Methods for Engineers and Applied Scientists
EMIS 5370 Probability and Statistics for Scientists and Engineers
EMIS 4395 Senior Design

Multiple Degrees

Because of the flexibility of the curriculum, a majority of Management Science majors choose to receive a second major or one or more minors from a wide range of other disciplines. Examples include a Bachelor of Science, Major in Management

Science, plus a second Bachelor's degree in Economics, Mathematics, Business, Computer Science, History, Psychology, Spanish, or French.

Other Management Science majors continue their studies to obtain a Masters of Science in Engineering Management, Systems Engineering, Information Engineering, or Operations Research. The 4+1 Program permits students to obtain both undergraduate and graduate degrees in a shorter time and with fewer courses than if taken separately or from different universities.

More information on these and other options available to Management Science majors can be found on the EMIS Department web site: www.engr.smu.edu/emis. EMIS faculty and advisers are also available to answer your questions about the program.

Computing Facilities

Students in the EMIS Department have access to a wide range of computing facilities and networking equipment. The department manages three PC-based computing labs, including the Enterprise Systems Design Laboratory created for students in the senior design course. General-use Unix and Linux machines (including 64-bit Alpha workstations and Sun UltraSparc systems) provide advanced computing, analytical software, and Web-hosting to all engineering students. Windows-based PCs are the primary desktop equipment and X-terminals are also available. All computing facilities are networked via high-speed Ethernet, with Gigabit Ethernet connections to Internet 1, Internet 2, and the National Lambda Rail research network. Open computing labs and wireless services provide additional facilities access points for students.

The Courses (EMIS)

1305. Computers and Information Technology. A survey course in computers and information technology that introduces the college student to the architecture of the personal computer, software, hardware, telecommunications, and artificial intelligence, as well as the social and ethical implications of information technology. The two-hour laboratory sessions reinforce the concepts learned in lecture, including a survey of word processing, spreadsheet, database management, presentation, and network software. Credit is not allowed for a CS, CpE, or MS major or minor. Credit is not allowed for both EMIS 1305 and EMIS 1307.

1307. Information Technology in Business. Today, computer literacy is essential to a career in any field, but nowhere is it more crucial than in the business field. This course focuses on the use of Information Technology in business. This course will explain the computer system, and the relationship of its parts to each other. It will define the terms used by technologists, and instill an appreciation for the effect of information technology on our lives and livelihood. The lab component of the course introduces the student to major productivity software packages, provides the fundamental knowledge that is a requirement for a business major, and allows the student to explore the benefits that technology can bring. No credit for EMIS major or minor. Credit is not allowed for both EMIS 1305 and 1307.

1360. Introduction to Management Science. Management science is the application of mathematical modeling and scientific principles to solve problems and improve life in society. This introductory class shows how to develop plans, manage operations, and solve problems encountered in business and government today. *Prerequisite:* Knowledge of college-level algebra.

2360. Engineering Economy. Evaluation of engineering alternatives by equivalent uniform annual cost, present worth, and rate-of-return analysis. Use of a computerized financial planning system. 0.5 TCH Design. *Prerequisite:* C- or better in MATH 1337. (Must enroll in lab.)

3150. Ethics in Computing. Computer professionals have a special responsibility to ensure ethical behavior in the design, development, and use of computers and computer networks. This course focuses on the education of the undergraduate through the study of ethical concepts and the social, legal, and ethical implications involved in computing. Issues to be studied include computer crimes, software theft, hacking and viruses, intellectual property, unreliable computers, technology issues in the workplace, and professional codes of ethics. *Prerequisite:* Junior standing.

3308. Engineering Management. Examines planning, financial analysis, organizational structures, management of the corporation (including its products, services, and people), transfer of ideas to the marketplace, ethics, and leadership skills. *Prerequisite:* Junior standing.

3309. Information Engineering and Global Perspectives. Examines global and information aspects of technology- and information-based companies. *Prerequisite:* Junior standing.

3360. Operations Research. A survey of models and methods of operations research. Deterministic and stochastic models in a variety of areas will be covered. Credit is not allowed for both EMIS 3360 and EMIS 8360. *Prerequisite:* EMIS 1360. (Must enroll in lab.)

4340 (STAT 4340). Statistical Methods for Engineers and Applied Scientists. Basic concepts of probability and statistics useful in the solution of engineering and applied science problems. Topics: probability, probability distributions, data analysis, sampling distributions, estimations, and simple tests of hypothesis. *Prerequisite:* C- or better in MATH 1338.

4(1-4)9(0-4). Undergraduate Project. An opportunity for the advanced undergraduate student to undertake independent investigation, design, or development. Variable credit from one to four term hours. Written permission of the supervising faculty member is required before registration. At least 0.5 of (1-4) TCH Design.

4395. Senior Design. A large project involving the design of a management system. Will include model building, data collection and analysis, and evaluation of alternatives. 3 TCH Design. *Prerequisites:* C- or better in EMIS 5362 and senior standing.

5050. Undergraduate Internship Program.

5300. Systems Analysis Methods. Introduction to modeling and analysis concepts, methods and techniques used in systems engineering, design of products and associated production and logistics systems and analysis of operational system performance. Specific topics include: probabilistic and statistical methods, Monte Carlo Simulation, optimization techniques, applications of utility and game theory, and decision analysis.

5301. Systems Engineering Process. The discipline, theory, economics, and methodology of systems engineering is examined. The historical evolution of the practice of systems engineering is reviewed, as are the principles that underpin modern systems methods. The economic benefits of investment in systems engineering and the risks of failure to adhere to sound principles are emphasized. An overview perspective distinct from the traditional design- and analytical-specific disciplines is developed.

5303. Integrated Risk Management. An introduction to risk management based upon integrated trade studies of program performance, cost, and schedule requirements. Topics include risk planning, risk identification and assessment, risk handling and abatement techniques, risk impact analysis, management of risk handling and abatement, and subcontractor risk management. Integrated risk management methods, procedures, and tools will be examined.

5305 Systems Reliability, Supportability and Availability Analysis. This course is an introduction to systems reliability, maintainability, supportability and availability (RMS/A) modeling and analysis with an application to systems requirements definition and systems design and development. Both deterministic and stochastic models are covered. Emphasis is placed on RMS/A analyses to establish a baseline for systems performance and to provide a quantitative basis for systems trade-offs. *Prerequisite* EMIS 5300 or equivalent.

5307. Systems Integration and Test. The process of successively synthesizing and validating larger and larger segments of a partitioned system within a controlled and instrumented framework is examined. System integration and test is the structured process of building a complete system from its individual elements and is the final step in the development of a fully functional system. The significance of structuring and controlling integration and test activities is stressed. Formal methodologies for describing and measuring test coverage, as well as sufficiency and logical closure for test completeness, are presented. Interactions with system modeling techniques and risk management techniques are discussed. The subject material is based upon principles of specific engineering disciplines and best practices, which form a comprehensive basis for organizing, analyzing, and conducting integration and test activities.

5310. Systems Engineering Design. An introduction to system design of complex hardware and software systems. Specific topics include design concept, design characterization, design elements, reviews, verification and validation, threads and incremental design, unknowns, performance, management of design, design metrics, and teams. The class will center on the development of real-world examples.

5315. Systems Architecture Development. A design-based methodological approach to system architecture development using emerging and current enterprise architecture frameworks. Topics: structured analysis and object-oriented analysis and design approaches; enterprise architecture frameworks, including the Zachman framework, FEAF, DoDAF, and ANSI/IEEE-1471; executable architecture model approaches as tools for system-level performance evaluation and trade-off analyses; case studies in enterprise architecture development; and the integration of architecture design processes into the larger engineering-of-systems environment. *Prerequisite*: EMIS 5301.

5320. Systems Engineering Leadership. This course augments the management principles embedded in the systems engineering process with process design and leadership principles and practices. Emphasis is placed on leadership principles by introducing the underlying behavioral science components, theories and models. The course demonstrates how the elements of systems engineering, project management, process design, and leadership integrate into an effective leadership system. *Prerequisite*: EMIS 5301.

5330. Systems Reliability Engineering. An in-depth coverage of tasks, processes, methods and techniques for achieving and maintaining the required level of system reliability considering operational performance, customer satisfaction and affordability. Specific topics include: Establishing system reliability requirements, reliability program planning, system reliability modeling and analysis, system reliability design guidelines and analysis, system reliability test and evaluation, and maintaining inherent system reliability during production and operation.

5335. Human-Systems Integration (HSI). This course advances the understanding and application of cognitive-science principles, analysis-of-alternatives methods and engineering-best practices for addressing the role of humans within the design of high-technology systems. In addition, HSI-specific processes (e.g., task-centered design; human-factors engineering; manpower, personnel and training; process analysis; usability testing and assessment) are presented and discussed. *Prerequisite*: EMIS 5301.

5340. Logistics Systems Engineering. An introduction to concepts, methods and techniques for engineering and development of logistics systems associated with product production/manufacturing, product order and service fulfillment, and product/service/customer support, utilizing system engineering principles and analyses. Specific topics include: logistics systems requirements, logistics systems design and engineering concurrently with product and service development, transportation and distribution, supply/material support, supply web design, and management and product/service/customer support.

5347. Critical Infrastructure Protection/Security Systems Engineering. The purpose of the course is to present systems engineering (SE) concepts as applied to the protection of the United States' critical infrastructure (CI). A top-level systems viewpoint provides a greater understanding of this system-of-systems (SOS). Topics include: the definition and advantages of SE practices and fundamentals; system objectives that include the viewpoint of the customer, user, and other stakeholders; the elements of the CI and their interdependencies; the impact transportation system disruptions; and systems risk analysis. *Prerequisites*: EMIS 5301, EMIS 5303

5351. Enterprise Fundamentals. An overview of business fundamentals, spanning the range of all functional areas: management, marketing, operations, accounting, information systems, finance, and legal studies.

5352. Information System Architecture. The architecture of an information system (IS) defines that system in terms of components and interactions among those components. This course addresses IS hardware and communications elements for information engineers, including computer networking and distributed computing. It addresses the principles, foundation technologies, standards, trends, and current practices in developing an appropriate architecture for Web-based and non-Internet information systems.

5353. Information System Design Strategies. Surveys the fundamentals of software engineering and database management systems (DBMS) for information engineers. Covers the principles, foundation technologies, standards, trends, and current practices in data-centric software engineering and systems design, including object-oriented approaches and relational DBMS. The focus is on system design, development, and implementation aspects, and not the implementation in code.

5355. Engineering Operations. The management of a technical organization's operations can contribute to the strategic goals and objectives of the enterprise. By analyzing and managing operations as systems, strategic choices are shown to drive design and operating decisions. The course covers the tools and techniques for solving problems to achieve the overall goals and strategies of manufacturing and services organizations.

5357. Decision-Support Systems. Covers the development and implementation of a data-centric, decision-support system (DSS), the underlying technologies, and current applications and trends. Topics include: decision-making, DSS components, optimization models, expert systems, data mining and visualization, knowledge discovery and management, and executive information systems.

5359. Information Engineering Seminar. Topics in management of information in specific industries or application areas. May be repeated for credit when the topics vary. *Prerequisite:* EMIS 5360.

5360. Management of Information Technologies. Defines the management activities of the overall computer resources within an organization or government entity. Consists of current topics in strategic planning of computer resources, budgeting and fiscal controls, design and development of information systems, personnel management, project management, rapid prototyping, and system life cycles.

5361. Computer Simulation Techniques. An introduction to the design and analysis of discrete probabilistic systems using simulation. Emphasizes model construction and use of a simulation language. 1.5 TCH Design. *Prerequisites:* Programming ability, introduction to probability or statistics.

5362. Production and Operations Management. A survey of models and methods for designing and implementing quality-based, integrated, production/distribution systems. Topics include demand forecasting, product mix decisions, distribution systems, facilities location and layout, scheduling, inventory and materials management, just-in-time, and quality control for manufacturing and service operations. *Prerequisite:* C- or better in EMIS 3360.

5364 (STAT 5344). Statistical Quality Control. An introduction to statistical quality-control methods that can be applied to meet the demand for ever-increasing levels of product and service quality. Basic methods and tools for analyzing, controlling, and improving product and service quality are covered. Probabilistic and statistical techniques are applied to modeling and analysis of variability associated with product production and service processes. Topics include analysis of product design tolerances, six-sigma techniques, statistical analysis of process capability, statistical process control using control charts, quality improvement, and acceptance sampling. *Prerequisite:* EMIS 4340 or 5370.

5365. Program and Project Management. Development of principles and practical strategies for managing projects and programs of related projects for achieving broad goals. Topics include: planning, organizing, scheduling, resource allocation, strategies, risk management, quality, communications, tools, and leadership for projects and programs.

5369. Reliability Engineering. An introduction to reliability engineering concepts, principles, techniques, and methods required for design and development of affordable products and services that meet customer expectations. Topics include reliability concepts and definitions, figures-of-merit, mathematical models, design analysis and trade studies, reliability testing including types of tests, test planning and analysis of test results, and statistical analysis of reliability data. 1 TCH Design. *Prerequisite:* C- or better in EMIS 4340 or 5370.

5370 (STAT 5340). Probability and Statistics for Scientists and Engineers. An introduction to fundamentals of probability and distribution theory, statistical techniques used by engineers and physical scientists. Examples of tests of significance, operating characteristic curves, tests of hypothesis for one or two parameters, estimation, analysis of variance, and the choice of a particular experimental procedure and sample size. *Prerequisite:* C- or better in MATH 2339 or equivalent.

5377 (STAT 5377). Statistical Design and Analysis of Experiments. An introduction to statistical principles in the design and analysis of industrial experiments. Completely randomized, randomized complete and incomplete block, Latin square, and Plackett-Burman screening designs. Complete and fractional factorial experiments. Descriptive and inferential statistics. Analysis of variance models. Mean comparisons. *Prerequisites and corequisites:* C- or better in EMIS 4340 and senior standing with a Science or Engineering major, or permission of instructor.

5(1-3)9(0-4). Special Topics. Individual or group study of selected topics in management science. *Prerequisite:* Permission of instructor.

ENVIRONMENTAL AND CIVIL ENGINEERING

Professor Bijan Mohraz, **Chair**

Professor: Bijan Mohraz; **Assistant Professors:** Khaled Abdelghany, Alfredo Armendariz, John H. Easton, Paul Krueger, David A. Willis; **Senior Lecturer:** Roger O. Dickey; **Lecturer:** Regina Gaiotti; **Adjunct Faculty:** John Barber, Arthur Beck, Mark K. Boyd, Gerald R. Carney, Robert R. Casagrande, Weiping Dai, James Duke, Ted Dumas, Carl Edlund, Fawzi Elghadamsi, Andrew Felder, Edward Forest (Retired Chair), Anwar Hirany, Louis Hosek, Ron Jackson, Raji Josiam, James E. Langford, Donald L. Legg, Paul Martin, Jon D. Rauscher, Cecil Smith (Professor Emeritus), D. Blair Spitzberg, John Stanley, Bennett Stokes, Ken Thomas, Jim Veach, Gregory Wilson, Dan Wittliff, Scott Woodrow.

Undergraduate programs within the Department of Environmental and Civil Engineering educate and train leaders in the fields of environmental protection, resource management, construction, and engineering design. Programs are tailored to the individual needs and interests of our students, so that students with interests in studying global climate change, protecting the quality of our drinking water, or designing the next generation of high-rise buildings or smart highways receive the training they need to excel in their careers. As part of their education, our students are paired with CEOs, business leaders, professional engineers, EPA directors, or corporate attorneys in a mentoring program designed to propel students into promising careers.

Environmental and civil engineering are inextricably linked. While civil engineering focuses on the infrastructure of modern society, environmental engineering is concerned with the well-being and health of the population and the environment. Environmental and civil engineering entered the early 1900s as a single integrated discipline, when it was critical to address sanitary problems to protect public health, and to develop regional water supplies and the civil infrastructure to support rapid urbanization and early industrialization. Separate disciplines gradually emerged, evolving and broadening to address the overall quality and function of modern society—preserving the environment while enabling the realization of an enriched life through technology.

Environmental Engineering and Environmental Science Programs. Today, the environmental field is dynamic and wide-ranging, comprising many different disciplines and professional roles. Environmental engineering and science involve not only traditional water and wastewater management, but also the management of hazardous and radioactive materials, pollution prevention and waste minimization, innovative hazardous waste treatment and site remediation processes, environmental and occupational health, resource conservation and recovery, sustainable development of natural resources, and air quality management and pollution control. In addition, modern manufacturing, both domestic and worldwide, is focusing on products fabricated from recycled and natural materials that are both competitive and harmlessly degraded in the environment. The trend toward global manufacturing will grow stronger in the years ahead. Environmental challenges presented by this movement must be overcome if the economic and lifestyle benefits of globalization are to be extended to all peoples of the world.

The educational objectives of the environmental engineering program are consistent with the missions of the Environmental and Civil Engineering Department, the School of Engineering, and the overall institutional mission of SMU. These educational objectives, determined based on the needs of the program's various constituencies, are:

1. Graduate highly educated engineers with the appropriate interdisciplinary knowledge to assume important management and leadership positions in a globally competitive world.
2. Ensure that graduates have a deep understanding of the scientific principles and the analytical and problem-solving skills to fully participate either as environmental managers or as process/design engineers in this increasingly essential field.
3. Prepare graduates with sufficiently broad knowledge to pursue advanced academic or professional degrees in engineering, medicine, law, business, or public policy.
4. Prepare graduates for licensing as professional engineers.
5. Instill in graduates the personal qualities of leadership, the facility for effective written and verbal communication, and an abiding commitment to lifelong learning.

The environmental engineering program prepares graduates for professional practice and advanced study through a focus in the following areas: (1) water supply and resources, (2) environmental systems and process modeling, (3) environmental chemistry, (4) wastewater management, (5) solid waste management, (6) hazardous waste management, (7) atmospheric systems and air pollution control, and (8) environmental and occupational health.

Civil Engineering Program. Civil engineers are engaged in planning, design, construction, maintenance, and management of the infrastructure of modern society. They are responsible for the design of water supply and wastewater treatment systems; transportation systems such as highways, railways, waterways, mass transit, airports, ports, and harbors; dams, reservoirs, and hydroelectric power plants; thermoelectric power plants; transmission and communication towers; high-rise buildings; and even aircraft and aerospace structures, shuttles, and space stations. Every major structure critical to this country, and global society, depends on the work of civil engineers.

The educational objectives of the civil engineering program are consistent with the missions of the Environmental and Civil Engineering Department, the School of Engineering, and the overall institutional mission of SMU. These educational objectives, determined based on the needs of the program's various constituencies, are:

1. Graduate highly educated engineers with the appropriate interdisciplinary knowledge to assume important management and leadership positions in a globally competitive world.
2. Ensure that graduates have a deep understanding of the scientific principles and the analytical and problem solving skills to fully participate either as civil engineering managers or design engineers in this increasingly essential field.

3. Prepare graduates with sufficiently broad knowledge to pursue advanced academic or professional degrees in engineering, law, business, or public policy.
4. Prepare graduates for licensing as professional engineers.
5. Instill in graduates the personal qualities of leadership, the facility for effective written and verbal communication, and an abiding commitment to lifelong learning.

The civil engineering program prepares graduates for professional practice and advanced study through a focus in the following areas: (1) structural analysis and design, (2) soil mechanics and foundations, (3) transportation systems, (4) water supply and wastewater utilities, and (5) water resource systems.

Degrees Offered. The Environmental and Civil Engineering Department offers undergraduate degrees as follows:

Bachelor of Science in Environmental Engineering
Bachelor of Science in Environmental Engineering with a Premedical Specialization
Bachelor of Science in Environmental Science
Bachelor of Science in Environmental Science with a Premedical Specialization
Bachelor of Science in Civil Engineering

The B.S. degree in Environmental Engineering, B.S. degree in Environmental Engineering with a Premedical Specialization, and B.S. degree in Civil Engineering are consistent with Accreditation Board of Engineering and Technology (ABET) accreditation guidelines, and with preparation for the Fundamentals of Engineering (FE) examination, the first step toward licensure as a Professional Engineer (P.E.). Indeed, SMU has the only ABET accredited, undergraduate Environmental Engineering Program in the state of Texas. Engineering design is integrated throughout the environmental and civil engineering curricula, each culminating in a major design experience based on the knowledge and skills acquired in earlier course work. In their senior year, the department's engineering students are required to take two terms of design where teams of two to four students work closely on practical projects sponsored by industry and government. Senior design projects incorporate engineering standards and realistic constraints including most of the following considerations: economic, environmental, sustainability, manufacturability, ethical, health and safety, social, and political. The department's engineering curricula ensure that students develop an understanding of the concepts of professional engineering practice including ethical responsibilities, effective oral and written communication, engineering management and entrepreneurship, functioning on multidisciplinary teams, procurement, bidding, interaction of design and construction professionals, professional licensing, and the need for lifelong learning.

The B.S. degree in Environmental Science and the B.S. degree in Environmental Science with a Premedical Specialization are designed to meet the professional goals of students whose environmental interests are broader. These programs offer the student greater depth with respect to the sciences, and greater course flexibility with respect to electives.

Departmental Facilities

Departmental offices and instructional and research laboratories are located in the new, state-of-the-art J. Lindsay Embrey Engineering Building. Environmental teaching and research laboratories include dedicated space for air quality and meteorology, industrial hygiene, environmental microbiology, and water quality. The air quality/meteorology and water quality laboratories are capable of conducting sophisticated chemical analyses of air samples, and assessing the quality of water supplies and wastes and the effectiveness of water and waste treatment procedures.

Major equipment includes several spectrophotometers including atomic absorption (AA), inductively coupled plasma (ICP) emission for low-level heavy metals analysis, and two Hewlett-Packard gas chromatographs (GC). Other equipment includes continuous ambient air monitoring equipment, a UV/visible spectrophotometer, pH and other specific ion meters, incubating ovens, microscopes, furnaces, centrifuges, dissolved oxygen meters, a Mettler titrator for chemical and acid/base surface experiments, several temperature control baths, and a tumbler for constant temperature studies. The air quality and meteorology laboratory includes state-of-the-art airflow, pressure, and volume measurement instrumentation. The industrial hygiene laboratory includes an inventory of the latest state-of-the-art personal monitoring equipment for assessing occupational exposure to a variety of industrial process stressors including: asbestos, noise, total and respirable dust, metals, radiation, and heat stress.

Civil engineering teaching and research laboratories include dedicated space for mechanics of materials/and structural engineering, hydraulics and hydrology, soil mechanics and geotechnical engineering, transportation materials, and intelligent transportation systems. Civil engineering students also utilize the Mechanical Engineering department's thermal and fluids laboratory.

The Embrey Building also houses a dedicated computer aided design (CAD) laboratory with AutoCAD software, and a general use computer laboratory for the department's students including personal computers, high-resolution color monitors, and laser printers. Computers in both the CAD and general use laboratories are connected, through a high-speed network, to the computer systems of the School of Engineering and SMU, as well as off-campus systems via the Internet. The computer network provides access to general applications software and specialized software for engineering problems including air dispersion modeling, AutoCAD, hydrologic and hydraulic modeling for water resource systems, statistical analysis and stochastic modeling, structural analysis and design, transportation systems planning and analysis, and water quality modeling.

Bachelor of Science in Environmental Engineering

Curriculum Requirements		***TCH***
College Requirements:	Humanities, Social Sciences, and SMU required courses	23
Mathematics and Statistics:	MATH 1337, 1338, 2339, 2343; STAT 4340	15
Sciences:	Biology: BIOL 1401 Chemistry: CHEM 1113, 1114, 1303, 1304, 3371 Earth Science: ENCE 1331 Meteorology Physics: PHYS 1105, 1106, 1303, 1304	26
Engineering Science and Design	Computer Science and Engineering: CSE 1340 or 1341 Civil/Mechanical Engineering: ENCE 2310, 2331, 2342	12
Environmental Engineering and Design:	ENCE 1301 or 1302, 2304, 2421, 3323, 3341, 3431, 3451, 4380, 4381, 5354	33
Environmental Technical Electives:	Selected with adviser approval	6
Engineering Leadership:	Computer Science and Engineering: CSE 4360 Engineering Management, Information and Systems: EMIS 3308, 3309 Environmental and Civil Engineering: ENCE 3302	12
Minimum total hours required		127

Bachelor of Science in Environmental Engineering
(Premedical Specialization)

Curriculum Requirements		***TCH***
College Requirements:	Humanities, Social Sciences, and SMU required courses	23
Mathematics and Statistics:	MATH 1337, 1338, 2339, 2343; STAT 4340	15
Sciences:	Biology: BIOL 1401, 1402, 3304, 3350 Chemistry: CHEM 1113, 1114, 1303, 1304, 3117, 3118, 3371, 3372 Earth Science: ENCE 1331 Meteorology Physics: PHYS 1105, 1106, 1303, 1304	41
Engineering Science and Design:	Computer Science and Engineering: CSE 1341 Civil/Mechanical Engineering: ENCE 2310, 2331, 2342	12
Environmental Engineering and Design:	ENCE 1301 or 1302, 2304, 2421, 3323 3341, 3431, 3451, 4380, 4381, 5354	33
Environmental Technical Electives:	Selected with adviser approval	6
Minimum total hours required		130

Bachelor of Science in Environmental Engineering and Bachelor of Science in Mathematics

Curriculum Requirements		***TCH***
College Requirements:	Humanities, Social Sciences, and SMU required courses	23
Mathematics and Statistics:	MATH 1337, 1338, 2339, 2343, 3315, 3337, and two advanced MATH electives selected with math adviser approval; STAT 4340	27
Sciences:	Biology: BIOL 1401 Chemistry: CHEM 1113, 1114, 1303, 1304, 3371 Earth Science: ENCE 1331 Meteorology Physics: PHYS 1105, 1106, 1303, 1304	26
Engineering Science and Design	Computer Science and Engineering: CSE 1340 or 1341 Civil/Mechanical Engineering: ENCE 2310, 2331, 2342	12
Environmental Engineering and Design:	ENCE 1301 or 1302, 2304, 2421, 3323, 3341, 3431, 3451, 4380, 4381, 5354	33
Advanced Environmental/ Mathematics Electives:	Choose two from: ENCE 5331, 5332, 5334; ME 5336	6
Minimum total hours required		127

Bachelor of Science in Environmental Science

Curriculum Requirements		***TCH***
College Requirements:	Humanities, Social Sciences, and SMU required courses	29
Mathematics and Statistics:	MATH 1337, 1338,; STAT 4340	9
Sciences:	Biology: BIOL 1401, 1402 Chemistry: CHEM 1113, 1114, 1303, 1304, 3371 Earth Science: ENCE 1331, GEOL 1301 Physics: PHYS 1105, 1106, 1303, 1304	33
Engineering Science:	Computer Science and Engineering: CSE 1340 or 1341, or EMIS 1307	3
Environmental Engineering:	Core: ENCE 1301, 2304, 2421 3302 Advanced: ENCE 3341, 3431, 3451	

Curriculum Requirements		*TCH*
	Management (Choose any 4 of the following 7): ENCE 5311, 5314, 5315, 5323, 5350, 5352, 5353	36
Environmental Technical Electives:	Selected with adviser approval	6
Technical and Engineering Leadership Electives:	Free electives	6
Minimum total hours required		122

Bachelor of Science in Environmental Science
(Premedical Specialization)

Curriculum Requirements		*TCH*
College Requirements:	Humanities, Social Sciences, and SMU required courses	29
Mathematics and Statistics:	MATH 1337, 1338; STAT 4340	9
Sciences:	Biology: BIOL 1401, 1402, 3304, 3350 Chemistry: CHEM 1113, 1114, 1303, 1304, 3117, 3118, 3371, 3372 Earth Science: ENCE 1331, GEOL 1301 Physics: PHYS 1105, 1106, 1303, 1304	44
Engineering Science:	Computer Science and Engineering: CSE 1340 or 1341 or EMIS 1307	3
Environmental Engineering:	Core: ENCE 1301, 2304, 2421, 3302 Advanced: ENCE 3341, 3431, 3451 Management (Choose any 4 of the following 7): 5311, 5314, 5315, 5323, 5350, 5352, 5353	36
Environmental Technical Electives:	Selected with adviser approval	3
Technical or Engineering Leadership Elective:	Free elective	3
Minimum total hours required		127

Bachelor of Science in Civil Engineering

Curriculum Requirements		*TCH*
College Requirements:	Humanities, Social Sciences, and SMU required courses	23
Mathematics and Statistics:	MATH 1337, 1338, 2339, 2343; STAT 4340	15
Sciences:	Chemistry: CHEM 1113, 1114, 1303, 1304 Earth Science: GEOL 1301 or 1315 Physics: PHYS 1105, 1106, 1303, 1304	19
Engineering Science and Design:	Computer Science and Engineering: CSE 1341 Civil/Mechanical Engineering: ENCE 2320, 2331, 2342/2142	13
Civil Engineering and Design:	ENCE 1301 or 1302, 2304, 2310, 2340/2140, 3323, 3350, 4350, 4380, 4381, 4385, 5354, 5372	37
Civil Engineering Technical Electives:	Selected with adviser approval	6
Engineering Leadership:	Computer Science and Engineering: CSE 4360 Engineering Management, Information and Systems: EMIS 3308, 3309 Environmental and Civil Engineering: ENCE 3302	12
Minimum total hours required		125

Bachelor of Science in Civil Engineering and Bachelor of Science in Mathematics

Curriculum Requirements		*TCH*
College Requirements:	Humanities, Social Sciences, and SMU required courses	23
Mathematics and Statistics:	MATH 1337, 1338, 2339, 2343, 3315, 3337, and two advanced MATH electives selected with math adviser approval; STAT 4340	27
Sciences:	Chemistry: CHEM 1113, 1114, 1303, 1304 Earth Science: GEOL 1301 or 1315 Physics: PHYS 1105, 1106, 1303, 1304	19
Engineering Science and Design:	Computer Science and Engineering: CSE 1341 Civil/Mechanical Engineering: ENCE 2320, 2331, 2342/2142	13
Civil Engineering and Design:	ENCE 1301 or 1302, 2304, 2310, 2340/2140, 3323, 3350, 4350, 4380, 4381, 4385, 5354, 5372	37
Advanced Civil Engineering/Mathematics:	ENCE 5361, ME 5322	6
Minimum total hours required		125

Minor in Environmental Engineering

For approval of a minor in environmental engineering, the student should consult the Environmental and Civil Engineering Department. A minimum of 15 term credit hours in environmental engineering courses is required. One example of an approved set of courses that provides a broad introduction to environmental engineering is:

ENCE 2304 Introduction to Environmental Engineering and Science

ENCE 2421 Aquatic Chemistry

ENCE 3431 Fundamentals of Air Quality I

ENCE 4329 Design of Water and Wastewater Systems

ENCE 5354 Environmental Engineering Principles and Processes

Based on the student's interests and background, other sets of environmental engineering courses may be substituted with the approval of the Environmental and Civil Engineering Department.

Minor in Civil Engineering

For approval of a minor in civil engineering, the student should consult the Environmental and Civil Engineering Department. A minimum of 15 term credit hours in civil engineering courses is required. One example of an approved set of courses, totaling 16 term credit hours, that provides an emphasis on structural analysis and design is:

ENCE 2310 Statics

ENCE 2340/2140 Mechanics of Deformable Bodies/Mechanics of Materials Laboratory

ENCE 3350 Structural Analysis

ENCE 4350 Structural Design

ENCE 4385 Soil Mechanics and Foundations

Based on the student's interests and background, other sets of civil engineering courses may be substituted with the approval of the Environmental and Civil Engineering Department.

The Courses (ENCE)

1301. Environment and Technology: Ecology and Ethics. Students are introduced to the economic, engineering, ethical, political, scientific, and social considerations of environmental decision-making and management. Local, regional, and global topics will be examined. Students will take off-campus field trips.

1302. Introduction to Environmental and Civil Engineering. Students are introduced to the disciplines of environmental and civil engineering. Many of the hallmarks of modern society, including high-rise office buildings, increased lifespan, the virtual elimination of numerous diseases, and reliable long-distance and public transportation systems are the result of work by environmental and civil engineers. Likewise, many problems presently confronting developing nations, including housing supply, food production, air and water pollution, spread of disease, traffic congestion, and flood control will be solved by environmental and civil engineers. The course emphasizes fundamental science, engineering, and ecological principles and encourages the development of analytical and critical thinking skills with real-world problem solving.

1331. Meteorology. Meteorology is the science and study of the earth's atmosphere and its interaction with the earth and all forms of life. Meteorology seeks to understand and predict the properties of the atmosphere, weather, and climate from the surface of the planet to the edge of space. Appropriate for all interested undergraduates.

1378. Transportation Infrastructure. An overview and definitions of infrastructure elements with concentration on transportation. Principals of infrastructure planning and management. Congestion and performance measures. Relationship with economy, environment, safety, homeland security and technology.

2140. Mechanics of Materials Laboratory. Experiments in mechanics of deformable bodies, to complement ENCE 2340. Simple tension tests on structural materials, simple shear tests on riveted joints, stress and strain measurements, engineering and true stress, engineering and true strain, torsion testing of cylinders, bending of simple supported beams, deflection of simply supported beams, buckling of columns, strain measurements of pressure vessels, Charpy Impact tests, effect of stress concentrators. *Corequisite or Prerequisite:* ENCE 2340.

2142. Fluid Mechanics Laboratory. One three-hour laboratory session per week. Credit: 1. Experiments in fluid friction, pumps, boundary layers, and other flow devices to complement lecture material of ENCE 2342. *Corequisite or Prerequisite:* ENCE 2342.

2304. Introduction to Environmental Engineering and Science. Introduction to a scientific and engineering basis for identifying, formulating, analyzing, and understanding various environmental problems. Material and energy balances are emphasized for modeling environmental systems and processes. Although traditional materials in air and water pollution are examined, emphasis is placed on contemporary topics such as hazardous waste, risk assessment, groundwater contamination, global climate change, stratospheric ozone depletion, and acid deposition. Where appropriate, pertinent environmental legislation is described, engineering models are derived and applied, and treatment technologies introduced. *Prerequisites:* CHEM 1303 and MATH 1338.

2310. Statics. Equilibrium of force systems; computations of reactions and internal forces; determinations of centroids and moments of inertia; introduction to vector mechanics. *Prerequisite:* MATH 1337 or equivalent.

2320. Dynamics. Introduction to kinematics and dynamics of particles and rigid bodies; Newton's laws, kinetic and potential energy, linear and angular momentum, work, impulse, and inertia properties. *Prerequisite:* ENCE 2310 or equivalent.

2331. Thermodynamics. The first and second laws of thermodynamics and thermodynamic properties of ideal gases, pure substances, and gaseous mixtures are applied to power production and refrigeration cycles. *Prerequisite:* CHEM 1303, ENCE 2310, and MATH 2339.

2340. Mechanics of Deformable Bodies. Introduction to analysis of deformable bodies including stress, strain, stress-strain relations, torsion, beam bending and shearing stresses, stress transformations, beam deflections, statically indeterminate problems, energy methods, and column buckling. *Prerequisite:* ENCE 2310.

2342 Fluid Mechanics. Fluid statics, fluid motion, systems and control volumes, basic laws, irrotational flow, similitude and dimensional analysis, incompressible viscous flow, boundary layer theory, and an introduction to compressible flow. *Prerequisites:* ENCE 2310, MATH 2339, and PHYS 1303. *Corequisite or Prerequisite:* MATH 2343.

2421. Aquatic Chemistry. Aspects of chemistry that are particularly valuable to the practice of environmental engineering are examined. A basic groundwork is provided for the quantitative analysis of water and wastewater systems. Fundamental methods of instrumental analysis are examined. Elements of thermodynamics, acid-base, redox, and colloidal chemistry are presented as appropriate. Laboratory sessions emphasize design, hands-on conduct of experimental procedures, and interpretation and statistical analysis of derived data. *Prerequisite:* CHEM 1303.

3302. Engineering Communications. Both oral and written communications skills for engineers: engineering documents, writing standards, and presentations; audience analysis; graphics; collaborative skills; and ethical issues. Students prepare several documents and presentations common in engineering practice. *Prerequisite:* Junior or Senior standing in engineering.

3323. Water Resources Engineering. The hydrologic cycle and associated atmospheric processes are introduced through derivation and practical application of the hydrologic budget equation encompassing precipitation, evaporation, transpiration, ground water flow, and surface water runoff. Unit hydrographs and flood hydrograph routing are examined through application of hydrologic simulation models. Students are exposed to probabilistic analysis and extreme value theory for determination of flood and drought hazard. Interpretation and statistical analysis of climatologic, hydrologic, and other environmental data are emphasized. Concepts of professional engineering practice are introduced with emphasis on the need for professional licensing and on project management through all phases of a typical project including conception, planning, preparation of design drawings and specifications for bidding and procurement purposes, the interaction of design and construction professionals, and water resource systems operation. *Prerequisites:* ENCE 2304 and 2342.

3325. Ground Water Hydrology. The hydrologic cycle and the subjects of porosity and permeability are introduced. Flow theory and its applications, storage properties, the Darcy equation, flow nets, mass conservation, the aquifer flow equation, heterogeneity and anisotropy, regional vertical circulation, unsaturated flow, and recharge are examined. Well hydraulics, stream-aquifer interaction, and distributed- and lumped-parameter numerical models are considered, as are groundwater quality, mixing cell models, contaminant transport processes, dispersion, decay and adsorption, and pollution sources. *Prerequisites:* ENCE 2342 and MATH 2343.

3327. Principles of Surface Water Hydrology and Water Quality Modeling. The theory and applications of the physical processes of the hydrologic cycle are examined. Different types of water bodies – streams, rivers, estuaries, bays, harbors, and lakes – are reviewed. The principal quality problems associated with bacteria, pathogens, viruses, dissolved oxygen and eutrophication, toxic substances, and temperature are examined in detail. Theoretical model approaches are emphasized. *Prerequisites:* ENCE 2421 and MATH 2343.

3341. Introduction to Solid and Hazardous Waste Management. Solid and hazardous waste are defined. Technology, health, and policy issues associated with solid waste and hazardous materials are examined. Methods of managing solid and hazardous waste are introduced and regulations presented where appropriate. The characteristics of hazardous and solid waste materials, health frameworks, and the distribution of contaminants in the environment are reviewed. *Prerequisites:* ENCE 2304 and 2421.

3350. Structural Analysis. Emphasis on the classical methods of analysis of statically determinate and indeterminate structural systems. Computation of reactions, shears, moments, and deflections of beams, trusses, and frames. Use of computers as an analytical tool. *Prerequisites:* ENCE 2340/2140.

3353. Introduction to Environmental Toxicology. The physiological and biochemical effects of physical, chemical, and biological processes are linked to factors present in the environment. Natural phenomena are described in terms of the carbon, oxygen, sulfur, phosphorus, and heavy metal cycles. The processes by which anthropogenic chemicals enter the environment and their complex effects on living organisms are examined in detail. *Prerequisite:* BIOL 1401. *Corequisite or Prerequisite:* CHEM 3371.

3355. Environmental Impact Evaluation, Policy, and Regulation. Methods for evaluating engineering projects on environmental quality are reviewed, as are environmental legislation and environmental quality indices. The strengths and weaknesses of government methodologies to protect the environment are reviewed. Pollution standards, marketable rights, taxes, and citizen empowerment are considered. Economic analysis and other policy perspectives are considered. *Prerequisite:* ENCE 2304.

3431. Fundamentals of Air Quality I. The science, engineering, public health, and economic aspects of air quality are covered. Topics include the sources of air pollutants, transport of pollutants in the environment, and atmospheric chemistry. The important properties and behavior of airborne particles and gases are reviewed. Also discussed are the science and national and international policies relating to greenhouse gas emissions, global climate change, and stratospheric ozone depletion. *Prerequisites:* CHEM 1303, MATH 1337 or equivalent, and PHYS 1303 or equivalent.

3451. Principles of Industrial Hygiene, Occupational Health, and Environmental Control. The recognition, evaluation, and control of health hazards in the working environment are presented. Principles of industrial toxicology, occupational diseases, and occupational health standards are examined. The application of industrial hygiene principles and practice as well as the measurement and control of atmospheric contaminants are presented. The design and evaluation of industrial ventilation systems are introduced. Lecture and three hours of laboratory. *Prerequisite:* BIOL 1401.

4329. Design of Water and Wastewater Systems. Physical, chemical, and biological concepts and processes that are specific to public water supplies and municipal wastewater management are covered. Fluid mechanics is reviewed followed by an introduction to hydraulic modeling for design of water distribution networks and wastewater collection networks. Design and operation of treatment systems for both drinking water and municipal wastewater pollution control are covered. Process modeling is employed for completion of two design projects, one for a public water supply treatment plant and the other for municipal wastewater treatment plant. Field trips are conducted to a public water supply treatment plant and to a municipal wastewater treatment plant. *Prerequisites:* CHEM 1303, and ENCE 2304 and 2342.

4333. Fundamentals of Air Quality II. Fundamental and advanced topics in air quality are covered, building upon ENCE 3431. Atmospheric dispersion of pollutants is examined and modern computer models are used to predict transport. A thorough review of energy technology and energy policy is presented, focusing on the economics and environmental impacts of conventional and alternative methods of energy generation. The importance of indoor air quality is discussed, including the risks from radon and biological aerosols. Additional topics of current interest are presented. Each student prepares a term paper related to energy policy and the environment. *Prerequisites:* ENCE 2331 or equivalent, and ENCE 3431.

4350. Structural Design. Study of strength, behavior and design of steel structures and reinforced concrete structures; members subjected to flexure, shear, and axial loads. *Prerequisite:* ENCE 3350.

4380. Environmental and Civil Engineering Design I. Students are responsible for completing a term-long environmental or civil engineering project for an industrial or regulatory client. The nature of design problems, constraints, and analytical tools are examined in an applied setting. An integrated design process is employed including problem identification and formulation, project planning, evaluation of alternatives, internal peer review and design iterations, preparation of design drawings and specifications for bidding and procurement purposes, the interaction of design and construction professionals, and implementation of the completed project. *Prerequisites:* Senior standing and ENCE 3302.

4381. Environmental and Civil Engineering Design II. Students are responsible for completing a term-long environmental or civil engineering project for an industrial or regulatory client. Students function on multidisciplinary design teams that stress the need for personal and written communication skills, leadership, effective group participation, and creative problem solving. Concepts of professional engineering practice are reinforced by student participation in applied design problems including the need for professional licensing, the ethical responsibilities of licensed engineers, and the need for lifelong learning to stay abreast of changing technology and public policy through active participation in professional societies, self-study, and continuing education. Periodic progress reports and reviews and a final report are prepared and presented. Both the client and faculty assess the completed design project. *Prerequisite:* ENCE 4380**.**

4385. Soil Mechanics and Foundations. Introduction to the basic principles that govern the behavior of soils, foundations, and other geotechnical engineering works. The central concepts covered include the index properties and classification of soils, soil permeability and pore water movement, stress distribution in soil and the effective stress concept, bearing capacity, compressibility, consolidation, settlement, shear strength, and soil engineering properties and their measurement. Geotechnical facilities introduced include foundations, retaining walls, tunnels, excavations, earth fill dams, pavements, stable earth slopes, sanitary landfills, and environmental remediation projects. *Prerequisite:* ENCE 2340.

5090. ENCE Seminar. Lectures by invited speakers from industry and academia, including SMU faculty and students, dealing with engineering practice and research topics of current interest in environmental and civil engineering. All students, staff, and faculty are invited.

5311. Environmental and Hazardous Waste Law. Federal environmental laws, with emphasis on laws dealing with hazardous substances, such as CERCLA and RCRA; regulations and the regulatory framework; definitions and substantive requirements; roles of the States and the Federal EPA; compliance and enforcement; case studies.

5312. Risk Assessment and Health Effects. Introduction to toxicology as it relates to environmental and health effects of hazardous materials; toxicological methodology; risk management factors including legal aspects; human health and ecological risk assessment and risk communication; emergency response; computer databases.

5313. Environmental Chemistry and Biology. Chemical and biochemical processes; controlling fate and transport of hazardous materials with emphasis on chemical equilibria; chemical thermodynamics; acid-base equilibria; precipitation and dissolution; oxidation-reduction processes; environmental transformations of organic materials; introductory taxonomy; microbial growth and kinetics; energy transfer; microbial ecosystems.

5314. Environmental Regulations and Compliance. Practical knowledge of federal and state environmental permitting processes and procedures is provided. Regulatory requirements are reviewed with emphasis on the 40 CFR regulations for water, air, and solid and hazardous waste. Air, water, storm water, and waste permits are reviewed, as well as permits-by-rule. Also explored are the consequences of noncompliance with regulations by presenting enforcement options available to government agencies.

5315. Integrated Waste Management. Comprehensive introduction to the fundamentals of the complex interdisciplinary field of hazardous waste management; current management practices; treatment and disposal methods; and site remediation. Topics include detailed case studies and design examples to evaluate the effectiveness of different treatment and containment technologies in addressing today's hazardous waste situations.

5322. Biological Waste Treatment. Biological treatment topics include an overview of microbiology and microbial metabolism; kinetics of biological growth; aerobic suspended growth processes including the various modifications of the activated sludge process, aerated lagoons, and sequencing batch reactors; aerobic attached growth processes including trickling filters, biofilter towers, and rotating biological contactors; anaerobic processes including sludge digestion and liquid waste treatment with the anaerobic contact process and anaerobic filters; biosolids handling and disposal; composting; land treatment; *in situ* biotreatment and biotreatment of contaminated soils.

5323. Project Management. Role of project officer; systems and techniques for planning, scheduling, monitoring, reporting, and completing environmental projects; total quality management; project team management, development of winning proposals; contract management and logistics; case study application of project management to all environmental media and programs; community relations, risk communication, crisis management, consensus building, media, and public policy.

5331. Air Pollution Management and Engineering. This course is geared towards graduate students interested in the science, engineering, public health, and economic aspects of air quality. Students will develop deep understanding and broad knowledge of the sources and properties of air pollutants, transport of pollutants in the environment, and government regulation of air quality. In addition, the operation and design of air pollution control systems are reviewed. Also discussed are the science and national and international policies relating to greenhouse gas emissions, global climate change, and stratospheric ozone depletion. A series of design projects reinforce the material presented in lecture. *Prerequisites:* CHEM 1304, MATH 1337 or equivalent, and PHYS 1303 or equivalent.

5332. Ground Water Hydrology and Contamination. Ground water hydrology; aquifer and well hydraulics; flow equations and models; implications for landfill design; sources and nature of ground water contaminants; monitoring and analysis; contaminant fate and transport; transport model for hazardous substances; ground water pollution control measures; containment and treatment; ground water quality management. *Prerequisite:* MATH 2343.

5333. Laboratory Methods in Environmental Engineering. This course provides students with hands-on, state-of-the-art experience with important experimental methods in environmental systems, evaluating the reliability and significance of parameter determinations. Covers instrumental and statistical methods used for characterization of water, air, and soil quality. Introduction to treatability studies including reactor dynamics. The course format provides two hours of lecture and three hours of laboratory component. *Prerequisite:* ENCE 5313, or two terms of undergraduate chemistry.

5334. Fate and Transport of Contaminants. Development and application of fate and transport models for water-borne contaminants with focus on material balance principle; mass transport and transformation processes; modeling of lakes and reservoirs; stream modeling; general flow case; ground water models; water-sediment, water-soil, and water-air interfaces; multiphase and integrated modeling approaches; case studies.

5335. Aerosol Science, Engineering, and Control Systems Design. This course is for graduate and upper-level undergraduate engineering students interested in the fundamental and advanced principles of aerosol science and engineering. The properties, behavior, and measurement of airborne particles are specifically reviewed. The origin and properties of atmospheric aerosols and the production of industrial and pharmaceutical aerosols are discussed. Students will study and develop designs for air pollution control equipment for stationary sources like power plants and mobile sources like diesel engines. Advanced filtration techniques for semiconductor clean rooms and other applications are reviewed. *Prerequisites:* ENCE 3431, or ENCE 2342 or equivalent.

5340. Introduction to Solid Mechanics. Three-dimensional stress and strain, failure theories, introduction to two-dimensional elasticity, torsion of prismatic members, beams on elastic foundations, introduction to plates and shells, and energy methods. *Prerequisites:* ENCE 2340 and MATH 2343.

5350. Introduction to Environmental Management Systems. An in-depth introduction to environmental management systems (EMSs). Includes systems such as EMAS, Responsible Care, OSHAS 18000, ISO 14000, and the Texas EMS program. Takes a step-by-step look at the ISO 14001 standard from the policy statement to the management review, and allows students to fully understand the Plan-Do-Check-Act approach of the system. Also introduces students to management system auditing, the requirements of a system auditor, and the certification process.

5351. Introduction to Environmental Toxicology. Toxicology is presented as it relates to environmental and health effects of hazardous materials. Toxicological methodologies, pharmacokinetics, mechanisms of action to toxicants, origin response to toxic substances, and relevant aspects of the occupational and regulatory environment will be examined. Specific topics include toxicology of metals, radiation, industrial solvents and vapors, pesticides, teratogens, mutagens, and carcinogens. Risk communication and risk assessment are examined as they relate to toxic substance exposure.

5352. Management of Radioactive Hazards. Principles of radioactive material production, uses, and hazards are presented with emphasis on their safe control and management. Topics in health physics and radiation protection related to the commercial nuclear industry are examined including uranium fuel production, light water reactor technologies, and industrial and medical uses of radioactive byproduct materials. Risk assessment methods and hazard management connected to the fuel cycles will be developed. The regulation of radioactive materials will be studied with emphasis on licensing of regulated industries, radioactive material transportation, radioactive waste management and disposal, radiological emergency preparedness, and decommissioning. *Prerequisite:* ENCE 5313.

5353. Environmental Epidemiology. Introduction to the science of epidemiology. Design and conduct of studies examining health effects of environmental exposures. Strengths and limitations of research strategies and interpretation of study results. Areas of interest include air and water pollution, lead, and biological marker outcomes.

5354. Environmental Engineering Principles and Processes. Waste minimization and pollution prevention techniques and objectives are introduced. A comprehensive study is made of biological, chemical, and physical principles and treatment strategies for controlling pollutant emissions. Equal emphasis is placed on underlying theory and practical engineering application of both common and innovative water and wastewater treatment processes. Design equations, procedures, and process models are rigorously derived for chemical/biological reactors and physical unit operations. Emphasis is placed on engineering analysis and application of process modeling techniques for design of unit processes to achieve specific treatment objectives. *Prerequisites:* CHEM 1303, ENCE 2304 and 2342, and MATH 2343.

5361. Matrix Structural Analysis and Introduction to Finite Element Methods. A systematic approach to formulation of force and displacement method of analysis; representation of structures as assemblages of elements; computer solution of structural systems. *Prerequisite:* ENCE 4350 or equivalent.

5362. Engineering Analysis with Numerical Methods. Applications of numerical and approximate methods in solving a variety of engineering problems. Examples include equilibrium, buckling, vibration, fluid mechanics, thermal science, and other engineering applications. *Prerequisite:* Permission of instructor.

5363. Architectural and Structural Engineering. The basic principles of structural analysis and mechanics of deformable bodies are introduced. Structural systems and principles are presented with an emphasis on architectural design. Students will be provided with a conceptual introduction to structures emphasizing the integration of structural and architectural design. Case studies of buildings are presented and discussed. *Prerequisites:* ENCE 2310 and 2320.

5364. Introduction to Structural Dynamics. Dynamic responses of structures and behavior of structural components to dynamic loads and foundation excitations; single- and multi-degree-of-freedom systems response and its applications to analysis of framed structures; introduction to systems with distributed mass and flexibility. *Prerequisite:* MATH 2343.

5365. Introduction to Construction Management. Construction practice techniques and current technological tools are examined. Included are cost estimating, bidding, contracts and contract bonds, risk and umbrella excess insurance, labor law and labor relations. Building codes and regulations are examined. Business methods with respect to managing project time and cost, including typical forms used in construction, are addressed.

5366. Introduction to Facilities Engineering Systems. The inter-relationships of fire protection, HVAC, electrical, plumbing, lighting, telecommunications, energy management systems for buildings are examined. A life-cycle approach examines each of these systems with respect to cost, durability, maintainability, operability, and safety. Facility operations, facility maintenance and testing, and assessments are discussed.

5367. Telecommunications in Facility Planning. A thorough description of telecommunications technology is presented. Provides the student with a working knowledge of the fundamental concepts of telecommunications technology for both voice and data. Topics presented include digital communications, standards and protocols, ethernets, local area networks, fiber optics and voice technologies.

5368. Facilities Contract Management. A critical foundation and understanding is provided of the terminology, arts and skills of contracts and contract negotiation, review and preparation, as well as insurance and risk management. Attention is also given to lease analysis, licensing and permits, when and how bidding contracts are warranted, how to prepare specifications and their role in contract creation, and supplier and vendor management in the post-contractual process.

5369. Electrical, Mechanical and Piping Systems for Buildings. Mechanical and electrical systems for buildings are examined with emphasis on practical aspects of the subjects. Space planning and architectural considerations, including cost and environmental impact of the mechanical and electrical systems are presented. *Prerequisites:* Undergraduate introduction to electrical circuits, classical mechanics, and fluid dynamics, or instructor's approval.

5370. Facility Planning. The overall planning process for construction projects is presented. The three divisions of planning: program planning, project planning, and activity planning are presented in an integrated manner. Included are different modeling approaches for the planning process.

5371. Facility Financial and Asset Management. Financial analysis and reporting, concepts and methods of accounting, budgeting, and evaluation of projects are examined. The role of facility managers in affecting corporate earnings and valuations is presented. The management of the facility over its entire life-cycle extending from planning and budgeting to the management of its assets and construction projects is included.

5372. Introduction to CAD. Provides students with hands-on, state-of-the-art experience with computer-aided drafting using AutoCAD to produce drawings used for engineering presentations and construction. Students will learn how to draw lines, curvilinear lines, use blocks and external references, write text, create plot files, and many other commands necessary to produce engineering drawings as used to construct environmental, civil, and structural engineering projects.

5373. Prestressed Concrete. Theory and application of prestressed concrete members, time-dependent deflections, and continuous prestressed beams. *Prerequisites:* ENCE 4350 and 5361.

5375. Advanced Concrete Design. Behavior, analysis and design of concrete slender columns, two-way slab systems, and deep beams. Yield line analysis for slabs. Design and behavior of shear walls, retaining walls and foundations systems. *Prerequisite:* ENCE 4350.

5377. Advanced Steel Design. Behavior and design of steel structures including general methods of plastic analysis, plastic moment distribution, steel frames, unbraced and braced frames, and composite construction. *Prerequisites:* ENCE 3350, 4350 and 5361.

5378. Transportation Planning and Traffic Engineering. This course is concerned mainly with the analysis and modeling of urban transportation systems. The course consists of three main parts. The first part provides an overview of main definitions and terminologies involved in the planning and modeling of urban transportation systems. The second part introduces the concept of urban transportation planning systems along with an overview of various models used in travel demand forecasting. The third part describes principles of traffic operations, analysis and control. *Prerequisite:* Basic principles of probability and statistics.

5383. Heating, Ventilating, and Air Conditioning. Examines the science and practice of controlling environmental conditions through the use of thermal processes and systems. Specific applications include refrigeration, psychometrics, solar radiation, heating and cooling loads in buildings, and design of duct and piping systems. Theory and analysis are emphasized. *Prerequisites:* ENCE 2331, 2342, and ME 3332.

5384. Energy Management for Buildings. Procedures to select energy saving options for buildings are examined with emphasis on the practical aspects of the subject. Space planning, architectural considerations, cost, and environmental impact of the mechanical and electrical systems are considered along with optimizing the life cycle cost of the proposed alternative. Software for life cycle cost and energy analysis are used to calculate energy consumption and compare energy features of proposed, audit-determined feasible changes to a building.

5385. Advanced Soil Mechanics. Physicochemical properties of soil and soil stabilization.

Advanced theories of soil deformation and failure as applied to slope stability and lateral loads. Soil-water interaction in earthen dams. *Prerequisite:* ENCE 4385.

5386. Foundation Engineering. Application of soil mechanics principles to the design and construction of shallow and deep foundations. Topics include: subsurface investigation procedures to obtain soil parameters for design and construction of structure foundations, bearing capacity and settlement analyses, construction procedures, and soil improvement techniques. *Prerequisite:* ENCE 4385.

5(1-4)9(1-2) Special Projects. Intensive study of a particular subject or design project, not available in regular course offerings, under the supervision of a faculty member approved by the department chair.

MECHANICAL ENGINEERING

Professor Yildirim Hürmüzlü, **Chair**

Professor Radovan Kovacevic, **Director, Research Center for Advanced Manufacturing**

Professors: Yildirim Hürmüzlü, David B. Johnson, Radovan Kovacevic, José Lage, Bijan Mohraz, Peter E. Raad, Wei Tong; **Associate Professor:** Charles M. Lovas; **Assistant Professors:** Gemunu S. Happawana, Paul Krueger, David Willis; **Lecturers:** Elena Borzova, Dona T. Mularkey; **Adjunct Faculty:** Bogdan Antohe, Terry V. Baughn, Jerry Gannaway, Ramon Goforth, Craig L. Lee, David Nowacki, Albert Petrasek, Rod Pipinich, Donald C. Price, Natarajan Ramanan, Edmund Richer, James Wilson, Chris Witzke; **Emeritus Professors:** Charles E. Balleisen, Jack P. Holman, Paul F. Packman, Cecil H. Smith, Hal Watson Jr., Edmund Weynand.

Mechanical Engineering is a very diverse, dynamic, and exciting field. Because of the wide-ranging technical background attained, mechanical engineers have the highest potential for employment after graduation with exceptional mobility necessary for professional growth even during bear-market conditions. Mechanical engineers apply their creative knowledge to solve critical problems in several different areas, such as bio-engineering (e.g., drug-delivery; artificial organs), construction, design and manufacturing, electronics, energy (e.g., production, distribution and conservation), maintenance (individual machinery and complex installations), materials processing, medicine (diagnosis and therapy), national security and defense, packaging, pollution mitigation and control, robotics and automation, sensors, small scale devices, and all aspects of transportation including space travel and exploration.

The Mechanical Engineering Department at SMU has a long tradition of offering a superb engineering education within an environment fostering creativity and innovation. Small classes, a trademark of the program, not only provides for strong mentoring but it also foments academic excellence through cooperation and teamwork. The exceptionally qualified faculty transmits knowledge using the most effective pedagogical skills, assisted in large by the SMU Center for Teaching Excellence and by the Norwick Center for Media and Instructional Technology. Leading by example, through encouragement and dedication, the faculty is committed to the success of every student. In addition to offering the introductory and advanced courses in their areas of specialization, faculty members teach courses that address the critical issues of technology and society, such as Machines and Society and Information Technology and Society.

The program genuinely prepares students to be creative by providing a solid background in fundamentals of science and engineering without compromising the practical aspects of mechanical engineering. Essential entrepreneurial know-how, interpersonal skills, and the importance of lifelong learning complement the educational experience of students. The department stimulates professional and social leadership by providing, among others, opportunities for students to participate in the SMU Student Section of the American Society of Mechanical Engineers and on the SMU Tau-Sigma Chapter of Pi-Tau-Sigma, the National Honorary Mechanical Engineering Fraternity.

The curriculum consists of two major stems, namely, Solid Mechanics and Thermal and Fluids, interlaced via practical mechanical engineering design throughout the curriculum. In the senior year, teams of students are guided through a complete Design Project, all the way from concept to construction to testing, with support from industries, foundations and volunteer professionals. State-of-the-art software, computers, and laboratory equipment support the high-quality education provided to students. Moreover, undergraduate students are encouraged to participate in research projects conducted by faculty and to consider extending their studies toward a graduate degree in Mechanical Engineering at SMU or elsewhere.

In conjunction with a solid liberal arts component, the program prepares students for graduate studies not only in engineering but also in other professional fields such as business, medicine, and law. SMU Mechanical Engineering graduates have consistently and successfully attained higher degrees in engineering, medicine, business and law, besides gaining employment as engineers or consulting engineers for major engineering, pharmaceutical, environmental, financial, banking, and real estate companies.

The Mechanical Engineering curriculum is accredited by the Accreditation Board for Engineering and Technology (ABET).

Specific educational objectives of the Mechanical Engineering undergraduate program are to produce graduates who:

1. Can apply the principles of mathematics, science, and engineering;
2. Are knowledgeable in thermal systems and mechanical systems as well as in the relationships among processes, process equipment, integrated design, and performance;
3. Can define problems involving design in both thermal systems and mechanical systems and are capable of developing and evaluating alternate designs as well as implementing design solutions;
4. Communicate effectively and who demonstrate an ability to function on multidisciplinary teams;
5. Can use modern engineering tools for conducting analyses, accomplishing designs, and communicating effectively;
6. Understand their responsibility to their profession and society in a global context and who are prepared for and realize the importance of lifelong learning; and
7. Have the necessary education in the arts, humanities, and ethics.

An outstanding cooperative education program (Co-op) is also available for our students. For further information on the Co-op Program, see “Cooperative Education” at the beginning of this School of Engineering section.

The Mechanical Engineering Department offers the following degrees:

Bachelor of Science in Mechanical Engineering
Bachelor of Science in Mechanical Engineering
with a Minor in Business Administration
Bachelor of Science in Mechanical Engineering
with an Engineering Management and Entrepreneurship Specialization
Bachelor of Science in Mechanical Engineering
with a Manufacturing Specialization
Bachelor of Science in Mechanical Engineering
with a Premedical Specialization
Master of Science in Mechanical Engineering

Master of Science in Manufacturing Systems Management
Master of Science in Packaging of Electronic and Optical Devices
Doctor of Philosophy in Mechanical Engineering

In addition, a minor in Mechanical Engineering is available to interested students. Moreover, the department cooperates with the Mathematics Department to offer dual Bachelor of Science degrees in Mechanical Engineering and Mathematics, and with the Physics Department to offer dual Bachelor of Science degrees in Mechanical Engineering and Physics.

Departmental Facilities

In support of the teaching and research endeavors of our department, several instructional and research laboratories are available, including:

Applied Machine Vision Laboratory. Latest technologies in image sensing, image acquisition, and image processing are integrated into systems to provide direct solutions for manufacturing industry problems. The laboratory is equipped with an ultra-high-shutter-speed camera assisted with pulsating nitrogen lasers, a high-frame-rate CCD camera, a three-dimensional machine vision system based on the structured-light SyncroVision camera, and three high-speed high-power image acquisition and processing systems.

Computational/Design Laboratory. Dedicated computational facilities that include personal computers and high-resolution color X-Terminals, all connected through a high-speed network that allows communication with the school's and University's computers as well as with off-campus systems via NSFNet. Available School of Engineering computational facilities include several high-speed, multiprocessor workstations and servers. Educational software includes Parametric Technologies Pro-Engineer CAD system, Matlab, ANSYS structural analysis package, MacroFlow and Fluent CFD packages.

Graphics Laboratory. Used primarily for first-year graphics, the facility is available for students working on design projects. A special design projects library is located adjacent to the drafting room.

High-Power Laser Processing Laboratory. This laboratory provides first-hand experience in the application of high-energy light (focused laser) to process different types of materials, including forming, cutting, drilling, joining, coating, and material property modification. The laboratory is equipped with a high-power MultiWave Nd:YAG laser with a power of 1000 watts in CW mode and 2500 watts in pulsating mode, a three-axis CNC positioning system, and a powerful data acquisition system for control and diagnostics.

Laboratory for Porous Materials Applications. This laboratory is devoted to the design, analysis and testing of porous media-based systems and devices, including next generation cooling devices, filters, chemical reactors, and mixers. The laboratory is equipped with instrumentation necessary for measuring effective thermo-hydraulic properties, including effective conductivity, permeability, and inertia coefficient.

Mechanics of Materials Laboratory. This laboratory is equipped for instruction and research on the behavior of materials under various loading conditions such as fatigue, impact, hardness, creep, tension, compression, and flexure.

MicroMachining Laboratory. This laboratory is equipped with lasers and Photonics equipment specifically for the fabrication of devices at the microscale.

Solid Freeform Fabrication Laboratory. The field of rapid prototyping by Solid Freeform Fabrication is a relatively recent by-product of the computer-integrated manufacturing revolution. SFF processes are additive in nature, in that three-dimensional CAD geometry is fabricated by successively layering or adding two-dimensional slices of the solid. In this laboratory, high-power laser and welding processes are used to make structurally sound metallic functional parts, molds, and dies.

Systems, Measurement, and Control Laboratory. Equipped for instruction in the design and analysis of analog and digital instrumentation and control systems. Modern measurement and instrumentation equipment is used for experimental control engineering, system identification, harmonic analysis, simulation, and real-time control applications. Equipment also exists for microprocessor interfacing for control and instrumentation.

Submicron Electro-Thermal Sciences Laboratory. This laboratory is dedicated to the experimental research and computational modeling of submicron integrated circuits. The laboratory features a laser-based thermo-reflectance measurement system, a microwave integrated circuit scalar performance electrical measurement system, and an adaptive thermal numerical solution package.

Systems Laboratory. Equipped for computational and experimental research in biomechanics, dynamics, and control.

Thermal and Fluids Laboratory. Equipment in this laboratory is used for instruction in experimental heat transfer, thermodynamics, and fluid mechanics. Modern equipment is available for conducting experiments on energy conservation, aerodynamics, internal combustion engine, HVAC systems, convective cooling of electronics, heat exchangers, and interferometric visualization. State-of-the-art systems support automatic control and data acquisition.

Welding Laboratory. The laboratory is equipped with three fully computerized welding cells (for gas tungsten arc welding, gas metal arc welding, and plasma arc welding) to promote high-quality research and technological innovations in arc and plasma welding.

Curriculum in Mechanical Engineering

Mechanical Engineering offers the broadest curriculum in engineering, as evidenced by the wide range of job opportunities in government and industry. The mechanical engineer is concerned with creation, research, design, analysis, production, and marketing of devices for providing and using energy and materials. The major concentration areas of the program are:

Solid and Structural Mechanics. Concerned with the behavior of solid bodies under the action of applied forces. The solid body may be a simple mechanical linkage, an aerodynamic control surface, an airplane or space vehicle, or a component of a nuclear reactor. The applied forces may have a variety of origins, such as mechanical, aerodynamic, gravitational, electromotive, and magnetic. Solid mechanics provides one element of the complete design process and interacts with all other subjects in the synthesis of a design.

Fluid Mechanics. Deals with the behavior of fluid under the action of forces applied to it. The subject proceeds from a study of basic fundamentals to a variety of applications, such as flow-through compressors, turbines, and pumps, around an airplane or missile. Fluid mechanics interacts with solid mechanics in the practice of mechanical engineering because the fluid flow is generally bounded by solid surfaces. Fluid mechanics is also an element in the synthesis of a design.

Thermal Sciences. Concerned with the thermal behavior of all materials — solid, liquid, and gaseous. The subject is divided into three important branches, namely, thermodynamics, energy conversion, and heat transfer. Thermodynamics is the study of the interaction between a material and its environment when heat and/or work are involved. Energy conversion is a study of the transformation of one form of energy to another, such as the conversion of solar energy to electrical energy in a solar cell. Heat transfer is a study of the processes by which thermal energy is transferred from one body of material to another. Because it takes energy to drive any apparatus and some of the energy always shows up as thermal energy, the thermal sciences interact with all other areas of study and can never be ignored in the design synthesis process.

Materials Science and Engineering. Pertains to the properties of all materials — solid, liquid, and gaseous. It deals with mechanical, fluid, thermal, electrical, and other properties. Properties of interest include modulus of elasticity, compressibility, viscosity, thermal conductivity, electrical conductivity, and many others. The study of materials proceeds from the characteristics of individual atoms of a material, through the cooperative behavior of small groups of atoms, up to the behavior and properties of the bulk material. Because all mechanical equipment is composed of materials, works in a material environment, and is controlled by other material devices, it is clear that the materials sciences lie at the heart of the design synthesis process.

Control Systems. Provides necessary background for engineers in the dynamics of systems. In the study of controls, both the transient and steady-state behavior of the system are of interest. The transient behavior is particularly important in the starting and stopping of propulsion systems and in maneuvering flight, whereas the steady-state behavior describes the normal operating state. Some familiar examples of control systems include the flight controls of an airplane or space vehicle and the thermostat on a heating or cooling system.

Design Synthesis. The process by which practical engineering solutions are created to satisfy a need of society in an efficient, economical, and practical way. This synthesis process is the culmination of the study of mechanical engineering and deals with all elements of science, mathematics, and engineering.

Bachelor of Science in Mechanical Engineering

Curriculum Notes

The minimum requirements for a Bachelor of Science in Mechanical Engineering degree are as follows:

Curriculum Requirements		***TCH***
General Education:	ENGL 1301, 1302, Perspectives and Cultural Formations courses.	21
Mathematics and Sciences:	MATH 1337, 1338, 2339, 2343 and STAT 4340 or equivalent. PHYS 1304, 1403; CHEM 1303; two additional 3000 level or higher Math or Science courses with the approval of the student's adviser.	31
Mechanical Engineering:	ME 1202, 1102, 1305, 2310, 2320, 2331, 2131, 2340, 2140, 2342, 2142, 3332, 3132, 3340, 3370, 4338, 4360, 4160, 4370, 4380, 4381, and 5322.	53
Advanced Major Electives:	Must be selected from 3000 level or higher ME courses with the approval of the student's adviser.	12
Leadership Electives:	Select two from EMIS 3308, EMIS 3309, ENCE 3302, or CSE 4360.	6
Wellness I and II:		2
Minimum total hours required		125

Any deviation from the ME curriculum requires approval of a petition submitted by the student to the ME faculty prior to the beginning of the term during which the student expects to complete the requirements for graduation.

Bachelor of Science in Mechanical Engineering (with a Minor in Business Administration)

The minimum requirements for a Bachelor of Science in Mechanical Engineering with a minor in Business Administration are as follows:

Curriculum Requirements		*TCH*
General Education:	ENGL 1301, 1302, Perspectives and Cultural Formations courses. Wellness	23
Mathematics/Statistics	MATH 1337, 1338, 2339, 2343, STAT 4340 or equivalent	15
Sciences:	CHEM 1303, PHYS 1303, 1304, 1105	10
Mathematics or Science Electives		6
Business	ECO 1312, ACCT 2311, ACCT 2312, FINA 3320, ITOM 3306, MKTG 3340, MNO 3370	21
Mechanical Engineering:	ME 1202, 1102, 1305, 2310, 2320, 2331, 2131, 2340, 2140, 2342, 2142, 3332, 3132, 3340, 3370, 4338, 4360, 4160, 4370, 4380, 4381, 5322 Advanced Major Elective 3	56
Minimum total hours required		131

Any deviation from the ME curriculum requires approval of a petition submitted by the student to the ME faculty prior to the beginning of the term during which the student expects to complete the requirements for graduation.

Admission requirements of the Cox School of Business for the Minor in Business Administration must be satisfied.

Bachelor of Science in Mechanical Engineering and Bachelor of Science in Mathematics

The Mechanical Engineering Department and the Mathematics Department offer a curriculum that enables a student to obtain both a Bachelor of Science in Mechanical Engineering and Bachelor of Science in Mathematics.

Curriculum Notes

The minimum requirements for the dual degree of Bachelor of Science in Mechanical Engineering and Bachelor of Science in Mathematics are as follows:

Curriculum Requirements		*TCH*
General Education:	ENGL 1301, 1302, Perspectives and Cultural Formations courses.	21
Mathematics:	MATH 1337, 1338, 2339, 2343, 3315, 3337, STAT 4340 or equivalent CSE 1340 or 1341 plus two advanced electives as defined in the description of the Mathematics major.	30
Sciences:	PHYS 1304 and 1403; CHEM 1303.	10
Mechanical Engineering:	ME 1202, 1102, 2310, 2320, 2331, 2131, 2340, 2140, 2342, 2142, 3332, 3132, 3340, 3370, 4338, 4360, 4160, 4370, 4380, 4381, and 5322.	50
Advanced Major Electives:	Must be selected from 3000 level or higher ME courses with the approval of the student's adviser.	9
Leadership Electives:	Select two from EMIS 3308, EMIS 3309, ENCE 3302, or CSE 4360	6
Wellness I and II:		2
Minimum total hours required		128

Bachelor of Science in Mechanical Engineering and Bachelor of Science in Physics

The Mechanical Engineering Department and the Physics Department offer a curriculum that enables a student to obtain both a Bachelor of Science in Mechanical Engineering and a Bachelor of Science in Physics.

Curriculum Notes

The minimum requirements for the dual degrees of Bachelor of Science in Mechanical Engineering and Bachelor of Science in Physics are as follows:

Curriculum Requirements		*TCH*
General Education:	ENGL 1301, 1302, Perspectives and Cultural Formation courses.	21
Mathematics:	MATH 1337, 1338, 2339, 2343, STAT 4340.	15
Sciences:	PHYS 1303, 1304, 3305, 3344, 3345, 3374, 4211, 4392, 5382, 5383 and two advanced physics electives; CHEM 1303.	38
Mechanical Engineering:	ME 1202, 1102, 1305, 2310, 2331, 2131, 2340, 2140, 2342, 2142, 3332, 3132, 3340, 3370, 4338, 4360, 4160, 4370, 4380, 4381, and 5322.	50
Leadership Elective:	Select one from EMIS 3308, EMIS 3309, ENCE 3302, or CSE 4360.	3
Wellness I and II:		2
Minimum total hours required		129

Any deviation from the ME and/or PHYS curricula requires approval of a petition submitted by the student to the appropriate faculty prior to the beginning of the term during which the student expects to complete the requirements for graduation.

Areas of Specialization

Mechanical engineering is a diverse field, and advanced major electives may be selected from a variety of advanced courses in mechanical engineering. In addition, specializations are offered in three important areas, namely Management and Entrepreneurship, Manufacturing, and Premedical. Therefore, each student may select one of these three specializations or may personalize his or her degree by particular choices of advanced major electives.

Bachelor of Science in Mechanical Engineering *(Engineering Management and Entrepreneurship Specialization)*

The Mechanical Engineering Department offers a B.S.M.E. degree with an Engineering Management and Entrepreneurship Specialization. This program includes required courses in Engineering Management, Information Engineering and Global Perspectives, Technical Entrepreneurship, and Technical Communications, while at the same time satisfying the requirements for an accredited degree in mechanical engineering.

Curriculum Notes

The minimum requirements for a Bachelor of Science in Mechanical Engineering degree with a Management and Entrepreneurship specialization are as follows:

Curriculum Requirements		*TCH*
General Education:	ENGL 1301, 1302, Perspectives and Cultural Formations Courses.	21
Mathematics and Sciences:	MATH 1337, 1338, 2339, 2343 and STAT 4340 or equivalent. PHYS 1304, 1403; CHEM 1303; two additional 3000 level or higher Math or Science courses with the approval of the student's adviser.	31

Mechanical Engineering:	ME 1202, 1102, 1305, 2310, 2320, 2331, 2131, 2340, 2140, 2342, 2142, 3332, 3132, 3340, 3370, 4338, 4360, 4160, 4370, 4380, 4381, and 5322.	53
Specialization:	EMIS 3308, EMIS 3309, CSE 4360 and ENCE 3302.	12
Advanced Major Electives:	Must be selected from 3000 level or higher ME courses with the approval of the student's adviser.	6
Wellness I and II		2
Minimum total hours required		125

Any deviation from the ME curriculum requires approval of a petition submitted by the student to the ME faculty prior to the beginning of the term during which the student expects to complete the requirements for graduation.

Bachelor of Science in Mechanical Engineering *(Manufacturing Specialization)*

This specialization enables students to select four major electives related to manufacturing engineering and manufacturing systems management. For details of the program, the student should consult the department.

Curriculum Notes

The minimum requirements for a Bachelor of Science in Mechanical Engineering degree with Manufacturing Specialization are as follows:

Curriculum Requirements		***TCH***
General Education:	ENGL 1301, 1302, Perspectives and Cultural Formations Courses.	21
Mathematics and Sciences:	MATH 1337, 1338, 2339, 2343 and STAT 4340 or equivalent. PHYS 1403, 1304; CHEM 1303; two additional 3000 level or higher Math or Science courses with the approval of the student's adviser.	31
Mechanical Engineering:	ME 1202, 1102, 1305, 2310, 2320, 2331, 2131, 2340, 2140, 2342, 2142, 3332, 3132, 3340, 3370, 4338, 4360, 4160, 4370, 4380, 4381, and 5322.	53
Manufacturing Electives:	Manufacturing electives must be approved by the student's adviser and must be selected from the following list: ME 5350, 5351, 5352, 5353, 5354, 5355, 5356, 5357, 5358, 5365, 5366, 5368, 5369, 5372, and 5391.	12
Leadership Electives:	Select two from EMIS 3308, EMIS 3309, ENCE 3302, or CSE 4360.	6
Wellness I and II:		2
Minimum total hours required		125

Any deviation from the ME curriculum requires approval of a petition submitted by the student to the ME faculty prior to the beginning of the term during which the student expects to complete the requirements for graduation.

Bachelor of Science in Mechanical Engineering *(Premedical/Biomedical Specialization)*

The Mechanical Engineering Department offers a B.S.M.E. degree with a premedical specialization. This program enables students to satisfy the premedical or predental requirements for admission to medical or dental school, while at the same time satisfying the requirements for an accredited degree in Mechanical Engineering.

Curriculum Notes

The minimum requirements for a Bachelor of Science in Mechanical Engineering degree with Premedical Specialization are as follows:

Curriculum Requirements		***TCH***
General Education:	ENGL 1301, 1302, Perspectives and Cultural Formations courses.	21
Mathematics:	MATH 1337, 1338, 2339, 2343, STAT 4340.	15
Sciences:	BIOL 1401, 1402, 3304, 3350; CHEM 1303, 1113, 1304, 1114, 3371, 3117, 3372, 3118; PHYS 1403, 1404.	38
Mechanical Engineering:	ME 1202, 1102, 1305, 2310, 2320, 2331, 2131, 2340, 2140, 2342, 2142, 3332, 3132, 3340, 3370, 4338, 4370, 4380, 4381, and 5322.	49
Advanced Major Elective:	ME 5332 or any 3000 level or higher ME course.	3
Leadership Elective:	Select one from EMIS 3308, EMIS 3309, ENCE 3302, or CSE 4360.	3
Wellness I and II:		2
Minimum total hours required		131

Any deviation from the ME curriculum requires approval of a petition submitted by the student to the ME faculty prior to the beginning of the term during which the student expects to complete the requirements for graduation.

Minor in Mechanical Engineering

For approval of a minor in Mechanical Engineering, the student should consult the department. A total of 15 semester hours in mechanical engineering courses is required. For example, a choice of five of the following courses represents a minor that provides a broad introduction to mechanical engineering.

ME 1202 and **1102** Introduction to Engineering
ME 2310 Statics
ME 2320 Dynamics
ME 2331 Thermodynamics
ME 2340 Mechanics of Deformable Bodies
ME 2342 Fluid Mechanics
ME 3340 Engineering Materials
ME 3370 Manufacturing Processes

Based on the student's interests and background, other sets of mechanical engineering courses may be substituted with the approval of the department.

The Courses (ME)

1102. Introduction to Engineering Lab. Companion laboratory to ME 1202; introduction to machine shop operations; mechanical measurements; basic research skills; the design process including group projects. *Corequisite* ME 1202

1202. Introduction to Engineering. Introduction to mechanical engineering and the engineering profession; the design process; sketching; forces in structures and fluids; conservation laws and thermal systems; motion of machinery. *Corequisite* ME 1102.

1301. Machines and Society. Introduces engineering systems to non-engineering students. The course is divided into four parts: 1) What is engineering, and what do engineers do? In particular, what do mechanical engineers do? Historical perspective on engineering design, principles of design engineering, and energy conversion processes. 2) Engineered products. What do mechanical engineers produce? The basic principles of converting science to technology. 3) The development of technology for society and humanity. 4) The laboratory and workshop experience, including computer animation and simulation.

1303. Energy, Technology, and the Environment. An elementary introduction to how energy is produced and distributed, energy resources, electrical power, heating and cooling, solar energy applications, and other topics related to people and the environment.

1305. Information Technology and Society. A comprehensive survey of information technologies and the growing interconnectivity between them as currently utilized throughout society. Students will acquire portable IT skills in the use of word processing, spreadsheets, presentation tools, graphics applications, and the Internet that will prepare them for success in the workplace and beyond. Issues surrounding IT will be discussed, including history, ethics, legal questions, use in producing and maintaining a competitive advantage, effects on society, and associated costs and benefits.

2131. Thermodynamics Laboratory. One three-hour laboratory session per week. Basic thermal-property and power-device measurements to complement lecture material of ME 2331. *Prerequisite or corequisite:* ME 2331.

2140. Mechanics of Materials Laboratory. Experiments in mechanics of deformable bodies, to complement ME 2340. Simple tension tests on structural materials, simple shear tests on riveted joints, stress and strain measurements, engineering and true stress, engineering and true strain, torsion testing of cylinders, bending of simple supported beams, deflection of simply supported beams, buckling of columns, strain measurements of pressure vessels, Charpy Impact tests, effect of stress concentrators. *Prerequisite or corequisite:* ME 2340.

2142. Fluid Mechanics Laboratory. One three-hour laboratory session per week. Credit: 1. Experiments in fluid friction, pumps, boundary layers, and other flow devices to complement lecture material of ME 2342. *Prerequisite or corequisite:* ME 2342.

2310. Statics. Equilibrium of force systems; computations of reactions and internal forces; determinations of centroids and moments of inertia; introduction to vector mechanics. *Prerequisite:* MATH 1337 or equivalent.

2320. Dynamics. Introduction to kinematics and dynamics of particles and rigid bodies; Newton's laws, kinetic and potential energy, linear and angular momentum, work, impulse, and inertia properties. *Prerequisite:* ME 2310 or equivalent.

2331. Thermodynamics. The first and second laws of thermodynamics and thermodynamic properties of ideal gases, pure substances, and gaseous mixtures are applied to power production and refrigeration cycles. *Prerequisite:* CHEM 1303, ME 2310, MATH 2339.

2340. Mechanics of Deformable Bodies. Introduction to analysis of deformable bodies including stress, strain, stress-strain relations, torsion, beam bending and shearing stresses, stress transformations, beam deflections, statically indeterminate problems, energy methods, and column buckling. *Prerequisite:* ME 2310.

2342. Fluid Mechanics. Fluid statics, fluid motion, systems and control volumes, basic laws, irrotational flow, similitude and dimensional analysis, incompressible viscous flow, boundary layer theory, and an introduction to compressible flow. *Prerequisites:* MATH 2339, ME 2310, Phys 1303; *Corequisite:* Math 2343.

3132. Heat Transfer Laboratory. One three-hour laboratory session per week. Experiments in conduction, convection, and radiation to complement lecture material of ME 3332 – Heat and Mass Transfer. *Prerequisite or corequisite:* ME 3332.

3332. Heat and Mass Transfer. Fundamental principles of heat transmission by conduction, convection, and radiation; mass transfer; and application of these principles to the solution of engineering problems. *Prerequisite:* ME 2331, ME 2342.

3340. Engineering Materials. A study of the fundamental factors influencing the structure and properties of structural materials, including metals, polymers, and ceramic. Phase diagrams, heat treatment, metallography, mechanical behavior, atomic bonding, and corrosion are covered in lecture and laboratory. *Prerequisite:* CHEM 1303 or equivalent.

3341. Intermediate Thermal Sciences. Application of the laws of thermodynamics, availability, irreversibility, real gases and mixtures, generalized thermodynamics relations and charts, and chemical equilibrium. *Prerequisite:* ME 2331.

3350. Structural Analysis. Emphasis on the classical methods of analysis of statically determinate and indeterminate structural systems. Computation of reactions, shears, moments, and deflections of beams, trusses, and frames. Use of computers as an analytical tool. *Prerequisites*: ME 2340/2140.

3370. Manufacturing Processes. A comprehensive, balanced, and up-to-date coverage of the relevant fundamentals and real-world applications of manufacturing processes (casting, forming, machining, laser beam machining, electrical discharge machining, abrasive waterjet machining, etc.). Rapid prototyping is included in this course as well. The lab portion consists of experiments intended to introduce students to the basics of manufacturing processes through hands-on work on a set of projects designed for such purpose. The lab work is intended to familiarize the students with the general tools used in a manufacturing environment and also to reinforce the learning of the lecture material. *Prerequisite:* ME 3340.

3390 (CFA 3390) German Technoculture. Fundamentals of German contemporary culture within the context of technology and study abroad experience. Emphasis is placed on communication skills. Field trips are an integral part of the course..

4090. Senior Project.

4160. Control Laboratory. Experiments in control engineering. Digital and analog simulation of feedback control systems. Actuator saturation. Design and implementation of simple control systems on various laboratory equipment. *Prerequisite or corequisite:* ME 4360.

4338. Thermal Systems Design. Thermal systems designs are prepared, presented, and critiqued. Associated problems of simulation, optimization, and economics are solved. Solving problems and design with a thermal network analyzer is included. *Prerequisites:* ME 3332.

4350. Structural Design. Study of strength, behavior and design of steel structures and reinforced concrete structures: members subjected to flexure, shear, and axial loads. *Prerequisites*: ME 3350 Structural Analysis.

4351. Ethical Decision-Making in Applied Science and Engineering Technology. Ethical issues, hard choices, and human failures in notorious, historical cases such as the Space Shuttle *Challenger*, Grand Teton Dam, and Union Carbide-Bhopal disasters. Principles, methods, and bases for ethical decision-making and action. Application of classical ethical philosophy to hypothetical, modern problems and dilemmas in the business of control and implementation of technology.

4360. Design and Control of Mechanical Systems. Block modeling of mechanical systems. Mathematical models of linear systems. Solution of differential equations by use of Laplace transforms. Feedback control systems, time domain analysis, stability, frequency response, and root locus plots, Bode diagrams, performance criteria, and system compensation. Design of control systems for mechanical systems. *Prerequisite:* ME 5322 or equivalent.

4370. Elements of Mechanical Design. Application of the principles of mechanics and physical properties of materials to the proportioning of machine elements, including consideration of fatigue, functioning, productivity, and economic factors. Computer applications. *Prerequisite:* ME 2340, ME 3370.

4380. Mechanical Engineering Design I. A study of design methodology and development of professional project-oriented skills including communication, team management, creative problem solving, interpersonal management, and leadership skills. Team-project activities are used to apply project-oriented skills to solution of design problems. Nontechnical considerations in design, including patents, ethics, aesthetics, safety, and economics are investigated. *Prerequisite or corequisite:* ME 3370.

4381. Mechanical Engineering Design II. Student design teams have full responsibility for conducting a full term design project for an industrial client. Periodic design reports and design reviews are presented to, and critiqued by, the industrial client, the faculty, and the design team. *Prerequisite or corequisite:* ME 4370. *Prerequisite:* ME 4380.

5050. Undergraduate Internship. Components: Internship.

5302 (EE 5362). Linear Systems Analysis. The course will introduce students to the topics within the domain of modern control theory. Special emphasis will be placed on the application of the developed concepts in designing linear systems and casting their responses in prescribed forms. Topics covered include state representation of linear systems, controllability, observability, and minimal representation, linear state variable feedback, observers, and quadratic regulator theory. *Prerequisite:* ME 4360/EE 3370.

5319. Advanced Mechanical Behavior of Materials. A senior-graduate course that relates mechanical behavior on a macro and microscopic level to design. Topics include: macroscopic elasticity and plasticity, viscoelasticity, yielding, yield surfaces, work hardening, geometric dislocation theory, creep, temperature-dependent and environment-dependent mechanical properties *Prerequisites:* ME 2340 and ME 3340.

5320. Intermediate Dynamics. Kinematics and dynamics of particles and rigid bodies: kinematics, inertia properties, Kane's dynamical equations, Euler's equations of motion, D'Alembert's principle, Lagrange's equations of motion. Use of Autolev, a symbol manipulation program for dynamics. *Prerequisite:* ME 2320, MATH 2339, MATH 2343.

5321. Failure Analysis. A senior-graduate course in the evaluation of the failure of structural materials and components. Topics include: site examination, macroscopic examination, optical microscopy, transmission electron and SEM interpretation, examination and interpretation of failure surfaces, failure modes, causes of failure. *Prerequisites:* ME 3340.

5322. Vibrations. Fundamentals of vibrations with application of simple machine and structural members. Harmonic motion, free and forced vibration, resonance, damping, isolation, and transmissibility. Single, multiple, and infinite degree-of-freedom systems. *Prerequisites:* ME 2320 and MATH 2343 or equivalent.

5323. Introduction to Fracture Mechanics. Linear elastic fracture mechanics, application of theory to design and evaluation of critical components: elastic stress intensity calculations, plane strain fracture toughness, plane stress and transitional behavior, crack opening displacements, fracture resistance, fatigue crack propagation, transition temperature approach to fracture control, microstructure of fracture, and fracture control programs. *Prerequisite:* ME 2340.

5324. Fatigue Theory and Design. A senior-graduate course. Includes continuum, statistical, and fracture mechanics treatments of fatigue, stress concentrators, planning and analysis of probit, SNP and response tests, mechanisms of fatigue design, fail safe vs. safe life design, crack propagation. Emphasizes engineering design aspects of fatigue rather than theoretical mechanisms. *Prerequisite:* ME 3340.

5326. Vehicle Dynamics. Modeling of wheeled vehicles to predict performance, handling, and ride. Effects of vehicle center of mass, tire-characteristic traction and slip, engine characteristics, and gear ratios of performance. Suspension design and steady-state handling models of four-wheeled vehicles and car-trailer systems to determine oversteer and understeer characteristics, critical speeds, and stability. Multi-degree-of-freedom ride models including tire and suspension compliance. Computer animation and simulations. *Prerequisite:* ME 2320 or consent of instructor.

5330. Heat Transfer. Application of the principles of conduction, convection, and radiation heat transfer. Steady and unsteady state, special configurations, numerical and analytical solutions, and design are topics included. *Prerequisite:* ME 3332 or equivalent.

5331. Advanced Thermodynamics. Laws of thermodynamics, availability, irreversibility, real gases and mixtures, thermodynamic relations and generalized charts, combustion, chemical and phase equilibrium, and computational combustion. *Prerequisites:* ME 2331 or equivalent.

5332. Heat Transfer in Biomedical Sciences. Fundamentals of heat transfer in medicine and biology. Biothermal properties. Thermal regulation processes. Biomedical heat transfer processes with applications in tissue laser radiation, freezing and thawing of biological materials, cryosurgery, and others. *Prerequisite:* ME 2342, ME 3332 or consent of instructor.

5333. Transport Phenomena in Porous Media. Fractals and their role in characterizing complex structures. Fundamental concepts of momentum, heat, and mass transport through heterogeneous (e.g., composites, porous) materials. Emphasis is placed on the mathematical modeling of heat and mass transfer in heterogeneous and fully saturated systems. Relevant industrial and natural applications are presented throughout the course. *Prerequisite:* ME 2342, ME 3332 or consent of instructor.

5336 (MATH 5336). Intermediate Fluid Dynamics. Review of fundamental concepts of undergraduate fluid mechanics and introduction to advanced fluid dynamics, including irrotational flow, tensore notation, and the Navier-Stokes equations. *Prerequisite:* ME 2342 or equivalent.

5337. Introduction to Computational Fluid Dynamics: Fundamentals of Finite Difference Methods. Concepts of stability, convergence, accuracy, and consistency. Applications to linear and nonlinear model partial differential equations. Curvilinear grid generation. Advanced topics in grid generation. Beam and Warming factored implicit technique. MacCormack techniques. Solution methods for the Reynolds equation of lubrication, the boundary layer equations, and the Navier-Stokes equations. *Prerequisites:* ME 2342 (or equivalent), and MATH 2343 (or equivalent), or consent of instructor.

5340. Introduction to Solid Mechanics. Three-dimensional stress and strain, failure theories, introduction to two-dimensional elasticity, torsion of prismatic members, beams on elastic foundation, plates and shells, and energy methods. *Prerequisites*: ME 2340 and MATH 2343.

5341. Structural Properties of Solids. Designed to develop an understanding of the structural aspect of solids and their relationship to properties and applications. Topics include structural defects, bonding and crystal structure, solid state reactions and phase transformations, degradation, and deformation. *Prerequisite:* ME 3340 or consent of instructor.

5342. Mechanical Engineering Aspects of Electronic Packaging. Thermal and mechanical design of electronic packaging to include fundamentals of fluid flow, heat transfer, modern cooling technologies, and thermal management; mechanical designs including stress and vibrations covered through industrial applications; coupled thermal and mechanical problems; systems including selection of cooling methods and hardware important to good design; design of equipment that operates in severe vibration environments developed using classical methods.

5343. Electronic Packaging Materials: Processes, Properties, and Testing. Intends to provide an overview of materials for electronic packaging. Examines solderability, microscopic processes, and alloy selection. Looks at composites and ways to apply conducting polymer-matrix composites, metal films, and vacuum processes. The importance of encapsulation, temperature humidity bias testing, and temperature cycle testing will be covered. Measurement of properties of materials in electronic packaging, thermal properties, physical properties and manufacturing properties and materials selection will also be covered.

5350. Design for Manufacturability and Concurrent Engineering. The advantages of involving both manufacturing and engineering into the early design of products and processes effectively, and cost determination and assessment of processing alternatives at the early design/manufacturing interface. Designing for manufacturing processing and factory capabilities as a function of quality, price, performance, and productivity will be examined with emphasis on parts and process simplification, alternative methods, anticipated volumes, and automated assembly.

5351. Computer-Integrated Manufacturing Systems. Imparts the basic concepts and use of computer-integrated manufacturing. Topics include integration techniques for manufacturing islands of automation; process planning and the production process life cycle in relation to automated control systems; process design techniques for shop-floor control of multiple interacting processes; distributed network process control; real-time aspects; interface protocols and languages of shop-floor machinery; computational and data processing techniques for planning, design, production, and shipping; and methods of optimizing output quality, price, and productivity. Economic justification and the use of artificial intelligence with respect to planning and process control will be examined.

5352. Modern Manufacturing Methods and Systems. Highly successful manufacturing methods and systems will be examined. Topics include the evolution of manufacturing technology in the United States, mass manufacturing, integrated manufacturing, distribution and manufacturing automation, just-in-time systems, continuous improvement, Kaizen, poka yoke, and total quality management. Modern Japanese manufacturing techniques will be examined in depth. The underlying concepts and strategic benefits of flexibility, agility, time-based competition, and global manufacturing operation will be covered. The course will be presented from the perspective of the manufacturing manager.

5353. Manufacturing Management Practices. New organizational structures, paradigms, and leadership styles. Problem solving within the business context: manufacturing strategies for optimizing production processes across the enterprise. Measuring and reporting business performance. Investment decision making under conditions of risk and uncertainty. Intellectual property strategies, products liability and the legal environment. Contemporary practices, including self-directed work forces, competitive assessment, total productive maintenance, managerial and activity-based costing, and other topics.

5354. Total Quality Management in Manufacturing. An overall total quality management perspective for the design of quality management systems. Metrics for cycle time and defects, baselining and benchmarking, and House of Quality approaches are examined. Managing product quality from inception to deployment. Topics include acquiring and stabilizing new production processes, data collection and analysis for improvement, and decision making. Purchasing, process control, and reliability are covered in detail. Taguchi and poka-yoke and other practices are examined as tools for implementing TQM.

5355. Integrated Design and Manufacturing. Industrial performance is strongly correlated to success in integrating design and manufacturing. The interrelationships between the total product realization cycle, product generation, and manufacturing are examined with the objective of improving industrial performance.

5356. Human Factors in Design and Manufacturing. A senior-graduate course dealing with human factors or ergonomics relating to designing for human use. The lectures cover the empirical and analytic aspects of design and manufacturing as affected by the need to accommodate human use and abilities. Included are topics on visual displays of static and dynamic information, text, graphics, symbols, codes, auditory tactual and olfactory displays, speech and nonverbal communications, physical work/materials handling, motor skills, and hand tool devices and controls. Workplace design, anthropometry, component arrangement in space, lighting, sound, climate, and motion will be covered. *Prerequisite:* Senior or graduate standing, or permission of instructor. *Recommended:* Understanding of simple statistical analysis.

5357. Optimized Mechanical Design. Principles and methods for optimal design of machine elements (springs, shafts, gears, weldments of joints, etc.) and mechanical systems (transmissions, cam systems, inertia loads and balancing, etc.). Computer applications. *Prerequisite:* ME 4370 or equivalent.

5358. Design of Electronic Packaging. Thermal and mechanical design of electronic packaging. Fundamentals of heat transfer and fluid flow are applied to electronic packages and systems, including selection of fans, heat sinks, and other hardware important to good design. Mechanical designs of equipment that operates in more severe shock and vibration environments are developed using classical methods, with consideration given to selecting appropriate hardware. *Prerequisites:* ME 2340 and 3332, or permission of instructor.

5359. Analysis and Design of Optoelectronic Packaging. Provides an overview of optical fiber interconnections in telephone networks, packaging for high-density optical back planes, selection of fiber technologies; semiconductor laser and optical amplifier packaging, optical characteristics and requirements, electrical properties, mechanical properties, waveguide technologies, optical alignment and packaging approaches, passive device fabrication and packaging, array device packaging; hybrid technology for optoelectronic packaging, and flip-chip assembly for smart pixel arrays. *Prerequisites:* ME 5342 and 5343.

5360. Electronic Product Design and Reliability. Provides a complete description of the fundamentals of the design process for electronic products. Covers the obtaining of the voice of the customer through processes such as Quality Function Deployment. Analyzes the process of conceptual design. Carries the concept through the parametric and tolerance analysis. The design review process will be discussed as well as a review of the use of CAD tools for schematic capture and PWB layout. Reviews the use of modern tools for the maintenance of design documentation, the process of product realization through prototypes, manufacturing trials, and the introduction into high volume manufacturing. The impact of design choices on product quality and reliability will be discussed in detail as will the prediction and measurement of product lifetimes. *Prerequisites:* ME 5342 and ME 5343.

5361. Matrix Structural Analysis. A systematic approach to formulation of force and displacement method of analysis; representation of structures as assemblages of elements; computer solution of structural systems. *Prerequisite:* ME 4350 or equivalent.

5362. Engineering Analysis with Numerical Methods. Application of numerical and approximate methods in solving a variety of engineering problems. Examples include: equilibrium, buckling, vibration, fluid mechanics, thermal science, and surveying problems. *Prerequisite:* Senior standing.

5363. Electronic Manufacturing Technology. Covers the complete field of electronics manufacturing. Topics include an introduction to the electronics industry, electronic components, the theory and methods of manufacture of solid state devices, packaging techniques such as wire bonding flip chip and TAB, printed wiring board, soldering and solderability, leaded and surface mounted components, electromagnetic interference, electrostatic discharge prevention, testability and electronic stress screening. In each area, the current technology, as well as leading edge tools are discussed. *Prerequisites:* ME 5342 and ME 5343 or permission of instructor.

5364. Introduction to Structural Dynamics. Dynamic responses of structures and behavior of structural components to dynamic loads and foundation excitations; single- and multi-degree-of-freedom systems response and its applications to analysis of framed structures; introduction to systems with distributed mass and flexibility. *Prerequisites:* MATH 2343.

5365. Strategies for Manufacturing Firms. Examines the development and implementation of strategies for product design and manufacturing that best supports the overall strategy of the firm. Topics include positioning the product and production system in the industry, location and capacity decision, implementing manufacturing technologies, facilities planning, vertical integration, logistics planning, and organizational culture. Case studies of manufacturing firms are used extensively.

5366. Manufacturing in a Global Era. Examines goals and strategies for manufacturing operations in the multinational environment. Topics include decision making for decentralizing and setting up foreign manufacturing operations, marketing, sales and distribution strategies, R&D support, location and capacity decisions, implementing new manufacturing technologies, facilities planning and modernizations, vertical integration, outsourcing strategies, logistics planning and organizational cultures. Case studies of manufacturing firms are used.

5368. Project and Risk Management. Focuses on specific concepts, techniques, and tools for managing projects successfully. Network planning techniques, resource allocation, models for multi-project scheduling, methods of controlling costs, determining schedules and performance parameters. The basics of risk management including hard analysis, risk analysis, risk control, and risk financing are covered. The focus of the course is to integrate risk assessment with managerial decision making. Examples and case studies are emphasized.

5369. Managing Technology and Innovation. In the face of rapid technological growth and innovation, a disciplined management approach is necessary to assure a reasonable expectation of success. The course examines the factors of proper selection, justification, and implementation of new technologies within the framework of consumer electronics, advanced materials, and emerging information capabilities, expert systems and machine tool industry. Topics include technological forecasting risk and uncertainty, and project management.

5371. Gas Dynamics and Design of Propulsion Systems. One-dimensional compressible flow, linearized two-dimensional flow method of characteristics, and oblique shocks. Design of air-breathing propulsion systems components: inlets, nozzles, compressors, turbines, and combustors. Interactions with the external flow. *Prerequisites:* ME 2342 and 3341.

5372. Introduction to CAD. Introduction to mechanical computer aided design. Survey of technical topics related to computer-aided design and computer-aided manufacturing. Emphasis on the use of interactive computer graphics in modeling, drafting, assembly, and analysis. Extensive hands-on use of Pro/Engineer, a state-of-the-art computer aided design system. *Prerequisites:* Junior standing or consent of instructor.

5376. Robotics – Introduction to Computer-Aided Manufacturing. Introduction to industrial robotics and numerically controlled machines. Economics of CAM. Applications or robotics in industry. Robot safety. Addition of senses and intelligence. Research in CAM Flexible manufacturing cells and systems. Hands-on laboratory work with industrial robots and NC machines. Independent study and report on a specific robot application. *Prerequisites:* CSE 1341, PHYS 1403, and MATH 2343 or equivalent.

5383. Heating, Ventilating, and Air Conditioning. Selection and design of basic refrigeration, air conditioning, and heating systems are treated. Load calculations, psychometrics, cooling coils, cooling towers, cryogenics, solar energy applications, and special topics are included. *Prerequisites:* ME 2331 and 3332.

5386. Convection Heat Transfer. Advanced topics in forced convection heat transfer using analytical methods and boundary-layer analysis. Laminar and turbulent flow inside smooth tubes and over external surfaces. Convection processes in high-speed flows. *Prerequisite:* ME 3332 or equivalent.

5(1-4)90. Undergraduate Seminar. An opportunity for the advanced undergraduate student to undertake independent investigation, design, and development. The project, and the supervising faculty, must be approved by the chairman of the department in which the student expects to receive the degree. Variable credit of one to four term hours.

5(1-4)9(1-5). Special Projects. Intensive study of a particular subject or design project not available in regular course offerings and under the supervision of a faculty member approved by the department chair. Variable credit of one to four term hours.

CENTER FOR SPECIAL STUDIES

The Special Studies designation is used to accommodate academic programs and courses that do not typically fit within the departments of the School of Engineering. Included under this section are courses designed to enable students who are not concentrating in engineering or applied science to learn about the characteristics, capabilities, and limitations of modern technology. Understanding of the machines and technical systems upon which contemporary society depends is of importance to students planning careers in business or the professions, or in the public sector.

The Courses (SS)

1099, 2099, 3099, 4099, 5099. Engineering Co-op Workterm. Each of these courses represents a term of industrial work activity in connection with the Engineering Cooperative Program. The courses are taken in numerical sequence and carry no credit. Students register for these courses in the same manner as other SMU courses except that no tuition is charged. Each course grade is determined by a written report by the student and from the scoring of the employer's evaluation form.

1101. Engineering and Beyond. This one-hour course is designed to assist first-year students in making an informed decision about their choice of major. Students experience each engineering department and the degrees offered through real-world examples of engineering.

3300. Technology and Public Policy. In this course, the effects of technology and public policy are studied by examining issues that involve business, engineering, social sciences, and international relations. Selected technological areas such as communications, energy, computers, and transportation are explored in detail to identify the problems that government and other institutions attempt to solve.

RESERVE OFFICERS' TRAINING CORPS

Air Force. Air Force ROTC courses are not offered on the SMU campus. SMU students who wish to earn appointments as commissioned officers in the U.S. Air Force may participate in the Air Force general military course and professional officer course through the University of North Texas in Denton (UNT). Students who participate in the UNT Air Force ROTC program are responsible for their own travel and other physical arrangements. The Air Force ROTC program develops skills and provides education vital to the career officer. Active-duty Air Force personnel provide all instruction and program administration.

The program is open to all students. First-year students may enroll in the four-year program, and students with at least two undergraduate or graduate academic years remaining may apply for the two- or three-year program. Students who complete their program with at least a Bachelor's degree will be awarded commissions as U.S. Air Force officers.

Scholarships, available to qualified students in both four-year and two-year programs, provide full tuition, fees, textbook allowance, and a monthly tax-free $100 subsistence allowance. National competition is based on SAT or ACT results, Air Force Officer Qualifying Test results or college academic record, and extracurricular and athletic activities. Uniforms and textbooks for AFROTC courses are issued at no cost to cadets. Students with at least six months' active military service may be granted waivers on a portion of the general military course.

UNT's Air Force ROTC courses are described under "Aerospace Studies" in the Dedman College section of this catalog. Further program information and application procedures may be obtained by contacting AFROTC-Det 835, P.O. Box 305400, , Denton TX 76203-5400; 940-565-2074; afrotc@unt.edu.

Army. Army ROTC courses are not offered on the SMU campus. Students can participate in the Army ROTC program at the University of Texas at Arlington by enrolling as they enroll for other SMU courses. Further program information and application procedures may be obtained by contacting UTA Department of Military Science at 817-272-2248. Students who participate in the UTA Army ROTC program are responsible for their own travel and other physical arrangements.

Army ROTC offers students the opportunity to graduate as officers and serve in the U.S. Army, the Army National Guard, or the U.S. Army Reserve. Army ROTC scholarships are awarded on a competitive basis. Each scholarship pays for tuition and required educational fees and provides a specified amount for textbooks, supplies, and equipment. Each scholarship also includes a subsistence allowance of up to $1,000 for every year the scholarship is in effect.

Students can participate in the Army ROTC on-campus program by enrolling as they enroll for other SMU courses. Army ROTC courses are listed under ROTC in the Schedule of Classes and permission to enroll must be obtained from Lisobel Bernal at Lbernal@engr.smu.edu or 214-768-3039.

ADMINISTRATION AND FACULTY

CORPORATE OFFICERS OF THE UNIVERSITY

R. Gerald Turner, *President*
Thomas E. Barry, *Vice President for Executive Affairs*
S. Leon Bennett, *General Counsel, Vice President for Legal Affairs and Government Relations, and Secretary*
James E. Caswell, *Vice President for Student Affairs*
Brad E. Cheves, *Vice President for Development and External Affairs*
Dana Gibson, *Vice President for Business and Finance*
Thomas W. Tunks, *Interim Provost and Vice President for Academic Affairs*
Elizabeth C. Williams, *University Treasurer*

ACADEMIC DEANS

John B. Attanasio, *Dean of Dedman School of Law and William Hawley Atwell Chair in Constitutional Law*
José Antonio Bowen, *Dean of Meadows School of the Arts*
Caroline Brettell, *Interim Dean of Dedman College*
William B. Lawrence, *Dean of Perkins School of Theology*
Gillian M. McCombs, *Dean and Director of Central University Libraries*
Albert W. Niemi Jr., *Dean of the Cox School of Business and Tolleson Distinguished Professor of Business Leadership and Economics*
Geoffrey C. Orsak, *Dean of the School of Engineering*
Robert A. Patterson, *Dean of School of Education and Human Development*
R. Hal Williams, *Dean of Research and Graduate Studies*

OFFICE OF THE PRESIDENT

Dexter Burger, *Director of Internal Audit*
Steve Orsini, *Director of Athletics*
Mary Jane Johnson, *Executive Assistant to the President*
Beth Wilson, *Executive Assistant to the President and Director of Institutional Access and Equity*

OFFICE OF THE PROVOST AND VICE PRESIDENT FOR ACADEMIC AFFAIRS

Ellen Jackofsky, *Associate Provost for Faculty and Administrative Affairs*
Ellen Pryor, *Associate Provost for Honors and International Programs*
John A. Hall, *University Registrar and Executive Director of Enrollment Services*
John Kalb, *Director of Institutional Research*
Ron Moss, *Dean of Undergraduate Admissions and Executive Director of Enrollment Services*
Marc Peterson, *Director of Financial Aid and Executive Director of Enrollment Services*
Pat Woods, *University Bursar and Executive Director of Enrollment Services*

OFFICE OF THE VICE PRESIDENT FOR BUSINESS AND FINANCE

George Chrisman, *Associate Vice President for Information Technology Services*
Bill Detwiler, *Associate Vice President for Human Resources and Business Services*
James E. Koons, *Associate Vice President for Campus Planning and Plant Operations*
John O'Connor, *Associate Vice President and Controller*
Randall Powell, *Associate Vice President for Budget Information and Technology Services*

OFFICE OF THE VICE PRESIDENT FOR DEVELOPMENT AND EXTERNAL AFFAIRS

Patricia Ann LaSalle, *Associate Vice President and Executive Director of Public Affairs*
Mark Peterson, *Associate Vice President for Development and Alumni Affairs*
Robert A. Bucker, *Assistant Vice President for Development and Special Projects*
Lisa Chou, *Assistant Vice President for Development Initiatives*
Martha Coniglio, *Assistant Vice President for University Events*
Marianne Piepenburg, *Assistant Vice President for Individual and Planned Giving*
Jill Stephenson, *Assistant Vice President for Alumni Relations*

OFFICE OF THE VICE PRESIDENT FOR LEGAL AFFAIRS AND GOVERNMENT RELATIONS

Mary Anne Rogers, *Executive Assistant to the General Counsel and Associate University Secretary*
Basil H. Thomson, *Associate General Counsel*
Carol B. Weber, *Associate University Counsel*

OFFICE OF THE VICE PRESIDENT FOR STUDENT AFFAIRS

Judith Banes, *Director of Recreational Sports*
William M. Finnin Jr., *Chaplain to the University*
Peter Gifford, *Director of the Wellness Program*
Doug Hallenbeck, *Director of Residence Life and Student Housing*
Patrick Hite, *Director of the Memorial Health Center*
Dee Siscoe, *Dean of Student Life and Associate Vice President for Student Affairs*

OFFICES OF THE ACADEMIC DEANS

Dedman College

Dennis D. Cordell, *Associate Vice Provost for General Education*
Jennifer Hayden, *Associate Dean of Student Records*
Kathy J. Hayes, *Associate Dean for Academic Affairs*
Kathleen Hugley-Cook, *Associate Dean for Student Affairs*
J. Randy Phillips, *Associate Dean for Administration*

Cox School of Business

William R. Dillon, *Senior Associate Dean for Academic Affairs*
Marcia Armstrong, *Associate Dean for Graduate Programs*
Elbert B. Greynolds, *Associate Dean for Undergraduate Programs*
Frank R. Lloyd, *Associate Dean for Executive Education*
Catherine Collins, *Assistant Dean for Administration and Finance*
Kevin Knox, *Assistant Dean for External Relations*

Education and Lifelong Learning

Kathy Hargrove, *Associate Dean and Director of Center for Teacher Education*
Rebecca Hood, *Assistant Dean and Director of Summer Studies*
Kathi Watts, *Director of Evening Studies*
Amy Heitzman, *Director of Continuing Studies*

Meadows School of the Arts

Kevin Paul Hofeditz, *Associate Dean for Student Affairs*
P. Gregory Warden, *Associate Dean for Academic Affairs*

School of Engineering

Jim Dunham, *Associate Dean for Academic Affairs*
Kathy M. Hubbard, *Senior Director, Undergraduate Student Experience and Enrollment Management*
Leo Pucacco, *Assistant Dean for Undergraduate Studies, Director of Undergraduate Advising*
Tammy L. Richards, *Assistant Dean, Operations, Enrollment, Marketing and Communications*

Dedman School of Law

Roy R. Anderson, *Senior Associate Dean for Academics*
Maureen N. Armour, *Associate Dean for Clinical Education*
Gail M. Daly, *Associate Dean for Library and Technology, Director of Underwood Law Library*
William A. DeLoach III, *Associate Dean for Student Affairs*
Christine Szaj, *Associate Dean for Administration*
Virginia M. Keehan, *Assistant Dean of Admissions*
Kelly Noblin, *Assistant Dean for Career Services*

Perkins School of Theology

Duane Harbin, *Assistant Dean for Information Technology and Institutional Research*
Marjorie Procter-Smith, *Associate Dean for Academic Affairs*
Scott Somers, *Assistant Dean for Development and External Relations*

Research and Graduate Studies

Barbara Phillips, *Assistant Dean for Graduate Studies*
Larry Smith, *Director of Research Administration and Technology Management*

DEDMAN COLLEGE

ADMINISTRATION

Dennis D. Cordell, Ph.D., *Associate Vice Provost for General Education*
Kathy J. Hayes, Ph.D., *Associate Dean for Academic Affairs*
Kathleen Hugley-Cook, Ph.D., *Associate Dean for Student Affairs*
Jennifer Haden, Ph.D., *Associate Dean for Student Records*
J. Randy Phillips, M.B.A., *Associate Dean for Administration*
Rick Fethke, B.B.A., *Financial Officer*

FACULTY

Gwendoline Aaron, *Lecturer of French,* M.A., Université de Liège, Belgium
Dalia AbdelHady, *Assistant Professor of Sociology,* Ph.D., New York (Albany)
Jeremy Du Quesnay Adams, *Professor of History,* Ph.D., Harvard
Michael A. Adler, *Associate Professor of Anthropology*, Ph.D., Michigan
Lisa Chang Ahnert, *Senior Lecturer in Chinese,* M.A., Oberlin College
Vladimir Ajaev, *Assistant Professor of Mathematics,* Ph.D., Northwestern
David Aldstadt, *Assistant Professor of French,* Ph.D., Ohio
Brandy Alvarez, *Lecturer of Italian*, M.A., Yale
Pedro Amaral, *Assistant Professor of Economics,* Ph.D., Minnesota
Sabri Ates, *Assistant Professor of History*, Ph.D., New York University
Bruce Ayati, *Assistant Professor of Mathematics,* Ph.D., Chicago
Helen Babbili, *Lecturer of Chemistry,* M.S., Kakatiya University, India
Peter J. Bakewell, *Edmund and Louise Kahn Professor of History,* Ph.D., Cambridge
Nathan S. Balke, *Professor of Economics,* Ph.D., Northwestern
Roberta Ballarin, *Assistant Professor of Philosophy,* Ph.D., UCLA
Manju Bansal, *Adjunct Lecturer of Hindi,* M.A., Kanpur
G. William Barnard, *Associate Professor of Religious Studies,* Ph.D., Chicago
Eric Barnes, *Associate Professor of Philosophy,* Ph.D., Indiana
Scott Bartlett, *Adjunct Assistant Professor of Philosophy,* Ph.D., SIU Illinois
Raveendra N. Batra, *Professor of Economics,* Ph.D., Southern Illinois
William Edward Beauchamp, *Associate Professor of French,* Ph.D., Columbia
Steven C. Bergman, *Research Associate Professor of Geological Sciences,* Ph.D., Princeton
Denis Bettaver, *Lecturer of French*, M.A., Texas (Arlington)
Edward Robert Biehl, *Professor of Chemistry,* Ph.D., Pittsburgh
Gordon Eastridge Birrell, *Associate Professor of German,* Ph.D., Stanford
David D. Blackwell, *Hamilton Professor of Geological Sciences,* Ph.D., Harvard
Damiano Bonuomo, *Lecturer of Italian*, M.A., Florida
Suzanne Bost, *Assistant Professor of English,* Ph.D., Vanderbilt
Richard Bozorth, *Associate Professor of English,* Ph.D., Virginia
Jacqueline Bradley, *Lecturer of English,* M.A., SMU
Teresa Brentegani, *Lecturer of Italian,* B.A., University of Milan
Caroline Brettell, *Dedman Family Distinguished Professor of Anthropology,* Ph.D., Brown
Alan S. Brown, *Professor of Psychology,* Ph.D., Northwestern
Christine E. Buchanan, *Professor of Biological Sciences,* Ph.D., Chicago
Paola Buckley, *Lecturer of French,* M.D., Maryland
Matthew Burstein, *Lecturer of Philosophy,* Ph.D., Georgetown
John D. Buynak, *Professor of Chemistry,* Ph.D., Rice
Josephine Caldwell-Ryan, *Lecturer of Women's Studies,* Ph.D., SMU
Jing Cao, *Assistant Professor of Statistical Science,* Ph.D., Missouri
Thomas W. Carr, *Associate Professor of Mathematics,* Ph.D., Northwestern

Bradley Kent Carter, *Associate Professor of Political Science,* Ph.D., California (Berkeley)
Carolyn E. Channell, *Senior Lecturer of English,* M.A., Case Western Reserve
Mark A. Chancey, *Assistant Professor of Religious Studies,* Ph.D., Duke
John R. Chávez, *Professor of History,* Ph.D., Michigan
Zhangxin (John) Chen, *Professor of Mathematics,* Ph.D., Purdue
Yeo-Jin Chung, *Assistant Professor of Mathematics,* Ph.D., California (Irvine)
Thomas E. Coan, *Associate Professor of Physics,* Ph.D., California (Berkeley)
Richard W. Cogley, *Associate Professor of Religious Studies,* Ph.D., Princeton
Olga L.V. Colbert, *Assistant Professor of Spanish,* Ph.D., Stanford
Dennis D. Cordell, *Professor of History,* Ph.D., Wisconsin
Anthony J. Cortese, *Professor of Sociology,* Ph.D., Notre Dame
John Cotton, *Adjunct Lecturer of Physics,* M.S., SMU
Edward F. Countryman, *University Distinguished Professor of History,* Ph.D., Cornell
R. Alan Covey, *Assistant Professor of Anthropology*, Ph.D., Michigan
Michael Crow, *Lecturer of Psychology,* Ph.D., SMU
Timothy Wood Crusius, *Professor of English,* Ph.D., Southern California
Charles E. Curran, *Scurlock Professor of Human Values,* S.T.D., Gregorian University, Rome, Italy
Susan Dadres, *Lecturer of Economics,* Ph.D., SMU
Steven V. Daniels, *Associate Professor of English,* Ph.D., Harvard
Robert Clay Davis, *Associate Professor of Mathematics,* Ph.D., Tulane
Rajat Deb, *Professor of Economics,* Ph.D., London School of Economics
Crista J. DeLuzio, *Assistant Professor of History,* Ph.D., Brown
Vincenzo E. DeNardo, *Associate Professor of Italian,* Ph.D., California (Los Angeles)
Yi Deng, *Assistant Professor of Economics,* Ph.D. Yale
Karen de Olivares, *Adjunct Lecturer of Sociology,* Ph.D., Michigan
Jill DeTemple*, Assistant Professor of Religious Studies*, Ph.D., North Carolina
Darryl Dickson-Carr, *Associate Professor of English*, Ph.D., California (Santa Barbara)
Melissa Barden Dowling, *Associate Professor of History,* Ph.D., Columbia
Xinlin Du, *Research Assistant Professor of Geological Sciences*, Ph.D., California (Berkeley)
Mallory M. Dubuclet, *Lecturer of English,* M.A., SMU
Denise DuPont, *Assistant Professor of Spanish,* Ph.D., Yale
John Edens, *Associate Professor of Psychology,* Ph.D., Texas A&M
Douglas E. Ehring, *William Edward Easterwood Professor of Philosophy,* Ph.D., Columbia
Carl Johan Elverskog, *Assistant Professor of Religious Studies,* Ph.D., Indiana
Monty Evans, *Adjunct Lecturer of Sociology,* Ph.D., North Texas
Ephrem Fernandez, *Associate Professor of Psychology,* Ph.D., Ohio State
Anthony R. Fiorillo, *Research Associate Professor of Geological Sciences,* Ph.D., Pennsylvania
Thomas B. Fomby, *Professor of Economics,* Ph.D., Missouri
Dennis A. Foster, *D.D. Frensley Professor of English,* Ph.D., California (Irvine)
David A. Freidel, *University Distinguished Professor of Anthropology,* Ph.D., Harvard
Serge Frolov, *Assistant Professor of Religious Studies and the Nate and Ann Levine Endowed Chair in Jewish Studies,* Ph.D., Claremont
Marie-Luise Gaettens, *Associate Professor of German,* Ph.D., Texas

Yongsheng Gao, *Assistant Professor of Physics,* Ph.D., University of Wisconsin, Madison
Heather Garrett-Pelletier, *Lecturer of French,* Ph.D., Vanderbilt
Peter B. Gifford, *Associate Professor of Wellness,* Ph.D., Illinois
Ian Gladwell, *Professor of Mathematics,* Ph.D., Manchester
Christina Gonzales-Boles, *Adjunct Lecturer of Spanish,* M.A., Texas A&M
Jo Goyne, *Senior Lecturer of English,* M.A., SMU
Francisco J. Granados, *Assistant Professor of Sociology,* M.A., Minnesota
Robert T. Gregory, *Professor of Geological Sciences,* Ph.D., California Institute of Technology
Ezra Greenspan, *Edmund J. and Louise W. Kahn Chair in Humanities, Professor of English,* Ph.D., Brown
Diana Grumbles, *Lecturer of English,* M.A., SMU
Richard F. Gunst, *Professor of Statistical Science,* Ph.D., SMU
Sandra Haas, *Adjunct Lecturer of Italian,* M.A., North Texas
Richard Haberman, *Professor of Mathematics,* Ph.D., MIT
Kenneth M. Hamilton, *Associate Professor of History,* Ph.D., Washington
Robert B. Hampson, *Associate Professor of Psychology,* Ph.D., Virginia
Ian R. Harris, *Associate Professor of Statistical Science,* Ph.D., Birmingham, U.K.
Robert L. Harrod, *Assistant Professor of Biological Sciences,* Ph.D., Maryland
Richard O. Hawkins, *Associate Professor of Sociology,* Ph.D., Washington
Kathy Jean Hayes, *Professor of Economics,* Ph.D., Syracuse
David Haynes, *Associate Professor of English,* M.A., Hamline University, St. Paul, MN
George Henson, *Lecturer of Spanish,* M.A., Middlebury
Eugene T. Herrin Jr., *Shuler-Foscue Professor of Geological Sciences,* Ph.D., Harvard
Stephen C. Hiltz, *Adjunct Assistant Professor of Philosophy,* Ph.D., Texas
Michael N. Holahan, *Associate Professor of English,* Ph.D., Yale
James Hollifield, *Professor of Political Science,* Ph.D., Duke
Paul Gordon Hook, *Associate Professor of Wellness,* Ph.D., North Texas
James Kirkland Hopkins, *Professor of History,* Ph.D., Texas
Vanessa Hopper, *Lecturer of English,* M.A., SMU
Werner Horsthemke, *Associate Professor of Chemistry,* Ph.D., Free University of Brussels
Kent Hornbostel, *Associate Professor of Physics,* Ph.D., Stanford
Susan Hornstein, *Lecturer of Psychology*, Ph.D., SMU
Michael Householder, *Assistant Professor of English,* Ph.D., California (Irvine)
Robert Howell, *Assistant Professor of Philosophy,* Ph.D., Brown
Ling Hua, *Assistant Professor of Chemistry,* Ph.D., Rice
Kathleen Hugley-Cook, *Adjunct Lecturer of French,* Ph.D., Johns Hopkins
Valerie Hunt, *Assistant Professor of Political Science,* Ph.D., Washington
Kyle Hyndman, *Assistant Professor of Economics,* M.A., New York
Rebecca Innocent, *Lecturer of English,* Ph.D., Illinois
Dennis S. Ippolito, *McElvaney Professor of Political Science,* Ph.D., Virginia
Mary Jackman, *Lecturer of English,* Ph.D., New Mexico State
Bonnie Jacobs, *Assistant Professor of Environmental Science,* Ph.D., Arizona
Lynn Romejko Jacobs, *Associate Professor of Wellness,* Ph.D., Texas Woman's University
Louis Jacobs, *Professor of Geological Sciences,* Ph.D., Arizona
Christian Jensen, *Assistant Professor of Economics*, Ph.D. Carnegie Mellon
Syeda Jesmin, *Lecturer of Sociology*, M.A., Texas (Arlington)

Calvin C. Jillson, *Professor of Political Science,* Ph.D., Maryland
Andrew B. Johnson, *Lecturer of Philosophy*, Ph.D., North Carolina
Benjamin H. Johnson, *Assistant Professor of History,* Ph.D., Yale
Richard S. Jones, *Professor of Biological Sciences,* Ph.D., Wesleyan University
Ernest N. Jouriles, *Professor of Psychology,* Ph.D., SUNY (Stony Brook)
D.J. Kassanoff, *Lecturer of English,* M.A., SMU
Jean Kazez, *Adjunct Assistant Professor of Philosophy,* Ph.D., Arizona
Robert L.P. Kehoe, III, *Assistant Professor of Physics,* Ph.D., Notre Dame
Robert Van Kemper, *Professor of Anthropology,* Ph.D., California (Berkeley)
Martine Kincaid, *Lecturer of French*, Ph.D., Cincinnati
Harold Knight, *Lecturer of English,* Ph.D., Iowa
Thomas J. Knock, *Associate Professor of History,* Ph.D., Princeton
Joseph F. Kobylka, *Associate Professor of Political Science,* Ph.D., Minnesota
Linda Koski, *Lecturer of Spanish,* Ph.D., Stanford
Sheri Locklear Kunovich, *Assistant Professor of Sociology,* Ph.D., Ohio State
James W. Lamb, *Adjunct Assistant Professor of Philosophy,* Ph.D., Brown
John C. Lamoreaux, *Associate Professor of Religious Studies,* Ph.D., Duke
Pamela Lange, *Senior Lecturer of English,* M.A., SMU
Michael Lattman, *Professor of Chemistry,* Ph.D., City University of New York
Verónica León, *Senior Lecturer of Spanish,* Ph.D., Texas
Bruce Levy, *Lecturer of Humanities,* Ph.D., Brown
John Mirick Lewis, *Associate Professor of English,* M.A., Harvard
Glenn Marston Linden, *Associate Professor of History,* Ph.D., Washington
Steven E. Lindquist, *Assistant Professor of Religious Studies*, Ph.D., Texas
Clayton Littlejohn, *Lecturer of Philosophy*, Ph.D., Nebraska
Victoria Lockwood, *Associate Professor of Anthropology,* Ph.D., California (Los Angeles)
Chris Logan, *Lecturer of Psychology*, Ph.D., Texas Tech University
Robin W. Lovin, *Maguire University Professor of Ethics,* Ph.D., Harvard
Michael Lusztig, *Associate Professor of Political Science,* Ph.D., McGill University
Esfandiar Maasoumi, *Robert H. and Nancy Dedman Professor of Economics,* Ph.D., London School of Economics
John Arthur Maguire II, *Professor of Chemistry,* Ph.D., Northwestern
Luis Maldonado-Peña, *Assistant Professor of Spanish,* Ph.D., Georgetown
Luigi Manzetti, *Associate Professor of Political Science,* Ph.D., Iowa
A. Lee McAlester, *Professor of Geological Sciences,* Ph.D., Yale
Gary D. McCartor, *Professor of Physics,* Ph.D., Texas A&M
Alexis M. McCrossen, *Associate Professor of History,* Ph.D., Harvard
Renee McDonald, *Associate Professor of Psychology,* Ph.D., University of Houston
Monnie McGee, *Assistant Professor of Statistical Science,* Ph.D., Rice
Jason R. McKenna, *Research Assistant Professor of Geological Sciences*, Ph.D., SMU
John Ashley Mears, *Associate Professor of History,* Ph.D., Chicago
Mogens V. Melander, *Associate Professor of Mathematics,* Ph.D., Technical University of Denmark
David J. Meltzer, *Henderson Morrison Professor of Anthropology,* Ph.D., Washington
Alicia E. Meuret, *Assistant Professor of Psychology,* Ph.D., Hamburg
Daniel Millimet, *Associate Professor of Economics,* Ph.D., Brown
Frank David Mitchell, *Lecturer of English,* Ph.D., North Texas
Montie Gene Monzingo, *Associate Professor of Mathematics,* Ph.D., Oklahoma
Peter Moore, *Professor of Mathematics,* Ph.D., Rensselaer Polytechnic Institute
Francisco Morán, *Assistant Professor of Spanish,* Ph.D., Georgetown

Alberto Morón-Pastor, *Assistant Professor of Spanish,* Ph.D., Madrid
Ross C Murfin, *Professor of English,* Ph.D., Virginia
Jack E. Myers, *Professor of English,* M.F.A., Iowa
Linda Neal, *Lecturer of Mathematics*, Ph.D., Texas A&M
Jasper Neel, *Professor of English,* Ph.D., Tennessee
Betty Nelson, *Senior Lecturer of Spanish,* M.A., SMU
Judy Newell, *Lecturer of Mathematics*, M.S., SMU
Beth S. Newman, *Associate Professor of English,* Ph.D., Cornell
Pauline Newton, *Lecturer of English,* Ph.D., Tulsa
Hon Keung (Tony) Ng, *Assistant Professor of Statistical Science,* Ph.D., McMaster University, Ontario, Canada
Donald L. Niewyk, *Professor of History,* Ph.D., Tulane
Takashi Nishikawa, *Assistant Professor of Mathematics*, Ph.D., Maryland (College Park)
Angela Nozaleda, *Lecturer of Spanish,* M.A., Madrid
Eva Oberdörster, *Lecturer of Biology,* Ph.D., Duke
Fredrick I. Olness, *Professor of Physics,* Ph.D., Wisconsin
Ashley O'Neill, *Lecturer of English,* M.A., North Texas
Daniel T. Orlovsky, *Professor of History,* Ph.D., Harvard
William C. Orr, *Professor of Biological Sciences,* Ph.D., Wayne State University
Thomas Osang, *Associate Professor of Economics,* Ph.D., California (San Diego)
Dayna Oscherwitz, *Assistant Professor of French,* Ph.D., Texas
Saltuk Ozerturk, *Assistant Professor of Economics,* Ph.D., New York University
Roger Parks, *Lecturer of Spanish*, M.S., New Mexico
John Phinney, *Adjunct Lecturer of Anthropology,* M.A., Nebraska
Patricia Pisano, *Adjunct Lecturer of English*, M.A., Cincinnati
Robert F. Pocklington, *Senior Lecturer of English,* Ph.D., Texas (Arlington)
Luis Polanco, *Lecturer of Spanish,* M.A., North Texas
Katherine Presnell, *Assistant Professor of Psychology*, Ph.D. Texas
Gloria Prieto, *Lecturer of Spanish,* M.B.E., SMU
Patricia Rawlins, *Adjunct Lecturer of Latin*, M.A., Texas
George W. Reddien Jr., *Professor of Mathematics,* Ph.D., Georgia Tech
Douglas A. Reinelt, *Professor of Mathematics,* Ph.D., California Institute of Technology
Torben Rick, *Assistant Professor of Anthropology,* Ph.D., Oregon
Thomas Ritz, *Associate Professor of Psychology,* Ph.D., Hamburg
H. Bryan Robbins, *Associate Professor of Wellness,* M.Ed., Arkansas
Timothy Rosendale, *Assistant Professor of English,* Ph.D., Northwestern
Santanu Roy, *Associate Professor of Economics,* Ph.D., Cornell
Lawrence S. Ruben, *Professor of Biological Sciences,* Ph.D., Minnesota
Elizabeth Russ, *Assistant Professor of Spanish,* Ph.D., Columbia
Kamal Saggi, *Professor of Economics,* Ph.D., Pennsylvania
Rupinder Saggi, *Lecturer of Economics,* Ph.D., North Carolina
Takayuki Sakamoto, *Assistant Professor of Political Science,* Ph.D., California (Santa Barbara)
C. Garth Sampson, *Professor of Anthropology,* D.Phil., Oxford
Milagros Sánchez-García, *Lecturer of Spanish,* M.A., Colorado State
Carolyn F. Sargent, *Professor of Anthropology,* Ph.D., Michigan State
Martha G. Satz, *Assistant Professor of English,* Ph.D., Texas (Dallas)
Randall J. Scalise, *Senior Lecturer of Physics,* Ph.D., Pennsylvania State
Mark A.F. Schell, *Professor of Chemistry,* Ph.D., Toronto

Keiko Schneider, *Lecturer of Japanese*, M.A.T., School for International Training
William R. Schucany, *Professor of Statistical Science,* Ph.D., SMU
Nina Schwartz, *Associate Professor of English,* Ph.D., California (Irvine)
Ona Seaney, *Lecturer of English,* M.A., University of New Mexico
Carol Seets, *Lecturer of Mathematics,* M.A., Texas (Dallas)
Lawrence F. Shampine, *Betty Clements Professor of Applied Mathematics,* Ph.D., California Institute of Technology
Stephen H. Shepherd, *Associate Professor of English,* Ph.D., Oxford
Ling Shiao, *Assistant Professor of History*, M.A., Brown
Dennis M. Simon, *Associate Professor of Political Science,* Ph.D., Michigan State
Lorelei Simpson, *Assistant Professor of Psychology*, Ph.D., California (Los Angeles)
Lisa Siraganian, *Assistant Professor of English*, Ph.D., Johns Hopkins
Daniel J. Slottje, *Professor of Economics,* Ph.D., Texas A&M
C.W. Smith, *Professor of English,* M.A., Northern Illinois
Jasper Smits, *Assistant Professor of Psychology,* Ph.D., Texas
Kelly Teague Smith, *Lecturer of English,* M.A., Texas Tech
Sherry L. Smith, *Professor of History,* Ph.D., Washington
Carolyn Smith-Morris, *Assistant Professor of Anthropology,* Ph.D., Arizona
David Y. Son, *Harold A. Jeskey Trustee Associate Professor of Chemistry,* Ph.D., MIT
Willard Lester Spiegelman, *Duwain E. Hughes Jr. Distinguished Professor of English,* Ph.D., Harvard
Harold Stanley, *Geurin-Pettus Distinguished Chair of American Politics and Political Economy,* Ph.D., Yale
Linda Brewster Stearns, *Professor of Sociology,* Ph.D., New York (Stony Brook)
S. Lynne Stokes, *Professor of Statistical Science,* Ph.D., North Carolina
Tom E. Stone, *Senior Lecturer of English,* Ph.D., Denver
Teresa Strecker, *Adjunct Associate Professor of Biology,* Ph.D., California (Los Angeles)
Ryszard Stroynowski, *Professor of Physics,* Ph.D., Geneva (Switzerland)
H. Troy Stuckey, *Research Assistant Professor of Geological Sciences*, Ph.D., North Texas
Brian W. Stump, *Albritton Professor of Geological Sciences,* Ph.D., California (Berkeley)
Rajani Sudan, *Associate Professor of English,* Ph.D., Cornell
Brent Sumerlin, *Assistant Professor of Chemistry,* Ph.D., Southern Mississippi
Steven D. Sverdlik, *Associate Professor of Philosophy,* Ph.D., Columbia
Neil J. Tabor, *Assistant Professor of Geological Sciences,* Ph.D., California (Davis)
Nobuko Taguchi, *Adjunct Lecturer of Japanese,* M.A., Arizona
Adrian Tan, *Lecturer of Sociology,* M.A., Ohio
Johannes Tausch, *Associate Professor of Mathematics,* Ph.D., Colorado State
Marshall N. Terry, *E.A. Lilly Distinguished Professor of English,* M.A., SMU
Vigdor L. Teplitz, *Professor of Physics,* Ph.D., Maryland
Brad Thompson, *Assistant Professor of Philosophy,* Ph.D., Arizona
Vicki Tongate, *Lecturer of English,* M.A., SMU
John E. Ubelaker, *Professor of Biological Sciences,* Ph.D., Colorado State
Jutta Irene Van Selm, *Associate Professor of German,* Ph.D., Texas
Roberto Vega, *Associate Professor of Physics,* Ph.D., Texas
Steven B. Vik, *Professor of Biological Sciences,* Ph.D., Oregon
Pia Vogel, *Assistant Professor of Biological Sciences*, Ph.D., Kaiserslautern, Germany
Gabriela Voki_, *Assistant Professor of Spanish,* Ph.D., Purdue

James Waddle, *Assistant Professor of Biological Sciences,* Ph.D., Washington University
Jacqueline Wald, *Lecturer of Spanish,* M.A., Catholic University of America
John B. Wagner, *Research Associate Professor of Geological Sciences,* Ph.D., UTD
Ben J. Wallace, *Professor of Anthropology,* Ph.D., Wisconsin
John V. Walther, *Matthews Professor of Geological Sciences,* Ph.D., California (Berkeley)
James Wang, *Lecturer of Chinese,* Ph.D., Stanford
Xinlei (Sherry) Wang, *Assistant Professor of Statistical Science,* Ph.D., Texas
David J. Weber, *Robert H. and Nancy Dedman Professor of History,* Ph.D., New Mexico
Shlomo Weber, *Robert H. and Nancy Dedman Trustee Professor of Economics,* Ph.D., Hebrew University of Jerusalem
Steven Weisenburger, *Jacob and Frances Mossiker Chair of Humanities and Professor of English,* Ph.D., Washington
Stephen K. Wegren, *Professor of Political Science*, Ph.D., Columbia
Kathleen A. Wellman, *Professor of History,* Ph.D., Chicago
Ronald Knox Wetherington, *Professor of Anthropology,* Ph.D., Michigan
Alvina Bonnie Wheeler, *Associate Professor of English,* Ph.D., Brown
Stuart Wick, *Visiting Assistant Professor of Physics*, Ph.D., Vanderbilt
Daniel Wiegman, *Lecturer of Spanish,* M.A., University of the Americas
R. Hal Williams, *Professor of History,* Ph.D., Yale
Richard Kelso Williams, *Professor of Mathematics,* Ph.D., Vanderbilt
David J. Wilson, *Associate Professor of Anthropology,* Ph.D., Michigan
J. Matthew Wilson, *Associate Professor of Political Science,* Ph.D., Duke
André Winandy, *Professor of French,* Ph.D., Pittsburgh
Rita Winandy, *Senior Lecturer of French,* Ph.D., Pittsburgh
Alisa Winkler, *Research Associate Professor of Geological Sciences,* Ph.D., SMU
Dale A. Winkler, *Research Associate Professor of Geological Sciences,* Ph.D., Texas (Austin)
John Wise, *Lecturer of Biology,* Ph.D., Rochester
Patty Wisian-Neilson, *Professor of Chemistry,* Ph.D., Texas
Wayne A. Woodward, *Professor of Statistical Science,* Ph.D., Texas Tech
Crayton J. Yapp, *Professor of Geological Sciences,* Ph.D., California Institute of Technology
Jingbo Ye, *Assistant Professor of Physics,* Ph.D., Swiss Federal Institute of Technology
Yunkai Zhou, *Assistant Professor of Mathematics*, Ph.D., Rice
James Ziegler, *Visiting Assistant Professor of English*, Ph.D., California (Irvine)
Tatiana Zimakova, *Adjunct Lecturer of Russian,* Ph.D., Moscow

EMERITUS FACULTY

Venita F. Allison, *Professor Emerita of Biological Sciences,* Ph.D., Texas Woman's University
Barbara Gallatin Anderson *University Distinguished Professor Emerita of Anthropology*, Docteur Université de Paris
Thomas R. Arp, *Associate Professor Emeritus of English,* Ph.D., Stanford
Irving A. Baker, *Associate Professor Emeritus of Political Science,* M.P.A., New York
Kay Bethune, *Assistant Professor Emerita of English,* M.A., SMU
U. Narayan Bhat, *Professor Emeritus of Statistical Science,* Ph.D., University of Western Australia

Lewis R. Binford, *University Distinguished Professor Emeritus of Anthropology,* Ph.D., Michigan
Richard P. Bland, *Associate Professor Emeritus of Statistics,* Ph.D., North Carolina
James O. Breeden, *Professor Emeritus of History,* Ph.D., Tulane
Maryhelen Bronson, *Professor Emerita of Physical Education,* Ed.D., New York
James E. Brooks, *Professor Emeritus of Geological Sciences,* Ph.D., Washington
Hugh W. Carney, *Assistant Professor Emeritus of French and Latin,* M.A., SMU
Kenneth Lane Carroll, *Professor Emeritus of Religious Studies,* Ph.D., Duke
Jeff D. Chalk III, *Associate Professor Emeritus of Physics,* Ph.D., Colorado
Herbert Corkran Jr., *Associate Professor Emeritus of Political Science,* Ph.D., Indiana
George Wolf Crawford, *Professor Emeritus of Physics,* Ph.D., Texas
Ronald L. Davis, *Professor Emeritus of History,* Ph.D., Texas (Austin)
Wonmo Dong, *Professor Emeritus of Political Science,* Ph.D., Georgetown
Ann M. Early, *Lecturer Emerita of English,* M.A.T., Harvard
Maurice G. Elton, *Professor Emeritus of French,* Ph.D., Cincinnati; Officier dans l'Ordre des Palmes académiques, French Ministry of Education
James Gerhardt, *Professor Emeritus of Political Science,* Ph.D., Harvard
Mary Alice Gordon, *Associate Professor Emerita of Psychology,* Ph.D., TCU
Henry L. Gray, *Professor Emeritus of Mathematics and Statistics,* Ph.D., Texas
Josef Hadar, *Professor Emeritus of Economics,* Ph.D., Minnesota
O.T. Hargrave, *Professor Emeritus of History,* Ph.D., Vanderbilt
David B. Hausman, *Professor Emeritus of Philosophy,* Ph.D., Iowa
William B. Heroy Jr., *Professor Emeritus of Geological Sciences,* Ph.D., Princeton
Harold J. Hietala, *Professor Emeritus of Anthropology and Statistical Science,* Ph.D., California (Los Angeles)
Michael J. Holdaway, *Professor Emeritus of Geological Sciences,* Ph.D., California (Berkeley)
Richard Alan Hunt, *Professor Emeritus of Psychology,* Ph.D., TCU
Robert G. Hunter, *D.D. Frensley Professor Emeritus of English Literature,* Ph.D., Columbia
Harold Alfred Jeskey, *R.S. Lazenby Professor Emeritus of Chemistry,* Ph.D., Wisconsin
Chandrakant Harilal Kapadia, *Professor Emeritus of Statistical Science,* Ph.D., Oklahoma State
Morton Brandon King Jr., *Professor Emeritus of Sociology,* Ph.D., Wisconsin
John Harry LaPrade, *Professor Emeritus of Spanish,* Ph.D., North Carolina
Robert L. Laury, *Professor Emeritus of Geological Sciences,* Ph.D., Wisconsin
William Mahler, *Associate Professor Emeritus of Biological Sciences,* Ph.D., Iowa
Anthony Edward Marks, *Professor Emeritus of Anthropology,* Ph.D., Columbia
Luís Martín, *Edmund and Louise Kahn Professor Emeritus of History,* Ph.D., Columbia
William F. May, *Cary M. Maguire Professor Emeritus of Ethics,* Ph.D., Yale
John Lawrence McCarthy, *Professor Emeritus of Biological Sciences,* Ph.D., Purdue
Curtis W. McIntyre, *Associate Professor Emeritus of Psychology*, Ph.D., Vanderbilt
Elizabeth G. Miller, *Professor Emerita of Spanish,* Ph.D., Texas (Dallas)
Peter K. Mollenhauer, *Associate Professor Emeritus of German,* Ph.D., Texas
Ruth Morgan, *Professor Emerita of Political Science,* Ph.D., Louisiana State
J. Carter Murphy, *Professor Emeritus of Economics,* Ph.D., Chicago
Ladislav P. Novak, *Professor Emeritus of Anthropology,* Ph.D., Minnesota

Benjamin Aby Petty, *Associate Professor Emeritus of Philosophy and Religious Studies,* Ph.D., Boston
Campbell B. Read, *Professor Emeritus of Statistical Science,* Ph.D., North Carolina
William R. Russell, *Professor Emeritus of Economics,* Ph.D., Washington
Tae Kun Seo, *Associate Professor Emeritus of Economics,* Ph.D., Texas A&M
Kenneth Dale Shields, *Professor Emeritus of English,* Ph.D., Edinburgh
Margaret M. Shriver, *Assistant Professor Emerita of French,* M.A., SMU
Doris Wyatt Simons, *Assistant Professor Emerita of Mathematics*, M.A., SMU
Franklin Sogandares-Bernal, *Professor Emeritus of Biological Sciences,* Ph.D., Nebraska
William Blackburn Stallcup Jr., *Professor Emeritus of Biological Sciences,* Ph.D., Kansas
Sallie M. Strange, *Assistant Professor Emerita of English,* M.A., SMU
William H. Tedford Jr., *Professor Emeritus of Psychology,* Ph.D., Emory
Ann Van Wynen Thomas, *Professor Emerita of Political Science,* LL.M., SMU
Joseph B. Tyson, *Professor Emeritus of Religious Studies,* Ph.D., Union Theological Seminary
Zoë Goss Urbanek, *Professor Emerita of Foreign Languages and Literatures,* M.A., Northwestern
Benjamin Christopher Watts, *Professor Emeritus of Education,* Ph.D., Colorado State College of Education
John T. Webster, *Professor Emeritus of Statistical Science,* Ph.D., North Carolina State
D. Fred Wendorf, *Henderson Morrison Professor Emeritus of Anthropology,* Ph.D., Harvard
Samuel A. Zimmerman, *Professor Emeritus of Spanish,* Ph.D., Florida

06420UGCat385-468FA 448 5/8/06, 11:12 AM

School of Education and Human Development

ADMINISTRATION

Robert A. Patterson, D.Ed., *Dean*
Sharon Hartley, B.A., *Assistant to the Dean*
Kathy Hargrove, Ph.D., *Associate Dean and Director of Teacher Education*
Rebecca Hood, M.A., *Assistant Dean and Director of Summer Studies*
Ne'Shaun Robinson, Jones, M.S., *Director of TRIO Programs*
Kathi Watts, M.A., *Director of Evening Credit Studies*
Amy Heitzman, M.A., *Director of Continuing Studies*
Marilyn Swanson, MLA, *Director of Programming for Gifted Students Institute*

FACULTY

Jill Allor, *Associate Professor of Literacy and Language Acquisition*, Ed.D., Vanderbilt
Lee Alvoid, *Senior Lecturer in Education*, Ph.D., Texas Woman's
Abigail Bartoshesky, *Visiting Assistant Professor of Anthropology and Education*, Ed.D., George Washington
Michael Colatrella, *Lecturer in Dispute Resolution*, J.D., Seton Hall
Denise Collins, *Associate Director of Pre-School Teacher Education,* Texas Woman's
Deborah Diffily, *Assistant Professor of Education*, Ph.D., North Texas
Katherine Hargrove, *Senior Lecturer in Gifted Education*, Ph.D., Texas Woman's
Francesca Jones, *Assistant Research Professor,* Ph.D., North Texas
Caroline Kethley, *Assistant Research Professor,* Ph.D., Texas (Austin)
Jiang (JoAnn) Lan, *Associate Professor of Education*, Ed.D., Northern Illinois
Patricia Mathes, *Texas Instruments Endowed Chair in Reading Research and Professor of Education*, Ph.D., Vanderbilt
Barbara Morganfield, *Senior Lecturer in Education*, Ed.D., Vanderbilt
Connie Peters, *Associate Director of Pre-School Teacher Education*, M.L.A., SMU
Anthony Picchioni, *Program Director of Dispute Resolution*, Ph.D., North Texas
William Pulte, *Associate Professor of Education,* Ph.D., Texas (Austin)
Kenneth L. Springer, *Associate Professor of Educational Psychology*, Ph.D., Cornell
Karen Vickery, *Program Director of Learning Therapy*, Ed.D., East Texas State
Paige Ware, *Assistant Professor,* Ph.D., California (Berkeley)
Shelley Wright, *Lecturer in Education*, Ed.D., Texas Tech

COX SCHOOL OF BUSINESS

ADMINISTRATION

Albert W. Niemi Jr., Ph.D., *Dean and Tolleson Distinguished Professor of Business Leadership and Economics*
William R. Dillon, Ph.D., *Senior Associate Dean for Academic Affairs*
Marcia Armstrong, Ph.D., *Associate Dean for Graduate Programs*
Elbert B. Greynolds, Ph.D., *Associate Dean for Undergraduate Programs*
Frank R. Lloyd, Ph.D., *Associate Dean of Executive and Management Development*
Catherine Collins, B.B.A., *Assistant Dean for Administration and Finance*
Kevin Knox, B.B.A., *Assistant Dean for External Relations*

FACULTY

Evrim Akdogu, *Assistant Professor of Finance,* Ph.D., Washington University
Ellen Allen, *Lecturer in Information Technology and Operations Management,* Ph.D., SMU
Jeffrey W. Allen, *Associate Professor of Finance,* Ph.D., Purdue
Jeffrey R. Austin, *Lecturer in Accounting,* Ph.D., Georgia
Thomas E. Barry, *Professor of Marketing,* Ph.D., North Texas
Amit Basu, *Charles Wyly Professor of Information Systems,* Ph.D., Rochester
Charles A. Besio, *Lecturer in Marketing,* M.B.A., SMU
Anita D. Bhappu, *Assistant Professor of Management and Organizations,* Ph.D., Arizona
Nilabhra Bhattacharya, *Assistant Professor of Accounting,* Ph.D., Georgia
Richard A. Briesch, *Assistant Professor of Marketing,* Ph.D., Northwestern
William B. Brueggeman, *Clara R. and Leo F. Corrigan Sr. Professor of Real Estate,* Ph.D., Ohio State
Chester G. Chambers, *Assistant Professor of Information Technology and Operations Management,* Ph.D., Duke
Andrew H. Chen, *Distinguished Professor of Finance,* Ph.D., California (Berkeley)
James C. Collins Jr., *Lecturer in Information Technology and Operations Management,* M.S.I.E., SMU
Michael L. Davis, *Lecturer in Finance,* Ph.D., SMU
Hemang A. Desai, *Associate Professor of Accounting,* Ph.D., Tulane
William R. Dillon, *Herman W. Lay Professor of Marketing and Professor of Statistics,* Ph.D., City University of New York
Edward J. Fox, *Assistant Professor of Marketing,* Ph.D., Pennsylvania
Judith H. Foxman, *Lecturer in Marketing,* M.B.A., SMU
Mel Fugate, *Assistant Professor of Management and Organizations,* Ph. D., Arizona State University
Amar Gande, *Assistant Professor of Finance,* Ph.D., NYU
Bezalel Gavish, *Eugene J. and Ruth F. Constantin Distinguished Professor of Business,* Ph.D., Technion, Israel Institute of Technology
Elbert B. Greynolds Jr., *Associate Professor of Accounting,* Ph.D., Georgia State
Jeffrey R. Hart, *Lecturer in Finance,* Ph.D., Texas (Arlington)
Peter A. Heslin, *Assistant Professor of Management and Organizations,* Ph.D., Toronto
Chris E. Hogan, *Assistant Professor of Accounting,* Ph.D., Ohio State
Daniel J. Howard, *Professor of Marketing,* Ph.D., Ohio State
Ellen F. Jackofsky, *Associate Professor of Management and Organizations,* Ph.D., Texas (Dallas)
Joakim Kalvenes, *Assistant Professor of Information Technology and Operations Management,* Ph.D., Vanderbilt

Neil J. Keon, *Assistant Professor of Information Technology and Operations Management,* Ph.D., Pennsylvania
Roger Anthony Kerin, *Harold C. Simmons Distinguished Professor of Marketing,* Ph.D., Minnesota
Barbara W. Kincaid, *Lecturer in Law,* J.D., SMU
James T. Kindley, *Lecturer in Marketing,* M.B.A., Harvard
Chun H. Lam, *Associate Professor of Finance,* Ph.D., Duke
David T. Lei, *Associate Professor of Strategy and Entrepreneurship,* Ph.D., Columbia
Joseph Magliolo III, *Professor of Accounting,* Ph.D., Stanford
Richard O. Mason, *Carr P. Collins Jr. Distinguished Professor of Management Sciences,* Ph.D., California (Berkeley)
David C. Mauer, *Professor of Finance,* Ph.D., Purdue
Gary T. Moskowitz, *Senior Lecturer in Strategy and Entrepreneurship,* Ph.D., Pennsylvania
Albert W. Niemi Jr., *John and Debbie Tolleson Distinguished Professor of Business Leadership and Economics,* Ph.D., Connecticut
Robin L. Pinkley, *Associate Professor of Strategy and Entrepreneurship,* Ph.D., North Carolina
Steven R. Postrel, *Assistant Professor of Strategy and Entrepreneurship,* Ph.D., MIT
Robert Puelz, *Associate Professor of Insurance and Financial Services on the Dexter Endowment,* Ph.D., Georgia
Miguel A. Quinonez, *Professor of Management and Organizations,* Ph.D., Michigan
Priyali Rajagopol, *Assistant Professor of Marketing,* Ph.D., Ohio State
Robert W. Rasberry, *Assistant Professor of Management and Organizations,* Ph.D., Kansas
Susan M. Riffe, Senior *Lecturer in Accounting,* Ph.D., Southern California
Ulrike Schultze, *Assistant Professor of Information Technology and Operations Management,* Ph.D., Case Western Reserve
John H. Semple, *Associate Professor of Information Technology and Operations Management,* Ph.D., Texas (Austin)
Raj Sethuraman, *Associate Professor of Marketing,* Ph.D., Northwestern
Wayne H. Shaw, *Helmut Sohmen Distinguished Professor of Corporate Governance,* Ph.D., Texas (Austin)
Tasadduq Shervani, *Associate Professor of Marketing,* Ph.D., Southern California
Suzanne B. Shu, *Assistant Professor of Marketing,* Ph.D., Chicago
John W. Slocum Jr., *O. Paul Corley Distinguished Professor of Management and Organizations,* Ph.D., Washington
James L. Smith, *Cary M. Maguire Professor of Oil and Gas Management,* Ph.D., Harvard
Eli M. Snir, *Assistant Professor of Information Technology and Operations,* Pennsylvania
Marion G. Sobol, *Professor of Information Technology and Operations Management,* Ph.D., Michigan
Gregory A. Sommers, *Assistant Professor of Accounting,* Ph.D., Ohio State
Rex W. Thompson, *James M. Collins Professor of Finance,* Ph.D., Rochester
Michael F. van Breda, *Associate Professor of Accounting,* Ph.D., Stanford
Donald M. VandeWalle, *Associate Professor of Management and Organizations,* Ph.D., Minnesota
Kumar Venkataraman, *Assistant Professor of Finance,* Ph.D., Arizona State
Michel R. Vetsuypens, *Professor of Finance,* Ph.D., Rochester

Gordon Walker, *Professor of Strategy and Entrepreneurship,* Ph.D., Pennsylvania
Catherine Weber, *Lecturer in Law,* J.D., SMU
Jiao Zhang, *Assistant Professor of Marketing,* Ph.D., Chicago

EMERITUS PROFESSORS

Marvin L. Carlson, *Professor of Accounting,* Ph.D., Wisconsin
Alan B. Coleman, *Professor Emeritus of Finance,* Ph.D., Stanford
Robert J. Frame, *Professor Emeritus of Finance,* Ph.D., Colorado
Richard W. Hansen, *Professor Emeritus of Marketing,* Ph.D., Minnesota
Thomas V. Hedges, *Associate Professor Emeritus of Accounting,* D.B.A., Indiana
Sydney Chandler Reagan, *Professor Emeritus of Real Estate and Regional Science,* Ph.D., Harvard
John A. Stieber, *Assistant Professor Emeritus of Finance,* M.A., SMU
Rhonald D. Walker, *Associate Professor Emeritus of Accounting/Business Law and Taxation,* J.D., SMU
Helen W. Watkins, *Associate Professor Emeritus of Business Law and Taxation,* J.D., SMU
Leland Michael Wooton, *Associate Professor Emeritus of Management and Organizations,* Ph.D., Southern California
Frank A. Young, *Associate Professor Emeritus of Insurance,* M.A., Michigan

MEADOWS SCHOOL OF THE ARTS

ADMINISTRATION

Carole Brandt, Ph.D., *Dean and Algur H. Meadows Chair*
P. Gregory Warden, Ph.D., *Associate Dean for Academic Affairs*
Kevin Paul Hofeditz, M.F.A., *Associate Dean for Student Affairs*
Greg Brown, M.B.A., *Managing Director*
Carleen Naugle, M.L.A., *Director of Business and Finance*
Mark Roglán, Ph.D., *Director of the Meadows Museum*
Jean Cherry, B.A., *Director of Graduate Admissions and Records*
Chuck Donaldson, B.A., *Coordinator of Undergraduate Academic Services*
Pam Henderson, *Director of Scholarships*
Tommy Newton, M.L.A., *Recruitment Coordinator*
Bunny Williamson, B.A., *Director of Undergraduate Academic Services*

FACULTY AND ARTISTIC STAFF

Division of Advertising
Temerlin Advertising Institute

Patricia Alvey, *Distinguished Chair and Director,* Ph.D., Texas (Austin)
Adrienne Beam, *Adjunct Lecturer*, B.A., TCU
Brice Beaird, *Adjunct Lecturer*, B.B.A., Texas Tech (Lubbock)
Bill Ford, *Executive-in-Residence,* B.S., Eastern New Mexico
Bill Galyean, *Adjunct Lecturer*, B.A., Louisiana (Lafayette)
W. Glenn Griffin, *Assistant Professor,* Ph.D, Texas (Austin)
Sarah Hall, *Adjunct Lecturer,* B.A., Dartmouth College
David Henry, *Adjunct Lecturer,* B.A., SMU
Alice Kendrick, *Professor, 2003-04 Meadows Foundation Distinguished Teaching Professor,* Ph.D., Tennessee (Knoxville)
Alison Malone, *Adjunct Lecturer,* M.B.A., Texas (Austin)
Peter Noble, *Senior Lecturer,* M.A., Texas (Austin)
Jim O'Rourke, *Adjunct Lecturer*, B.S., St. John's
Christopher Owens, *Adjunct Lecturer*, B.S.A., North Texas
Kartik Pashupati, *Assistant Professor*, Ph.D., Texas (Austin)
Helayne Wendel, *Adjunct Lecturer*, M.B.A., Tampa

Division of Art

Peter Beasecker, *Associate Professor,* M.F.A., New York State College of Ceramics at Alfred University
Rebecca Carter, Assistant Professor, M.F.A., School of the Art Institute of Chicago
Charles DeBus, *Senior Lecturer,* B.F.A., University of Dallas
Barnaby Fitzgerald, *Professor,* M.F.A., Yale
Debora Hunter, *Associate Professor,* M.F.A., Rhode Island School of Design
Bill Komodore, *Professor,* M.F.A., Tulane
Vanessa Paschakarnis, *Assistant Professor,* M.F.A., Nova Scotia College of Art and Design
Laurence Scholder, *Professor, 1992-93 Meadows Foundation Distinguished Teaching Professor,* M.A., Iowa
Noah Simblist, *Assistant Professor*, M.F.A., Washington
James W. Sullivan, *Chair, Professor,* M.F.A., California State (Long Beach)
Philip Van Keuren, *Associate Professor,* M.F.A., SMU
Mary Vernon, *Associate Professor, 1998-99 Meadows Foundation Distinguished Teaching Professor,* M.A., New Mexico

Division of Art History

Janis Bergman-Carton, *Associate Professor,* Ph.D., Texas (Austin)
Annemarie Weyl Carr, *University Distinguished Professor, 1989-90 Meadows Foundation Distinguished Teaching Professor,* Ph.D., Michigan
Randall C. Griffin, *Division Chair, Associate Professor*, Ph.D., Delaware
Adam Herring, *Associate Professor,* Ph.D., Yale
Karl Kilinski II, *Professor,* Ph.D., Missouri
Pamela Patton, *Associate Professor;* Ph.D., Boston University
Lisa Pon, *Assistant Professor,* Ph.D., Harvard
Mark Roglán, *Adjunct Associate Professor; Director, Meadows Museum,* Ph.D., Universidad Autónoma de Madrid
Salvador Salort, *Adjunct Assistant Professor; Curator, Meadows Museum,* Ph.D., Royal College of Spain, University of Bologna
Charissa N. Terranova, *Assistant Professor*, Ph.D., Harvard
P. Gregory Warden, *Associate Dean for Academic Affairs, Professor, 1996-97 Meadows Foundation Distinguished Teaching Professor,* Ph.D., Bryn Mawr

Division of Arts Administration

P. Gregory Warden, *Chair ad interim*, Ph.D., Ph.D., Bryn Mawr

Division of Cinema-Television

Pamela Elder, *Associate Professor*, M.A., University of Memphis
Sean Griffin, *Associate Professor,* Ph.D., University of Southern California
Kevin Heffernan, *Associate Professor,* Ph.D., Wisconsin (Madison)
Kelli Herd, *Lecturer,* B. A., SMU
Mark Kerins, *Assistant Professor,* Ph.D., Northwestern University
Derek Kompare, *Assistant Professor,* Ph.D., Wisconsin (Madison)
Carolyn Macartney, *Assistant Professor,* M.F.A., The School of the Art Institute of Chicago
David Sedman, *Associate Professor and Director of Meadows Engineering and Technology,* Ph.D., Bowling Green
Rick Worland, *Associate Professor and Division Chair, 1997-98 Meadows Foundation Distinguished Teaching Professor,* Ph.D., California (Los Angeles

Division of Corporate Communications & Public Affairs

Christina Baily-Byers, *Adjunct Lecturer,* M.B.A., Nova University
Maria Dixon, *Assistant Professor,* Ph.D., Missouri
Joseph Downing, *Assistant Professor,* Ph.D., Rensselaer Polytechnic Institute
Nina Flournoy, *Senior Lecturer,* B.A., Louisiana
Rita Kirk, *Division Chair and Professor, 2000-01 Meadows Foundation Distinguished Teaching Professor, 2003-2004 University Distinguished Teaching Professor,* Ph.D., Missouri
Kathy LaTour, *Senior Lecturer,* M.F.A., SMU
Owen Lynch, *Assistant Professor,* Ph.D., Texas A&M
Arnold Wayne Jones, *Adjunct Lecturer*, J.D., University of Virginia School of Law
Cecilia Stubbs Norwood, *Adjunct Lecturer,* M.B.A., North Texas
Daniel Schill, *Assistant Professor*, Ph.D. (May 2006), Kansas

Division of Dance

Shelley C. Berg, *Associate Professor,* Ph.D., New York University
Danny Buraczeski, *Visiting Artist in Residence*, B.A., Bucknell University
Patricia Harrington Delaney, *Associate Professor,* M.F.A., SMU
Kirt Hathaway, *Adjunct Lecturer*, Experienced Performer, Instructor and Artistic Director of Collin County Ballet Theatre

Jennifer Holmes, *Adjunct Lecturer*, B.F.A., SMU, The Pilates Studio® Teacher Certification
Karen Kriete, *Assistant Professor,* Scholar and Faculty with Harkness Ballet; New York City Ballet Scholar
Nathan Montoya, *Associate Professor*, M.S., Indiana University School of Music
Leslie Peck, *Associate Professor*, Balanchine Trust Repetiteur and Principal Dancer
Max Stone, *Artist-in-Residence,* M.F.A., SMU
Susan A. White, *Adjunct Lecturer,* M.A., Arizona State
Myra Woodruff, *Division Chair and Professor,* B.A., New York University, International Artist, Instructor and Choreographer, Graham Technique Scholar

Accompanists

Richard Abrahamson, *Staff Musician,* Juilliard School of Music
Jamal Mohamed, *Staff Musician,* Percussion Specialist
Mina Polevoy, *Part-time Staff Musician*
Edward Lee Smith, *Part-time Staff Musician,* Percussion Specialist
Daniel J. Sullivan, *Part-time Staff Musician*, M.M., SMU
Janeen Vestal, *Part-time Staff Musician,* B.M., SMU

Division of Journalism

Carolyn Barta, *Senior Lecturer,* M.A., Texas (Austin)
Melvin Coffee, *Assistant Professor,* M.S., Northwestern
Craig Flournoy, *Assistant Professor,* Ph.D., Louisiana State
Michele Houston, *Senior Lecturer,* B.S., Texas (Austin)
Camille Kraeplin, *Assistant Professor,* Ph.D., Texas (Austin)
Tony Pederson, *Belo Distinguished Chair,* M.A., Ohio State
Lucy L. Scott, *Executive-in-Residence*, B.F.A., SMU
Lori Stahl, *Lecturer*, M.A., Northwestern,
J. Richard Stevens, *Assistant Professor*, Ph.D., Texas (Austin)
Jayne Suhler, *Senior Lecturer,* M.A., Texas (Austin)

Division of Music

Nancy Cochran, *Director, Division of Music, Professor of Music,* M.M., Ball State
Samuel Holland, *Professor of Music and Associate Director for Academic Affairs; Head, Piano Pedagogy,* Ph.D., Oklahoma
Alan Wagner, *Assistant Professor of Music Education and Associate Director of Meadows Wind Ensemble, Assistant Director for Admissions*, Ph.D., Florida State

Ensemble Directors

Marciem Bazell, *Assistant Professor of Opera,* M.M., Temple University
Alfred Calabrese, *Associate Professor and Director of Choral Activities*, D.M., Indiana
Jack Delaney, *Professor of Music and Director of Bands, 1999-2000 Meadows Foundation Distinguished Teaching Professor,* D.M.A., University of Cincinnati College-Conservatory of Music
Jon Lee, *Adjunct Lecturer, Director of Percussion Ensemble,* M.M., SMU
Paul Phillips, *Professor and Director of Orchestral Activities,* D.M.A., Eastman School of Music
Akira Sato, *Adjunct Lecturer, Director of Meadows Jazz Orchestra,* M.M., North Texas

Instrumental Faculty

Flute

Deborah Baron, *Adjunct Assistant Professor*, M.M., The Juilliard School
Jean Larson, *Adjunct Associate Professor,* Principal Flute DSO; M.M., Texas

Oboe

Eric Barr, *Adjunct Associate Professor,* Principal Oboe DSO; M.M., Catholic University

Erin Hannigan, *Adjunct Assistant Professor*, DSO, M.M., Eastman School of Music

Clarinet

Paul Garner, *Adjunct Associate Professor,* Associate Principal Clarinet DSO; M.M., Kansas

Bassoon

Wilfred Roberts, *Adjunct Associate Professor,* Principal Bassoon DSO; B.M., Oberlin College Conservatory of Music

Saxophone

Donald Fabian, *Adjunct Lecturer*, M.M., Michigan State University

Trumpet

Tom Booth, *Adjunct Associate Professor,* DSO; M.M., Illinois

Horn

Haley Hoops, *Adjunct Assistant Professor,* DSO, M.M. Northwestern University

Gregory Hustis, *Adjunct Professor, 1995-96 Meadows Foundation Distinguished Teaching Professor,* Principal Horn DSO; B.M., Curtis Institute of Music

Trombone

John Kitzman, *Adjunct Associate Professor,* Principal Trombone DSO; B.M., Michigan

Tuba

Matthew Good, *Adjunct Associate Professor*, B.M., Curtis Institute of Music

Percussion

Kalman Cherry, *Adjunct Associate Professor,* Principal Timpani DSO; Artist Diploma, Curtis Institute of Music

Douglas Howard, *Adjunct Associate Professor,* Principal Percussion DSO; M.M., Catholic University

Drew Lang, *Adjunct Lecturer*, M.M., University of Arizona

Ed Smith, *Adjunct Lecturer*

Jamal Mohamed, *Adjunct Lecturer*

Violin

Vesselin Demirev, *Adjunct Assistant Professor,* Artist Certificate, SMU

Diane Kitzman, *Adjunct Associate Professor,* B.A., Michigan

Eduard Schmieder, *Algur H. Meadows Professor of Violin and Chamber Music,* Diploma, Mussorgsky Musical College, Leningrad, Russia, Gnessin State Musical and Pedagogical Institute, Moscow, Russia

Jan Mark Sloman, *Adjunct Associate Professor,* Principal Associate Concertmaster DSO; Curtis Institute, Princeton

Viola

Barbara Hustis, *Adjunct Associate Professor,* Associate Principal Viola DSO; Curtis Institute of Music, Utah

Ellen Rose, *Adjunct Associate Professor,* Principal Viola DSO; M.M., Juilliard School of Music

Cello

Christopher Adkins, *Adjunct Associate Professor,* Principal Cello DSO; M.M.A., Yale

Double Bass

Thomas Lederer, *Adjunct Associate Professor,* Co-Principal Double Bass DSO; B.F.A., Carnegie Mellon

Harp

Susan Dederich-Pejovich, *Adjunct Assistant Professor,* Principal Harp DSO; B.A., Cleveland Institute of Music

Guitar

Robert Guthrie, *Adjunct Professor,* B.M., North Carolina School of the Arts

Keyboard

Organ/Harpsichord

Larry Palmer, *Professor of Harpsichord and Organ and Director of Graduate Studies,* A.Mus.D., Eastman School of Music

Piano

Joaquin Achucarro, *Joel Estes Tate Professor of Piano;* International Recording Artist and Pianist

Alessio Bax, *Adjunct Lecturer*, Artist Certificate, SMU

Wesley Beal, *Accompanist,* M.M., SMU

Tara Emerson, *Accompanist,* M.M., South Carolina

David Karp, *Professor of Piano,* D.M.A., Colorado

Carol Leone, *Associate Professor and Head of Piano,* Ph.D., North Texas

Alfred Mouledous, *Professor of Piano,* Pianist DSO; M.M., Eastman School of Music

David Porritt, *Piano Technician,* B.S., John Brown University

Piano Pedagogy/Preparation

Matthew Kline, *Associate Director of Piano Preparatory Department, Lecturer in Piano Pedagogy*, M.M., SMU

Catharine Lysinger, *Director of Piano Preparatory Department, Lecturer in Piano Pedagogy*, D.M.A., University of Houston

Music Education

Lynne Jackson, *Adjunct Lecturer*, M.M., Vandercook

Deborah Perkins, *Adjunct Assistant Professor,* Ph.D., North Texas

Caroline Stupple, *Assistant Professor of Music Education*, M.M.E., Temple University

Thomas W. Tunks, *Associate Provost and Professor of Music Education,* Ph.D., Michigan State

Music History/Literature

Lynne Jackson, *Adjunct Lecturer*, M.M., Vandercook

Deborah Perkins, *Adjunct Assistant Professor,* Ph.D., North Texas

Caroline Stupple, *Assistant Professor of Music Education*, M.M.E., Temple University

Thomas W. Tunks, *Associate Provost and Professor of Music Education,* Ph.D., Michigan State

Music Theory/Composition

Robert Frank, *Assistant Professor of Composition and Music Theory,* Ph.D., North Texas

Jacquelyn Hale, *Assistant Professor of Music Theory*, Ph.D., UNT

Kevin Hanlon, *Associate Professor of Composition,* D.M.A., Texas (Austin)

David L. Mancini, *Associate Professor of Music Theory,* Ph.D., Yale

Simon Sargon, *Professor of Composition,* M.S., Juilliard School of Music

Martin Sweidel, *Associate Professor of Composition,* D.M.A., University of Cincinnati College-Conservatory of Music

Robert Krout, *Assistant Professor and Head of Music Therapy Department*, Ed.D., Columbia University, MT-BC, R.M.Th.

Sacred Music

Michael Hawn, *Professor, D.M.A.,* Southern Baptist Theological Seminary

Voice

Virginia Dupuy, *Professor,* M.M., Texas (Austin)
Joan Heller, *Senior Lecturer and Head of Voice,* M.M., New England Conservatory
Barbara H. Moore, *Professor of Music,* M.S., Illinois

Division of Theatre

Rhonda Blair, *Professor of Theatre,* Ph.D., Kansas
Linda Blase, *Adjunct Lecturer,* M.F.A., Trinity
Carole Brandt, *Professor of Theatre,* Ph.D., Southern Illinois University
Leslie Brott, *Assistant Professor of Theatre,* M.F.A., Pennsylvania State University
Brad Cassil, *Lecturer in Stage Management,* B.F.A., California Institute of the Arts
Michael Connolly, *Associate Professor of Theatre,* Ph.D., Indiana
James Crawford, *Assistant Professor of Theatre,* M.F.A., University of California (San Diego)
Charles Helfert, *Associate Professor of Theatre, 2003-04 Meadows Foundation Distinguished Teaching Professor,* Ph.D., Wisconsin
Kevin Paul Hofeditz, *Associate Dean for Student Affairs, Professor of Theatre,* M.F.A., Missouri (Kansas City)
Steve Leary, *Technical Director,* B.A., Cameron
Bill Lengfelder, *Associate Professor of Theatre,* M.F.A., Lindenwood College
Cecil O'Neal, *Professor of Theatre,* B.A., Wisconsin
Russell Parkman, *Associate Professor of Theatre,* M.A. (Certified in Mime), Illinois
Virginia Ness Ray, *Associate Professor of Theatre*, Professional Certificate with Prize, Royal Academy of Dramatic Art, London; Post-Graduate Certificate-Acting and Voice, Yale University
Melinda Robinson, *Draper/Cutter,* M.F.A., Southern California
Sara Romersberger, *Assistant Professor of Theatre,* M.A. (Certified in Mime), Illinois
Ashley Smith, *Assistant Professor of Theatre,* M.F.A., University of Delaware
Gretchen Smith, *Associate Professor of Theatre,* Ph.D., Indiana
Claudia Stephens, *Associate Professor of Theatre and Division Chair,* M.F.A., Carnegie Mellon
Giva Taylor, *Costume Shop Manager,* M.F.A., SMU
Kathy Windrow, *Adjunct Lecturer,* M.A., M.F.A., SMU
Stanley Wojewodski, *Distinguished Artist-in-Residence,* M.F.A., The Catholic University of America
Steve Woods, *Assistant Professor of Theatre,* M.F.A., University of New Orleans

EMERITUS PROFESSORS

Robert T. Anderson, *University Distinguished Professor of Organ and Sacred Music, 1981-82 Meadows Foundation Distinguished Teaching Professor,* D.S.M., Union Theological Seminary
Robert Beard, *Associate Professor Emeritus of Dance,* M.F.A., SMU
Robert B. Chambers, *Associate Professor Emeritus of Stage Design,* M.A., Kansas
Alessandra Comini, *University Distinguished Professor Emerita, 1986-87 Meadows Foundation Distinguished Teaching Professor,* Ph.D., Columbia
Harris Crohn, *Associate Professor Emeritus of Piano,* D.M.A., Eastern School of Music
Charles Eagle, *Professor Emeritus of Music Therapy*
Eugene Ellsworth, *Professor Emeritus of Music*

Elizabeth A. Ferguson, *Professor Emerita of Dance, 1985-86 Meadows Foundation Distinguished Teaching Professor,* M.F.A., SMU
John Gartley, *Professor Emeritus of Cinema,* Ph.D., Michigan
Peggy Harrison, *Professor Emerita of Communication Disorders*
Mesrop Kesdekian, *Professor Emeritus of Theatre,* M.A., Penn State
Arthur B. Koch, *Associate Professor Emeritus of Art, 2004-05 Meadows Foundation Distinguished Teaching Professor,* M.S.A., Washington
Lois B. Land, *Professor Emerita of Music*
Bob R. Leonard, *Professor Emeritus of Theatre,* Ph.D., Kansas
John McElroy, *Professor Emeritus of Art*, M.S., Florida State
David McHam, *Professor Emeritus of Communications, 1994-95 Meadows Foundation Distinguished Teaching Professor,* M.S., Columbia
Dale Moffitt, *Associate Professor of Theatre, 1991-92 Meadows Foundation Distinguished Teaching Professor,* Ph.D., Washington State
Jim Morris, *Associate Professor Emeritus of Communications,* Ed.D., North Texas
James A. Ode, *Professor Emeritus of Music Education,* D.M.A., Performer's Certificate, Eastman School of Music
G. Donald Pasquella, *Associate Professor Emeritus of Communications,* M.A., Iowa
Darwin Payne, *Professor Emeritus of Communications,* Ph.D., Texas (Austin)
Ross W. Powell, *Associate Professor Emeritus of Music,* M.M. Eastman School of Music
Martin S. Reese, *Professor Emeritus of Communications*
Don Umphrey, *Professor Emeritus of Advertising,* Ph.D., Texas (Austin)
Wilbert Verhelst, *Professor Emeritus of Art*, M.A., University of Denver
Harold Weiss, *Professor Emeritus of Speech*
Stephen D. Wilder, *Professor Emeritus of Art*, M.F.A., Wisconsin

SCHOOL OF ENGINEERING

ADMINISTRATION

Geoffrey C. Orsak, Ph.D., *Dean*
James G. Dunham, P.E., Ph.D., *Associate Dean*
Tammy L. Richards, P.E., M.B.A., *Assistant Dean, Operations, Enrollment, Marketing and Communications*
Leo Pucacco, Ph.D., *Assistant Dean, Undergraduate Studies*
Richard S. Barr, Ph.D., *Chair, Engineering Management, Information, and Systems*
Hesham El-Rewini, P.E., Ph.D., *Chair, Department of Computer Science and Engineering*
Bijan Mohraz, P.E., Ph.D., *Chair, Department of Environmental and Civil Engineering*
Panos Papamichalis, P.E., Ph.D., *Chair, Department of Electrical Engineering*
Yildirim Hürmüzlü, Ph.D., *Chair, Department of Mechanical Engineering*
Andy Winstel, B.B.A., *Financial and Information Officer*
Kathy M. Hubbard, B.A., *Senior Director, Undergraduate Student Experience and Enrollment Management*
Misti Compton, *Executive Assistant to the Dean*

RESIDENT FACULTY

Khaled Abdelghany, *Assistant Professor of Environmental and Civil Engineering*, Ph.D., Texas (Austin)
Alfredo Armendariz, *Assistant Professor of Environmental and Civil Engineering,* Ph.D., North Carolina
H. Charles Baker, P.E., *Senior Lecturer of Electrical Engineering,* Ph.D., Texas (Austin)
Richard S. Barr, *Associate Professor of Engineering Management, Information, and Systems,* Ph.D., Texas (Austin)
Jerome K. Butler, P.E., *University Distinguished Professor of Electrical Engineering,* Ph.D., Kansas
Thomas Chen, *Associate Professor of Electrical Engineering and Associate Professor of Computer Science and Engineering,* Ph.D., California (Berkeley)
Frank Coyle, *Senior Lecturer of Computer Science and Engineering,* Ph.D., SMU
Marc P. Christensen, *Assistant Professor of Electrical Engineering,* Ph.D., George Mason
Carlos E. Davila, *Associate Professor of Electrical Engineering,* Ph.D., Texas (Austin)
Roger O. Dickey, P.E., *Senior Lecturer of Environmental and Civil Engineering,* Ph.D., SMU
Scott C. Douglas, *Associate Professor of Electrical Engineering,* Ph.D., Stanford
James G. Dunham, P.E., *Associate Professor of Electrical Engineering and Associate Professor of Computer Science and Engineering,* Ph.D., Stanford
Margaret H. Dunham, P.E., *Professor of Computer Science and Engineering,* Ph.D., SMU
John H. Easton, *Assistant Professor of Environmental and Civil Engineering,* Ph.D., Alabama, Birmingham
Hesham El-Rewini, P.E., *Professor of Computer Science and Engineering,* Ph.D., Oregon State
Judy Etchison, *Lecturer of Computer Science and Engineering*, M.S., Texas A&M, Commerce
Donald E. Evans, *Lecturer of Computer Science and Engineering,* D.M.A., North Texas
Gary Evans, P.E., *Professor of Electrical Engineering,* Ph.D., California Institute of Technology
Mark Fontenot, *Lecturer of Computer Science and Engineering*, M.S., SMU

Regina Gaiotti, P.E., *Lecturer of Environmental and Civil Engineering,* Ph.D., McGill, Canada
W. Milton Gosney, P.E., *Cecil and Ida Green Professor of Electrical Engineering,* Ph.D., California (Berkeley)
Ping Gui, *Assistant Professor of Electrical Engineering,* Ph.D., Delaware
Gemunu S. Happawana, *Assistant Professor of Mechanical Engineering,* Ph.D., Purdue
Richard V. Helgason, *Associate Professor of Engineering Management, Information, and Systems and Associate Professor of Computer Science and Engineering,* Ph.D., SMU
Jack P. Holman, P.E., *Brown Foundation Professor of Mechanical Engineering,* Ph.D., Oklahoma State
Yildirim Hürmüzlü, *Professor of Mechanical Engineering,* Ph.D., Drexel
David B. Johnson, P.E., *Professor of Mechanical Engineering,* Ph.D., Stanford
Jeffery L. Kennington, P.E., *Professor of Engineering Management, Information, and Systems,* Ph.D., Georgia Institute of Technology
Alireza Khotanzad, P.E., *Professor of Electrical Engineering,* Ph.D., Purdue
Fatih Kocan, *Assistant Professor of Computer Science and Engineering,* Ph.D., Case Western Reserve
Radovan Kovacevic, *Herman Brown Chair Professor of Mechanical Engineering,* Ph.D., University of Montenegro
Paul Krueger, *Assistant Professor of Mechanical Engineering and Assistant Professor of Environmental and Civil Engineering,* Ph.D., California Institute of Technology
José Lage, P.E., *Professor of Mechanical Engineering* Ph.D., Duke
Choon S. Lee, *Associate Professor of Electrical Engineering,* Ph.D., Illinois (Urbana)
Mary Alys Lillard, *Lecturer of Engineering Management, Information, and Systems,* M.S., SMU
Charles M. Lovas, P.E., *Associate Professor of Mechanical Engineering,* Ph.D., Notre Dame
David W. Matula, *Professor of Computer Science and Engineering,* Ph.D., California (Berkeley)
Gretchen Miller, *Visiting Lecturer of Engineering Management, Information, and Systems,* M.B.A., Texas (Arlington)
Bijan Mohraz, P.E., *Professor of Environmental and Civil Engineering, and Professor of Mechanical Engineering,* Ph.D., Illinois (Urbana)
Dona Mularkey, *Lecturer of Mechanical Engineering,* Ph.D., Vanderbilt
Sukumaran Nair, P.E., *Associate Professor of Computer Science and Engineering and Associate Professor of Electrical Engineering,* Ph.D., Illinois (Urbana)
Eli V. Olinick, *Associate Professor of Engineering Management, Information, and Systems,* Ph.D., California (Berkeley)
Geoffrey C. Orsak, *Professor of Electrical Engineering,* Ph.D., Rice
Panos Papamichalis, P.E., Professor *of Electrical Engineering,* Ph.D., Georgia Institute of Technology
Behrouz Peikari, P.E., *Professor of Electrical Engineering,* Ph.D., California (Berkeley)
Peter E. Raad, P.E., *Professor of Mechanical Engineering,* Ph.D., Tennessee (Knoxville)
Dinesh Rajan, *Assistant Professor of Electrical Engineering,* Ph.D., Rice
Peter-Michael Seidel, *Assistant Professor of Computer Science and Engineering,* Ph.D., University of Saarland, Germany
Thomas Siems, *Senior Lecturer of Engineering Management, Information, and Systems*, Ph.D., SMU

Mandyam D. Srinath, P.E., *Professor of Electrical Engineering,* Ph.D., Illinois (Urbana)

Jerrell R. Stracener, *Scholar in Residence of Engineering Management, Information, and Systems,* Ph.D., SMU

Stephen A. Szygenda, P.E., *Cecil H. Green Chair Professor of Computer Science and Engineering and Cecil H. Green Chair Professor of Engineering Management, Information, and Systems,* Ph.D., Northwestern

Mitchell A. Thornton, P.E., *Associate Professor of Computer Science and Engineering and Associate Professor of Electrical Engineering,* Ph.D., SMU

Jeff Tian, P.E., *Associate Professor of Computer Science and Engineering,* Ph.D., Maryland

Yuhang Wang, *Assistant Professor of Computer Science and Engineering,* Ph.D., Dartmouth College

David A. Willis, *Assistant Professor of Mechanical Engineering and Assistant Professor of Environmental and Civil Engineering,* Ph.D., Purdue

EMERITUS FACULTY

Kenneth L. Ashley, P.E., *Professor Emeritus of Electrical Engineering,* Ph.D., Carnegie Mellon

Charles E. Balleisen, P.E., *Professor Emeritus of Mechanical Engineering,* M.S.M.E., MIT

Robert R. Fossum, *Professor Emeritus of Electrical Engineering,* Ph.D., Oregon State

Someshwar C. Gupta, P.E., *Professor Emeritus of Electrical Engineering,* Ph.D., California (Berkeley)

Kenneth W. Heizer, P.E., *Professor Emeritus of Electrical Engineering,* Ph.D., Illinois (Urbana)

Lorn L. Howard, P.E., *Professor Emeritus of Electrical Engineering,* Ph.D., Michigan State

Paul F. Packman, P.E., *Professor Emeritus of Mechanical Engineering,* Ph.D., Syracuse

John A. Savage, P.E., *Professor Emeritus of Electrical Engineering,* M.S.E.E., Texas (Austin)

Cecil H. Smith, P.E., *Professor Emeritus of Environmental and Civil Engineering,* Ph.D., Texas (Austin)

Hal Watson Jr., P.E, *Professor Emeritus of Mechanical Engineering,* Ph.D., Texas (Austin)

ADJUNCT FACULTY

Jeffrey Alcantara, *Adjunct Assistant Professor of Computer Science and Engineering,* B.F.D., Texas A&M (Reel FX Creative Studios)

Feridoon Amini, *Adjunct Assistant Professor of Computer Science and Engineering,* M.S., SMU (Southwest Airlines)

Bogdan Antohe, *Adjunct Associate Professor of Mechanical Engineering,* Ph.D., SMU (MicroFab)

Karl Arunski, *Adjunct Assistant Professor of Engineering Management, Information, and Systems,* M.S.E.E., Washington University (Raytheon)

Leslie-Ann Asmus, *Adjunct Assistant Professor of Engineering Management, Information, and Systems,* Ph.D., George Mason University

John Barber, *Adjunct Assistant Professor of Environmental and Civil Engineering*, Ph.D., Indiana University of Pennsylvania (University of Texas at Dallas)

Terry V. Baughn, P.E., *Adjunct Associate Professor of Mechanical Engineering,* Ph.D., Delaware

John D. Baschab, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, M.B.A., University of Chicago (Impact Innovations Group)

Arthur Beck, P.E., *Adjunct Associate Professor of Environmental and Civil Engineering,* M.S., SMU (B.S.M. Engineers

Robert L. Bell, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, M.E.E.E., Brigham Young University (Lockheed Martin)

William David Bell, *Adjunct Assistant Professor of Engineering Management, Information, and Systems,* D.E., SMU (U.S. Defense Department)

Eric Bird, *Adjunct Assistant Professor of Electrical Engineering,* M.S., SMU (Ericsson)

Elena Borzova, *Adjunct Assistant Professor of Mechanical Engineering and Adjunct Assistant Professor of Environmental and Civil Engineering,* Ph.D., SMU

Mark K. Boyd, P.E., *Adjunct Assistant Professor of Environmental and Civil Engineering*, Ph.D., SMU (LCA Environmental)

William A. Bralick Jr., *Adjunct Assistant Professor of Computer Science and Engineering,* Ph.D., Pennsylvania State (Texas Instruments)

Ann E. Broihier, *Adjunct Lecturer of Computer Science and Engineering,* M.S., Northern Illinois (Raytheon)

Madhukar Budagavi, *Adjunct Assistant Professor of Electrical Engineering,* Ph.D., Texas A & M (Texas Instruments)

Hakki Candan Cankaya, *Adjunct Assistant Professor of Computer Science and Engineering,* Ph.D., SMU (Alcatel)

Gerald R. Carney, *Adjunct Associate Professor of Environmental and Civil Engineering,* Ph.D., North Texas (U.S. Environmental Protection Agency)

Robert Casagrande, *Adjunct Assistant Professor of Environmental and Civil Engineering,* M.B.A., SMU (SMU)

Michael Cassidy, *Adjunct Professor of Mechanical Engineering,* Ph.D., Illinois (Lucent Technologies)

Jean Chastain, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, M.B.A., University of Dallas (WorldCom)

Cheng Chung Chen, *Adjunct Assistant Professor of Electrical Engineering,* Ph.D., Florida

George W. Chollar, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, Ph.D. Texas Tech University (The Statistical Design Institute)

Kevin D. Cluff, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, P.E., Ph.D., University of Maryland, College Parks (Abbott Labs)

Luis E. Contreras, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, Ph.D., Georgia Institute of Technology

Howard Cowin, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, M.S.E., California State University at Northridge (Lockheed Martin)

Weiping Dai, P.E., *Adjunct Assistant Professor of Environmental and Civil Engineering,* Ph.D., Carnegie Mellon University (Trinity Consultants)

Gunter H. Daley, *Adjunct Assistant Professor of Engineering Management, Information, and Systems,* M.S., Southern Methodist University (UGS)

Joseph H. Dean, *Adjunct Assistant Professor of Engineering Management, Information, and Systems,* Ph.D., Texas A&M (Lockheed Martin)

Dennis Delzer, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, Ph.D. Oregon State University (TI/Raytheon)

James Duke, P.E., *Adjunct Associate Professor of Environmental and Civil Engineering,* Ph.D., Colorado State University

Ted Dumas, P.E., *Adjunct Associate Professor of Environmental and Civil Engineering and Adjunct Professor of Mechanical Engineering*, M.S.C.E., SMU

Matthew Durchholz, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, Ph.D., SMU (Lockheed Martin)

Carl Edlund, P.E., *Adjunct Associate Professor of Environmental and Civil Engineering,* B.S.M.E., University of Maryland (U.S. Environmental Protection Agency)

Fawzi Elghadamsi, P.E., *Adjunct Associate Professor of Environmental and Civil Engineering and Adjunct Associate Professor of Mechanical Engineering*, Ph.D., SMU (HDR)

Andrew Felder, Adjunct *Assistant Professor of Environmental and Civil Engineering,* J.D., New York Law School (The Arsenal Companies)

Edward Forest, *Retired Chair of Environmental and Civil Engineering,* Ph.D., Princeton

Dennis Frailey, *Adjunct Professor of Computer Science and Engineering and Adjunct Professor of Engineering Management, Information, and Systems,* Ph.D., Purdue (Raytheon)

Jerry Gannaway, *Adjunct Associate Professor of Mechanical Engineering,* D.E., SMU (Lockheed Martin)

Ramon Goforth, *Adjunct Professor of Mechanical Engineering,* Ph.D., Texas (Arlington)

Steven Gray, *Adjunct Professor of Electrical Engineering,* Ph.D., Northeastern (Nokia)

Dale Gutt, *Adjunct Lecturer of Computer Science and Engineering,* M.S., SMU

Ganesh L. Harpavat, *Adjunct Assistant Professor of Engineering Management, Information, and Systems,* Ph.D., University of Rochester (Lucent Technologies)

James Hinderer, *Adjunct Assistant Professor of Engineering Management, Information, and Systems,* Ph.D., (Raytheon)

Anwar Hirany, P.E., *Adjunct Assistant Professor of Environmental and Civil Engineering, and Adjunct Assistant Professor of Mechanical Engineering,* Ph.D., Cornell (ESPRI)

Ahmed H'mimy, *Adjunct Assistant Professor of Electrical Engineering,* Ph.D., SMU (Andrew Corp.)

Hossam H'mimy, *Adjunct Associate Professor of Electrical Engineering,* Ph.D., SMU (Ericsson)

Louis Hosek, *Adjunct Assistant Professor of Environmental and Civil Engineering*, Ph.D., Oklahoma (American Electric Power)

Gerard Ibarra, *Adjunct Assistant Professor of Engineering Management, Information, and Systems,* M.S., SMU (Business Courier Services)

Ron Jackson, *Adjunct Assistant Professor of Environmental and Civil Engineering,* B.S., Northern Illinois University (KDFW-TV)

Raji Josiam, *Adjunct Assistant Professor of Environmental and Civil Engineering*, M.S.C.E., Texas A&M (U.S. Environmental Protection Agency)

Kamran Z. Khan, *Adjunct Lecturer of Computer Science and Engineering,* M.S., UTD (MCI WorldCom)

Mohamed Khalil, *Adjunct Assistant Professor of Computer Science and Engineering,* Ph.D., New Mexico State

Clark Kinnaird, P.E., *Adjunct Associate Professor of Electrical Engineering,* Ph.D., SMU (Texas Instruments)

Bernard Ku, *Adjunct Professor of Electrical Engineering*, Ph.D., SMU (SBC Labs)

James E. Langford, *Adjunct Associate Professor of Environmental and Civil Engineering*, M.Arch., Harvard (James E. Langford, Architects and Planners, L.L.C.)

Craig L. Lee, *Adjunct Professor of Mechanical Engineering,* Ph.D., SMU (Raytheon)

Donald L. Legg, P.E., *Adjunct Associate Professor of Environmental and Civil Engineering,* M.S.S.M., University of Akron (Bell Helicopter)

Richard Levine, P.E., *Adjunct Professor of Electrical Engineering,* Ph.D., MIT (Beta Scientific Laboratory)

Richmond G. Lewin, *Adjunct Instructor of Computer Science and Engineering,* M.C.S.E., SMU

Jan Lyons, *Adjunct Assistant professor of Engineering Management, Information, and Systems,* Ph.D., University of Alabama in Huntsville

Babu V. Mani, *Adjunct Assistant Professor of Computer Science and Engineering,* Ph.D., Nova Southeastern (Alcatel)

F. Marco Marchetti, *Adjunct Assistant Professor of Computer Science and Engineering,* Ph.D. Queen's University, Canada (Trisphere Consulting Services)

Paul Martin, P.E., *Adjunct Assistant Professor of Environmental and Civil Engineering,* M.S., Nebraska

Matthew R. McBride, *Adjunct Lecturer of Computer Science and Engineering,* M.S. SMU (Countrywide Financial)

Lee McFearin, *Adjunct Assistant Professor of Computer Science and Engineering,* Ph.D., SMU (Alcatel)

Freeman L. Moore, *Adjunct Assistant Professor of Computer Science and Engineering*, Ph.D., North Texas (Raytheon Systems Co.)

James Norton, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, Ph.D., Oklahoma State University

David Nowacki, *Adjunct Assistant Professor of Mechanical Engineering,* Texas (Dallas)

Augustyn Ortynski, *Adjunct Assistant Professor of Engineering Management, Information, and Systems,* Ph.D., SMU (Nortel)

Robert S. Oshana, *Adjunct Lecturer of Computer Science and Engineering,* M.S., SMU (ObjectSpace Inc.)

David Pearson, *Adjunct Assistant Professor of Electrical Engineering,* M.S., SMU (Alcatel)

David Peters, *Adjunct Assistant Professor of Engineering Management, Information, and Systems,* B.B.A., SMU, M.S. in Accounting and Information Management, University of Texas at Dallas

Albert Petrasek, *Adjunct Associate Professor of Mechanical Engineering,* Ph.D., Texas A&M ((Carter and Burgess)

John J. Pfister, *Adjunct Assistant Professor of Computer Science and Engineering,* M.C.S., Texas A&M (Texas Instruments)

Oscar K. Pickels, *Adjunct Assistant Professor of Engineering Management, Information, and Systems,* M.B.A., SMU

Jon Piot, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, M.B.A. Harvard Business School (Impact Innovations Group)

Rod Pipinich, *Adjunct Associate Professor of Mechanical Engineering,* Ph.D., SMU (Lockheed Martin)

Donald C. Price, *Adjunct Professor of Mechanical Engineering,* Ph.D., Oklahoma State (Raytheon)

John D. Provence, P.E., *Adjunct Associate Professor of Electrical Engineering,* Ph.D., SMU (Honeywell)

Leo R. Pucacco, *Adjunct Assistant Professor of Electrical Engineering,* Ph.D., SMU

P.K. Rajasekaran, P.E., *Adjunct Professor of Electrical Engineering,* Ph.D., SMU

Natarajan Ramanan, *Adjunct Assistant Professor of Mechanical Engineering,* Ph.D., Ohio State (FSI International)

Jon D. Rauscher, *Adjunct Associate Professor of Environmental and Civil Engineering,* Ph.D., Colorado State University (U.S. Environmental Protection Agency)

Mohamed Omar Rayes, *Adjunct Assistant Professor of Computer Science and Engineering,* Ph.D., Kent State

Edmond Richer, *Adjunct Assistant Professor of Mechanical Engineering,* Ph.D., SMU (Southwestern)

Mark Sampson, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, M.S., University of Southern California (EDS)
Steven Sanazaro, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, M.A., University of Illinois-Champaign (Tatum CIO Partners)
Sanjay Kumar Singh, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, Ph.D., University of Georgia (Computer Technology Solutions)
V. Devon Smith, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, Ph.D., University of North Texas (Lockheed Martin)
Gordon Sohl, *Adjunct Assistant Professor of Electrical Engineering,* B.S., Minnesota (Abbott Laboratories)
Gheorghe Spiride, *Adjunct Assistant Professor of Engineering Management, Information, and Systems,* Ph.D., SMU (Nortel Networks)
D. Blair Spitzberg, *Adjunct Associate Professor of Environmental and Civil Engineering,* Ph.D., Texas (U.S. Nuclear Regulatory Commission)
Wendy Spring, *Adjunct Assistant Professor of Engineering Management, Information, and Systems,* M.B.A., Texas (Arlington)
John Stanley, *Adjunct Assistant Professor of Environmental and Civil Engineering*, M.S. (Engineering Management), SMU (FACServices Inc.)
Stephen L. Stepoway, *Adjunct Assistant Professor of Computer Science and Engineering,* Ph.D., Texas (Dallas)
Bennett Stokes, *Adjunct Associate Professor of Environmental and Civil Engineering,* J.D., Texas (Austin)
William Stripling, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, DEEM, SMU (EDS)
William Swanson, *Adjunct Assistant Professor of Engineering Management, Information, and Systems,* B.S., Texas A&M
Ken Thomas, *Adjunct Assistant Professor of Environmental and Civil Engineering*, M.S. (Human Relations and Business), Amberton University
Jim Veach, *Adjunct Assistant Professor of Environmental and Civil Engineering,* J.D., SMU (Fina Oil & Chemical Co.)
John Via, III, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, DEEM, SMU (Alcon Laboratories)
Gregory Wilson, P.E., *Adjunct Assistant Professor of Environmental and Civil Engineering,* Ph.D., Arizona State (Texas A&M University, Commerce))
James Wilson, *Adjunct Associate Professor of Mechanical Engineering,* Ph.D., SMU (Raytheon)
Dan Wittliff, *Adjunct Assistant Professor of Environmental and Civil Engineering,* M.B.A., University of Oklahoma (Dan Wittliff Consulting PLCC)
Chris Witzke, *Adjunct Associate Professor of Mechanical Engineering,* M.S.E.E., SMU (Marlow Industries)
Scott Woodrow, P.E., *Adjunct Assistant Professor of Environmental and Civil Engineering*, M.S. (Hazardous and Waste Materials Management), SMU (Atmel Corporation)
John Yarrow, *Adjunct Assistant Professor of Engineering Management, Information, and Systems*, M.S., University of North Texas (Southwest Airlines)
Hossam Zaki, *Adjunct Professor of Engineering Management, Information, and Systems,* Ph.D., SMU
Yanjun Zhang, *Adjunct Assistant Professor of Computer Science and Engineering, and Engineering Management, Information, and Systems,* Ph.D., University of California-Berkeley (Sabre Decision Technologies)

06420.506