COLLEGE OF ENGINEERING

FRANK H. DOTTERWEICH
COLLEGE OF ENGINEERING

William A. Heenan, *Dean*
Kuruvilla John, *Associate Dean*
Sheryl L. Custer, *Executive Assistant to the Dean*
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Mission Statement

The Frank H. Dotterweich College of Engineering at Texas A&M University-Kingsville is dedicated to recruiting the highest caliber students, retaining them through guidance and direction and graduating degreed engineers and scientists who will compete and be recognized in a global society. To further fulfill this mission, an ongoing, self-evaluation process will include an active recruitment program of faculty and staff who will not only be recognized nationally for their expertise, but also for their ability to impart to students the most needed skills to function in a competitive work environment.

The Frank H. Dotterweich College of Engineering comprises the following academic units:

Department of Chemical Engineering and Natural Gas Engineering
Department of Civil and Architectural Engineering
Department of Electrical Engineering and Computer Science
Department of Environmental Engineering
Department of Industrial Technology
Department of Mechanical Engineering and Industrial Engineering
South Texas Environmental Institute

The college offers basic level programs leading to the Bachelor of Science degrees in chemical engineering, civil engineering, electrical engineering and mechanical engineering. These engineering programs are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET). The college also offers programs leading to the Bachelor of Science degrees in architectural engineering, computer science and industrial technology.

The basic level engineering programs are designed to give the student an understanding of the fundamental principles underlying engineering science and engineering practice. Each curriculum contains basic courses to develop a solid foundation in mathematics, chemistry and physics and includes a general background in humanities and social sciences. Building on this background, the engineering science courses provide application of basic principles and the analysis of engineering systems. The engineering design component of the curriculum in each area provides the engineering student with methods and techniques for the solution of technological problems of society.

The curriculum in architectural engineering, computer science and in industrial technology are similarly structured to provide the students a solid base in their field.

The laboratory facilities are equipped to facilitate learning. Students will become familiar with the instruments, procedures and processes employed in industry. A computation center is available for students' use throughout their course of study.

The college offers programs of study leading to both the Master of Science and the Master of Engineering degrees along with a Ph.D. in Environmental Engineering. Individuals interested in graduate programs should review the requirements listed in the graduate catalog.

Entering Freshmen

Entering freshmen are required to have a minimum composite score of 21 on the ACT or 970 on the SAT. Students whose test scores fall between 18-20 (ACT) or 810-969 (SAT) will be placed in the Pre-Engineering (PPEN) major status in order to

complete preparatory course work. The student will be transferred to an engineering program after successfully obtaining an overall cumulative and math/science GPA of 2.0 in the second semester of course work. (Course work in math and science must include MATH 1348 or higher and CHEM 1111/CHEM 1311.)

Students who fall below the minimum pre-engineering test score (ACT-18/SAT-810) will not be allowed entry into the college until an overall, cumulative and math/science GPA of 2.5 or better has been attained. Once this criteria has been met, the student may reapply for admission to an engineering program.

Transfer Students

Transfer students will be accepted in the college unconditionally if their overall grade point average from the previous institutions is a 2.5. A&M-Kingsville students desiring to change their major to engineering must also meet this requirement.

Non-engineering majors may take one lower level (1000-2000) engineering course a semester. Upper level engineering courses (3000-4000) may not be taken by non-engineering majors. Exceptions to the above policy must be approved in writing by the dean of the student's college and the dean of engineering. Students who enroll in engineering courses without approval will be dropped from the course.

Students who transfer into the College of Engineering from another college within this institution that have a cumulative GPA of 2.0-2.49 on a 4.0 grading system will be placed into our Pre-Engineering (PPEN) major. After two semesters (Fall/Spring), the student will be re-evaluated by his/her adviser. If the student has maintained satisfactory progress, the student will be transferred out of PPEN and placed into a regular engineering major. A special change of major form will be completed and signed by the adviser, the chair of the department and the dean of the college. Students who do not achieve satisfactory progress will remain in PPEN and will be re-evaluated again after the completion of one (1) academic year.

Students planning to transfer to the Frank H. Dotterweich College of Engineering from another four-year university should apply for admission as early as possible. Once accepted, the student is encouraged to contact the appropriate department chair during the semester prior to enrolling at A&M-Kingsville. Course transferability and course prerequisite requirements can be determined to allow a smooth transition into the program at A&M-Kingsville.

Community college transfer students should complete English, mathematics and science courses as early as possible. The basic engineering courses required for a specific degree should also be completed. If some of these courses are not available at the college the student is attending, early transfer or a summer session at A&M-Kingsville may be advisable to enable the student to stay on schedule.

Specific articulation and joint admission agreements are available for several community colleges. These agreements can be viewed on the college's homepage at http://www.engineer.tamuk.edu.

Transfer of Credit

The university has established course equivalencies from the majority of Texas community colleges and universities. The Texas Higher Education Coordinating Board has established guidelines on course transferability from two-year colleges to four-year universities in engineering. In addition to the university policies controlling the granting of credit for course work taken at other institutions where equivalency has not been established, the following policies apply to students entering the Frank H. Dotterweich College of Engineering from such institutions:

a. All courses taken at another institution are subject to approval by the dean of the Frank H. Dotterweich College of Engineering and the chair of the degree granting department. Courses are approved on a course-by-course basis to ensure their acceptability in fulfilling requirements for a degree. In making this evaluation, the student may be required by the dean and/or department chair to produce catalogs and other supporting material from the institution from which the student is transferring.
b. All passing grades will be accepted from students transferring under a Joint Articulation Agreement. For all others, degree credit will not normally be granted for any course taken at another institution in which the student's grade in that course was not the equivalent of at least a *C* and an overall 2.0 on a 4.0 grading system.

A maximum of 72 semester hours may be transferred from institutions that do not have engineering programs accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET). Advanced (3000- or 4000-level) engineering courses from four-year institutions that do not have ABET accredited programs may be applied toward degree requirements only if approved by the department chair and the dean.

The student is responsible for timely processing of all course substitutions. This action should be completed during the first semester of work at A&M-Kingsville.

Academic Counseling

Students are assigned to an academic adviser in their major department upon entering the Frank H. Dotterweich College of Engineering. Academic counseling and preregistration sessions are scheduled each semester to allow students to review their academic progress and plan their schedule for the next semester. All pre-engineering and engineering students are assigned an adviser. Students are required to see their adviser before they will be permitted to register. Students should also consult their adviser for approval of academic matters such as choice of electives, course substitutions, course overloads and adding or dropping courses. The dropping of key courses in a curriculum may delay the student's progress toward the desired degree.

Requirements for the Bachelor of Science Degree in the Frank H. Dotterweich College of Engineering

The basic requirements for the Bachelor of Science degree is 130-142 semester hours of academic work, depending upon the career field chosen. Students coming from high school with adequate preparation will be able to satisfy this requirement in eight semesters. Students requiring preparatory work or choosing to take lighter loads will take longer to complete degree requirements.

Engineering is a rapidly changing profession and the departmental curricula are updated continuously to keep pace with these changes. Students entering under this catalog will be required to comply with such curriculum changes in order to earn their degree. However, the total number of semester hours required for the degree may not be increased and all work completed in accordance with this catalog prior to the curriculum change will be applied toward the student's degree requirements. Courses that are modified or added to a curriculum and incorporated into the curriculum at a level beyond that at which a student is enrolled may become graduation requirements for that student. Courses that are incorporated into the curriculum at a level lower than the one at which the student is enrolled are not required for that student. Former students of the college who have been out of school for two consecutive semesters must meet the curriculum requirements in effect at the time of their readmission.

Graduation Requirements

A candidate for a degree in the Frank H. Dotterweich College of Engineering must satisfy the university's "General Education Requirements" as set forth earlier in the catalog.

For engineering, computer science and industrial technology degree plans, the Criterion I (B) requirement must be satisfied by taking BCOM 3304. The social science or humanities elective must come from any advanced level political science or history course. Students are encouraged to take HIST 3324 to satisfy this requirement. Criterion VI, the fine arts elective, must be chosen from ARTS 1303, ARTS 1304; MUSI 2306 or THEA 4308.

A candidate for a degree from the Frank H. Dotterweich College of Engineering must also meet the following requirements in fulfilling one of the degree plans prescribed on the following pages.

All candidates must satisfy the requirements to maintain a grade point average of 2.0 on (1) all course work attempted and (2) all course work attempted at A&M-Kingsville.

Candidates for engineering or computer science degrees must also maintain a grade point average of 2.0 in (1) all engineering and computer science courses in the major specified for the degree and (2) all mathematics and natural science courses specified for the degree.

Candidates for the industrial technology degree must also maintain a grade point average of 2.5 in (1) all course work specified for their major and (2) 2.0 for all business administration course work specified for the degree.

It is the candidate's responsibility to ensure that all degree requirements are met.

Effective Fall 2005, Industrial Technology majors must pass a departmental exit exam.

Communication Skills

The college will evaluate the communication skills of all its majors. Each student must demonstrate minimal communication skills by passing BCOM 3304 with a minimum grade of "C."

DEPARTMENT OF CHEMICAL ENGINEERING AND NATURAL GAS ENGINEERING

Ali Pilehvari, *Chair*
Engineering Complex 303. MSC 193. Extension 2002.

Professors
Al-Saadoon, Heenan, Pilehvari, Serth
Associate Professor
Chisholm
Assistant Professor
Lee

The Educational Objectives of the Chemical Engineering Program are:

1. **To prepare students for successful careers in the chemical process industries, related industries and governmental agencies.**

2. **To prepare students for post-graduate study in chemical engineering or related disciplines.**

3. **To instill in students a sense of responsibility to their profession and to society in general.**

CHEMICAL ENGINEERING (CHEN)

1301. Introduction to Chemical Engineering. 3(3-0)
Introduction to the profession of chemical engineering. Elementary design problems are used to introduce open-ended problems and critical thinking. Principles of teaming are emphasized throughout the course in accord with the design problems. Prerequisite: registration in or credit for CHEM 1311.

2371. Conservation Principles. 3(3-0)
Applications of the conservation laws of mass and energy to the solution of chemical engineering problems. Prerequisites: CHEM 1312 and CHEN 1301 or PHYS 2325/2125.

3310. Heat Transfer Phenomena. 3(3-0)
Fundamentals of energy transport and system applications involving this operation including computer applications to heat exchanger design. Prerequisites: CHEN 3392/NGEN 3392, CHEM 2421 or CHEM 3323/3123 and CHEN 3347 or MEEN 3347.

3315. Chemical Process Design I. 3(3-0)
Basic principles and techniques of economic analysis and cost engineering with applications to problems in chemical process and equipment design. Prerequisites: CHEN 2371 and credit for or registration in CHEN 3310.

3321. Process Simulation. 3(3-0)
The basic numerical methods used in chemical process simulation. An introduction to the use of commercial process simulators, with hands-on applications. Prerequisite: MATH 3320.

3347. Chemical Engineering Thermodynamics I. 3(3-0)
Theory and applications of the first and second laws of thermodynamics to mechanical, chemical, magnetic and electrical interactions for both reversible and irreversible processes. Prerequisite: MATH 2414. Corequisite: PHYS 2326/2126.

3371. Chemical Engineering Thermodynamics II. 3(3-0)
Procedures for deciding when and to what extent chemical reactions and phase changes may be expected to occur according to the basic principles of physical chemistry and the laws of thermodynamics. Application of computers to advanced thermodynamic problems. Prerequisites: CHEM 3331, CHEM 3325/3125 and CHEN 3347.

3392. Fluid Transport Phenomena. 3(3-0)
Fundamentals of momentum transport, including fluid statics, flow of compressible and incompressible fluids, pumps, turbines and compressors, with computer applications. Prerequisite: MATH 3320. Corequisite: MEEN 2355 or MEEN 3355. (Credit may not be obtained in both CHEN 3392 and NGEN 3392.)

4278. Unit Operations. 2(0-6)
Selected laboratory experiments on fluid flow and heat transfer. Prerequisite: CHEN 3310. Laboratory fee, $5.

4279. Unit Operations Laboratory. 2(0-6)
Selected laboratory experiments on heat and mass transfer. (Credit may not be obtained in both CHEN 4279 and NGEN 4279.) Laboratory fee, $5.

4311. Biochemical Engineering. 3(3-0)
Principles involved in the processing of biological materials using biological agents such as cells, enzymes or antibodies. Prerequisites: CHEM 3323/3123 or CHEM 2421 and CHEM 3331.

4316. Chemical Process Design II. 3(3-0)
The application of chemical engineering principles to a sequence of design problems utilizing computer software, such as SIMSCI. Prerequisites: CHEN 3315, CHEN 3371 and CHEN 3310.

4317. Chemical Process Design III. 3(3-0)
The application of chemical engineering principles, including economic criteria to a comprehensive design problem. Computer software is utilized as a design aid. Prerequisites: CHEN 4316, CHEN 4373, CHEN 4389 and credit for or registration in CHEN 4392.

4335. Special Problems. V:1-3
Individual solution of selected problems in chemical engineering conducted under direct supervision of a faculty member. May be repeated for up to six hours. Prerequisite: senior standing.

4373. Kinetics and Reactor Design. 3(3-0)
Chemical reaction rates and design of chemical reactors. Applications of computers to chemical kinetics and the design of chemical reactors. Prerequisites: CHEN 3371, CHEN 3310 and CHEM 3332.

4383. Natural Gas Processes. 3(3-0)
The design, operation and economics of systems for the utilization of hydrocarbon gases and liquids, the concentration of their components by absorption and fractionation procedures. Use of computer aided design and economic evaluation of facility designs. Prerequisites: CHEN 4389. (Credit may not be obtained in both CHEN 4383 and NGEN 4383.)

4386. Air Pollution Control. 3(3-0)
A fundamental approach to air pollution testing, control and design of control systems. Introduction to dispersion modeling via computer. Prerequisite: CHEN/NGEN 3392 and senior standing.

4388. Process Heat Transfer. 3(3-0)
Design and analysis of heat transfer equipment used in the chemical and petroleum industries. Heat exchangers, condensers, evaporators, reboilers. Extended surface heat transfer equipment. Computer applications to heat exchanger design. Prerequisite: CHEN 3310.

4389. Mass Transfer Phenomena. 3(3-0)
Fundamentals of mass transport, including gas absorption, extraction, membrane separation, binary and multicomponent distillation, with computer design applications. Prerequisites: CHEN 3331 and credit or registration in CHEN 3310.

4392. Process Dynamics and Control. 3(2-3)
Basic operating theory of control instruments and their application to industrial chemical process. Applications of computers to process control. Prerequisites: CHEN 4373 and CHEN 4389. Laboratory fee, $5.

NATURAL GAS ENGINEERING (NGEN)

2102. Introduction to Natural Gas Engineering Design II. 1(1-0)
An introduction to the natural gas industry with emphasis on the role and duties of a natural gas engineer. Open ended problems regarding planning, development and operation of natural gas fields will be employed to allow second year students to apply design and decision making. Team development will be stressed.

3322. Fundamentals of Reservoir Engineering. 3(2-3)
Physical properties of petroleum reservoir rocks, lithology, porosity, fluid saturations, permeability and capillary characteristics as they relate to the production of oil and gas. Thermodynamic behavior of naturally occurring hydrocarbon mixtures. Evaluation and correlation of physical properties of petroleum reservoir fluids. Corequisites: NGEN/CHEN 3392, GEOL 1304/1104 and CHEM 2421. Laboratory fee, $5.

3392. Fluid Transport Phenomena. 3(3-0)
Fundamentals of momentum transport including fluid statics, flow of compressible and incompressible fluids, pumps, turbines and compressors, with computer applications. Prerequisites: MATH 3320. Corequisite: MEEN 2355 or MEEN 3355. (Credit may not be obtained in both NGEN 3392 and CHEN 3392.)

3493. Natural Gas Drilling Engineering. 4(3-3)
Introduction to drilling equipment and methods, drilling fluids, casing and cementing of wells. Application of computers to the drilling of wells. Prerequisites: NGEN 3322 and NGEN/CHEN 3392. Laboratory fee, $10.

4279. Unit Operations Laboratory. 2(0-6)
Selected laboratory experiments in heat and mass transfer. Prerequisites: CHEN 4389. (Credit may not be obtained for both NGEN 4279 and CHEN 4279.) Laboratory fee, $5.

4310. Gas and Oil Property Evaluation. 3(3-0)
The application of natural gas engineering principles in estimating the value of gas and oil properties utilizing computer softwares, such as POGO. Prerequisites: NGEN 4385 and NGEN 4496.

4317. Environmental Engineering Fundamentals. 3(3-0)
An introductory course in environmental engineering: science basis, law and regulations, protection of human health and the environment from air, water, solid/hazardous and product pollution. Structure of the environmental industry. Prerequisite: junior or senior standing in physical science, engineering or agriculture. (Credit may not be obtained in both NGEN 4317 and EVEN 4317.)

4335. Special Problems. V:1-3
Individual solution of selected problems in natural gas engineering conducted under direct supervision of a faculty member. May be repeated for up to 6 semester hours. Prerequisite: senior standing.

4337. Industrial Hygiene and Toxicology. 3(3-0)
Introduction to workplace environmental controls to safeguard the health and comfort of both employees and the public, including the toxic/hazardous effects of chemical, physical and biological agents. Establishing, maintaining and assessing an industrial hygiene and toxicology program. Prerequisite: junior standing in physical science, engineering or agriculture.

4383. Natural Gas Processes. 3(3-0)
The design, operation and economics of systems for the utilization of hydrocarbon gases and liquids, the concentration of their components by absorption and fractionation procedures. Use of computer aided design and economic evaluation of facility designs. Prerequisites: CHEN 4389. (Credit may not be obtained in both NGEN 4383 and CHEN 4383.)

4385. Advanced Reservoir Engineering. 3(3-0)
Phase relations of hydrocarbon systems, material balance methods, flow in reservoirs and displacement of gas. The application of computers to reservoir engineering. Prerequisite: NGEN 3493.

4387. Well-Logging and Correlation. 3(3-0)
Theory and methods of modern well-logging and their applications. Prerequisite: NGEN 3493 or GEOL 3431.

4496. Natural Gas Production and Distribution. 4(3-3)
Theory, design and methods of gas well testing and production. Distribution topics include pipeline and compressor design and flow measurement. The application of computers to production, testing and distribution design and evaluation. Prerequisites: NGEN 3392/CHEN 3392 and NGEN 3322. Laboratory fee, $5.

Degree Requirements
Bachelor of Science in Chemical Engineering
Accredited by the EAC of the Accreditation Board for Engineering and Technology

Freshman Year				**Junior Year**			
CHEM 1111	**1**	**CHEM 1112**	**1**	**BIOL 1308**	**3**	**CHEN 3310**	**3**
CHEM 1311	**3**	**CHEM 1312**	**3**	**CHEN 3321**	**3**	**CHEN 3315**	**3**
CSEN 2303	**3**	**CHEN 1301**	**3**	**CHEN 3331**	**3**	**CHEM 3332**	**3**
ENGL 1301	**3**	**ENGL 1302**	**3**	**CHEN 3347**	**3**	**CHEN 3371**	**3**
HIST 1301	**3**	**MATH 2414**	**4**	**CHEN 3392**	**3**	**^*Kinesiology***	**1**
MATH 2413	**4**	**PHYS 2325/**		**POLS 2301**	**3**	**POLS 2302**	**3**
MEEN 1201	**2**	**PHYS 2125**	**4**		**18**		**16**
	19		**18**				
Sophomore Year				**Senior Year**			
CHEM 3323/		**BCOM 3304**	**3**	**Adv. Soc Sci or**		**CHEN 4279/**	**2**
CHEM 3123	**4**	**CHEM 3325/**		**Hum. Elective**	**3**	**CHEN 4311**	**3**
CHEN 2371	**3**	**CHEM 3125**	**4**	**CHEN 4278**	**2**	**CHEN 4317**	**3**
Fine Arts Elective	**3**	**MATH 3415**	**4**	**CHEN 4316**	**3**	**CHEN 4386**	**3**
HIST 1302	**3**	**MEEN 2355**	**3**	**CHEN 4373**	**3**	**CHEN 4392**	**3**
^*Kinesiology*	**1**	**PHYS 2326/**		**CHEN 4389**	**3**	**^*Kinesiology***	**1**
MATH 3320	**3**	**PHYS 2126**	**4**	**MATH Elective**	**3**		**15**
	17		**18**		**17**		
						Total Hours Required:	**138**

Electives are selected from the following:
Mathematics: MATH 4320, MATH 4370, MATH 4371, MATH 4341, MATH 4321, MATH 4372, MATH 4373, STAT 4303, CSEN 4363.
Social science or humanities: any advanced-level political science course or any advanced-level history course.
Fine arts electives: ARTS 1303, ARTS 1304, MUSI 3302/THEA 3302, MUSI 2306, MUSI 3306 or THEA 4308.
BCOM 3304, Business Communications, must be taken and passed with a "C" or better to satisfy the communication criteria and the Frank H. Dotterweich College of Engineering's communication skills requirement.

^For courses listed under Core Curriculum "Components" see "General Requirements for Graduation with a Baccalaureate Degree" in an earlier section of this Catalog.

Degree Requirements
Bachelor of Science in Natural Gas Engineering
(with an emphasis in Environmental Engineering)
Accredited by the EAC of the Accreditation Board for Engineering and Technology

Freshman Year				Junior Year			
CHEM 1111	1	BIOL 1308/BIOL 1108	4	CHEM 3331	3	CEEN 3311	3
CHEM 1311	3	CHEM 1112	1	CHEN 3347	3	CHEN 3310	3
CSEN 2304	3	CHEM 1312	3	CHEN 3392/		EEEN 3331	3
ENGL 1301	3	ENGL 1302	3	NGEN 3392	3	NGEN 3493	4
GEOL 1303/		MATH 2413	4	NGEN 3322	3	NGEN 4496	4
GEOL 1103	4	NGEN 1201	2	Soc Sci/Hum Elective	3		17
HIST 1301	3		17	STAT 4303	3		
MEEN 1201	2				18		
	19						
Sophomore Year				**Senior Year**			
CHEM 2421	4	BCOM 3304	3	CHEN 4389	3	^*Kinesiology*	1
^*Kinesiology*	1	HIST 1302	3	EVEN 4317/		MATH Elective	3
MATH 2414	4	MATH 3320	3	NGEN 4317	3	NGEN 4279	2
NGEN 2102	1	MEEN 2355	3	EVEN 4337/		NGEN 4310	3
PHYS 2325/		PHYS 2326/		NGEN 4337	3	NGEN 4383	3
PHYS 2125	4	PHYS 2126	4	Fine Arts Elective	3	NGEN 4387	3
POLS 2301	3	POLS 2302	3	^*Kinesiology*	1		15
	17		19	NGEN 4385	3		
					16	**Total Hours Required:**	**138**

Mathematics elective: MATH 4320, MATH 4341, MATH 4370, MATH 4371, MATH 4372, MATH 4374, STAT 4303, CSEN 4363. Other electives may be chosen only with consent of adviser and department chair.
The social science or humanities elective: any advanced-level political science course or any advanced-level history course.
The fine arts elective ARTS 1303, ARTS 1304, MUSI 3302/THEA 3302, MUSI 2306, THEA 4308.
BCOM 3304 must be taken and passed with a "C" or better to satisfy the communication criteria and the Frank H. Dotterweich College of Engineering's communication skills requirement.
NOTE: This is a suggested plan of study. Courses may not be taken out of order without permission of adviser. In every case prerequisites must be satisfied before a course is taken. The complete program of electives must be approved by the department chair.

^For courses listed under Core Curriculum "Components" see "General Requirements for Graduation with a Baccalaureate Degree" in an earlier section of this Catalog.

DEPARTMENT OF CIVIL AND ARCHITECTURAL ENGINEERING

Hector Estrada, *Chair*
Engineering Complex 376D. MSC 194. Extension 2269.

Professors
Leelani, Sai
Associate Professors
Estrada, Faruqi
Assistant Professors
Aguiniga, You

The Educational Objectives of the Civil Engineering Program are:

1. **To instill in our students a sense of the scholarship and leadership of the civil engineering profession.**

2. **To educate and prepare students for a lifelong career as practicing professional civil engineers who are ethical and socially responsible.**

3. **To produce graduates with a strong academic base for advanced studies.**

The Educational Objectives of the Architectural Engineering Program are:

1. **To provide graduates with the necessary engineering skills to engage in lifelong careers as practicing professional architectural engineers who are ethical and socially responsible.**

2. **To develop engineering graduates with a broad understanding of the problem-solving and design skills necessary to operate in the interdisciplinary arena of architectural engineering.**

3. **To provide candidates with the knowledge and skills of mathematics, science and engineering necessary to pursue post-baccalaureate studies.**

ARCHITECTURAL ENGINEERING (AEEN)

1310. Computer Based Graphics and Design. 3(2-3)
Introduction to procedures in computer-aided design and computer graphics used in producing plans and three-dimensional electronic models associated with building design and construction. Required of all freshman in Architectural Engineering.

1320. Introduction to Architectural Design. 3(1-6)
Introduction to architectural design principles, concepts and problem-solving approaches. Issues addressed by a series of two-and three-dimensional building studies. Six laboratory hours a week. Prerequisite: AEEN 1310.

2325. Introduction to Development in Architecture. 3(3-0)
Principles of architectural development with emphasis on form and space relationships, structural elements, building materials and methods of construction, building and site relationships. Prerequisite: AEEN 1320.

3303 Structural Analysis. 3(3-0)
Statically determinate structures. Moving loads. Analysis of statically indeterminate structures by consistent deformation, slope-deflection and moment-distribution. Prerequisite: CEEN 3311. (Credit may not be obtained in both AEEN 3303 and CEEN 3303.)

3304. Reinforced Concrete Design. 3(3-0)
Mechanics, behavior and design of reinforced concrete members subject to axial loads, bending, torsion and shear. Prerequisite: AEEN 3303. (Credit may not be obtained in both AEEN 3304 and CEEN 3304.)

3331. Building Construction. 3(3-0)
Discussion of properties of construction materials and components; fabrication and construction technologies, methods and processes; engineered systems characteristic of commercial buildings such as foundation, structural, building envelope, mechanical and electrical systems. (Credit may not be obtained in both AEEN 3331 and ITEN 3331.)

3335. Environmental Systems for Buildings. 3(3-0)
Planning and design of lighting and climate control systems including heating, ventilation and air conditioning. Introduction to plumbing systems including water and wastewater piping systems. Prerequisite: MEEN 3347 and Corequisite: CEEN 3392.

4279. Senior Design Project I. 2(1-3)
Application of engineering concepts covered in the upper division courses to architectural engineering problems including design of building structural and services systems, with emphasis on teamwork. Introduction to practical aspects of construction and professional ethics. Prerequisites: AEEN 3304 and CEEN 3342.

4289. Senior Design Project II. 2(1-3)
Application of engineering concepts covered in the upper division courses to architectural engineering problems including design of building structural and services systems, with emphasis on teamwork. Introduction to practical aspects of construction and professional ethics. Prerequisites: AEEN 4316 and AEEN 4320.

4316. Structural Steel Design. 3(3-0)
AISC specifications for the design of axially loaded members, beams, columns and connections. Introduction to plastic design. Prerequisite: AEEN 3303. (Credit may not be obtained in both AEEN 4316 and CEEN 4316.)

4320. Building Services Engineering. 3(3-0)
Planning and design of heating, ventilation, air-conditioning, plumbing, power distribution and lighting systems; introduction to fire protection systems. Prerequisite: AEEN 3335 and EEEN 3331.

4326. Construction Engineering. 3(3-0)
Construction methods and management of earthwork with heavy equipment and others. Construction estimating, planning and control. Network theory and critical path methods. Prerequisite: AEEN 3303 and Corequisite: CEEN 3317. (Credit may not be obtained in both AEEN 4326 and CEEN 4326.)

CIVIL ENGINEERING (CEEN)

2113. Surveying Laboratory. 1(0-3)
Engineering field surveying and practices of taping, leveling, traversing, error adjustments, stadia, earthwork and highway curves. Corequisite: CEEN 2212. Laboratory fee, $5.

2212. Surveying. 2(2-0)
Engineering principles and practices of plane surveying, taping, leveling, traversing, surveying errors, topographic stadia, earthwork, highway curves and construction surveys. Prerequisite: MEEN 1310. Corequisite: MATH 2413.

2301. Mechanics I. (ENGR 2301) 3(3-0)
Resultants of force systems. Statics of beams, trusses, frames and other engineering structures. Friction. Distributed forces. Centroids and centers of gravity. Moments of inertia of areas and masses, Mohr's circle. Prerequisite: PHYS 2325/2125. Corequisite: MATH 2414.

3143. Geotechnical Engineering Laboratory. 1(0-3)
Principles and practices of geotechnical engineering laboratory with emphasis on the related ASTM and AASHTO testing standards. Corequisite: CEEN 3342. Laboratory fee, $5.

3144. Construction Materials. 1(1-0)
Engineering properties of materials for design and construction. Related ASTM test specifications of construction materials such as concrete, asphalt, timber, steel, synthetic materials, etc. Prerequisites: CEEN 3143.

3145. Construction Materials Laboratory. 1(0-3)
Engineering principles and practices for testing construction materials based on ASTM testing standards. Corequisite: CEEN 3144. Laboratory fee, $5.

3167. Hydraulics and Environmental Engineering Laboratory. 1(0-3)
Open-channel-flow visualization and measurement, hydraulic machinery characteristics and water and wastewater analysis. Corequisite: CEEN 3365. Laboratory fee, $7.

3303. Structural Analysis. 3(3-0)
Statically determinate structures. Moving loads. Analysis of statically indeterminate structures by consistent deformation, slope-deflection and moment-distribution. Prerequisite: CEEN 3311.

3304. Reinforced Concrete Design. 3(2-3)
Mechanics, behavior and design of reinforced concrete members subject to axial loads, bending, torsion and shear. Prerequisite: CEEN 3303.

3311. Strength of Materials. 3(3-0)
Hooke's Law; stress and strain at a point; Mohr's circle; axial stresses; torsion; shear, moment and deflection in beams; shear center; unsymmetrical bending; columns; theories of failure; introduction to fatigue; and statically indeterminate members. Prerequisites: CEEN 2301 and MATH 2414.

3317. Engineering Economy. 3(3-0)
Principles of economic analysis applied to engineering; evaluation of engineering alternatives; economic significance of engineering proposals. Cash flow diagrams, equivalence of cash flow patterns, interest, rate of return comparison, inflation, time value of money, income tax and depreciation, benefit/cost comparison, break even analysis, fixed costs, operating costs and other costs. Prerequisite: junior standing in engineering.

3342. Geotechnical Engineering. 3(3-0)
Principles of geotechnical engineering, soil composition, classification, flownet, compaction, consolidation, effective stress, bearing capacity and slope stability. Prerequisites: CEEN 3311 and PHYS 2326/2126.

3365. Environmental Engineering. 3(3-0)
Treatment and distribution of water. Wastewater conveyance and treatment systems. Physical, chemical and biological treatment processes. Solid waste management. Introduction to air pollution control. Prerequisites: CEEN 3392 and CHEM 1311/1111. Corequisite: CEEN 3167.

3392. Hydraulics and Fluid Mechanics. 3(3-0)
Fluid statics, flow of fluids through pipes and open channels, hydraulic machines. Corequisite: MEEN .

In addition to the listed prerequisite for the following 4000 series courses, a student must have an overall grade point average of 2.0 or higher.

4279. Design in Civil Engineering I. 2(1-3)
Engineering concepts integrated from the topics taught in sequences of upper division courses to produce practical, efficient and feasible solutions of civil engineering problems. Computer applications are included. Prerequisites: CEEN 3303 and a minimum GPA of 2.0 in mathematics and science. Corequisite: CEEN 4362.

4289. Design in Civil Engineering II. 2(1-3)
Engineering concepts integrated from the topics taught in sequences of upper division courses to produce practical, efficient and feasible solutions of civil engineering problems. Computer applications are included. Prerequisites: CEEN 3342, CEEN 4316 and a minimum GPA of 2.0 in mathematics and science.

4314. Matrix Methods in Structural Analysis. 3(3-0)
Formulation and application of the direct stiffness method to truss, beam and frame structures; introduction to the finite element method for 2-D problems; and use and interpretation of computer structural analysis programs. Prerequisite: CEEN 3303.

4315. Timber Behavior and Design. 3(3-0)
Mechanical properties of wood, stress grades and working stresses; effects of strength-reducing characteristics, moisture content and duration of loading and causes of wood deterioration; blued-laminated timber and plywood; behavior and design of connections, beams and beam-columns; and structural applications. Prerequisite: CEEN 3303.

4316. Structural Steel Design. 3(3-0)
AISC specifications for the design of axially loaded members, beams, columns and connections. Introduction to plastic design. Prerequisite: CEEN 3303.

4317. Computer Methods in Civil Engineering. 3(2-3)
Application of computer methods to solution of civil engineering problems, including the use of mathematical modeling, error analysis, optimization, solution of algebraic and differential equations and integration pertaining to infrastructure system analysis. Prerequisite: CEEN 4316.

4320. Foundation Engineering Analysis. 3(3-0)
Bearing capacity and related soil properties for analysis and design of foundations, including retaining walls. Prerequisites: CEEN 3303 and CEEN 3342.

4326. Construction Engineering. 3(3-0)
Construction methods and management of earthwork with heavy equipment and others. Construction estimating, planning and control. Network theory and critical path methods. Prerequisite: CEEN 3303. Corequisite: CEEN 3317.

4336. Selected Topics. V:1-3
One or more topics of civil engineering. May be repeated when topic changes. Prerequisite: senior standing.

4359. Principles of Transportation Engineering. 3(2-3)
Principles of transportation engineering, profession of transportation engineering, system and organization, system characteristics, traffic engineering studies, traffic flow, intersection control and capacity, highway alignment and capacity. Prerequisite: senior standing in engineering. Laboratory fee, $5.

4362. Hydrology. 3(3-0)
Hydrologic cycle; transpiration, evaporation, snow melt and planetary circulation. Rainfall-runoff relations, index, unit hydrographs, synthesized hydrographs. Binomial, normal and extreme-value skewed distributions. Prerequisites: CEEN 3392. Corequisite: STAT 4303.

4364. Design of Water and Wastewater Conveyance Systems. 3(3-0)
Water and wastewater flows and measurement, design of water transportation systems, design of gravity-flow sanitary sewers and stormwater drainage systems, pumps and pump systems, design of pumping stations. Prerequisite: CEEN 3392.

4367. Introduction to Geoenvironmental Engineering. 3(3-0)
Soil-water-contaminant interaction processes, conduction phenomena, hydraulic conductivity and contaminant transport phenomena, effects of contaminants on soil properties, site characterization and soil remediation techniques; design aspects of waste containment systems such as landfills, seepage barriers and cutoff walls. Prerequisites: CEEN 3342 and CEEN 3365.

4368. Foundation Engineering. 3(3-0)
Soil strength. Bearing capacity of soils and shallow foundation. Immediate and consolidation settlement. Lateral earth pressure theory and retaining walls. Deep foundation and stability analysis of soil slopes. Prerequisite: CEEN 3342.

4369. Transportation Engineering Design. 3(2-3)
Engineering design concepts used to produce practical, efficient, economical and feasible solutions to problems in such transportation areas as highways, traffic freight and materials movement, railroads and air transport. Computer applications are included. Prerequisites: CSEN 2304 and CEEN 3303. Laboratory fee, $5.

4489. Design in Civil Engineering II. 4(2-6)
Engineering concepts integrated from the topics taught in sequences of upper division courses to produce practical, efficient and feasible solutions of civil engineering problems. Computer applications are included. Prerequisites: CEEN 3342 and CEEN 4316. Laboratory fee, $5.

Degree Requirements
Bachelor of Science in Architectural Engineering

Freshman Year				Junior Year			
AEEN 1310	3	AEEN 1320	3	AEEN 3303	3	AEEN 3304	3
CHEM 1111	1	ENGL 1302	3	AEEN 3331	3	AEEN 3335	3
CHEM 1311	3	HIST 1301	3	BCOM 3304	3	CEEN 3392	3
ENGL 1301	3	MATH 2414	4	CEEN 3143	1	EEEN 3331	1
MATH 2413	4	PHYS 2125	1	CEEN 3317	3	^*Kinesiology*	1
MEEN 1201	2	PHYS 2325	3	CEEN 3342	3	POLS 2302	3
	16		17		16		16

Sophomore Year				Senior Year			
CEEN 2301	3	AEEN 2325	3	AEEN 4279	2	AEEN 4289	2
HIST 1302	3	CEEN 3311	3	AEEN 4316	3	AEEN 4326	3
ITEN 2321	3	^*Kinesiology*	1	AEEN 4320	3	Engineering Elective	3
^*Kinesiology*	1	MATH 3320	3	CEEN 3144	1	MATH or Sci Elective	3
MATH or Science Elect	3	MEEN 2302	3	CEEN 3145	1	Soc. Sci. or	
PHYS 2126	1	POLS 2301	3	Engineering Elective	3	Hum. Elective	3
PHYS 2326	3		16	Fine Arts Elective	3	STAT 4303	3
	17				16		17

Total Hours Required: 131

Engineering electives: CEEN 2113, CEEN 2212, CEEN 4314, CEEN 4315, CEEN 4320, CEEN 4364, CEEN 4368; ITEN 2330, ITEN 3313, ITEN 4353, MEEN 3348, MEEN 3354, MEEN 4349 or any approved engineering course.
Mathematics and science electives: CHEM 1312/CHEM 1112 or any approved upper-level chemistry course, MATH 3315, MATH 4341, MATH 4372, or MATH 4374, BIOL 1306/BIOL 1106, BIOL 2421, GEOL 1305, GEOL 3407, GEOL 4425, GEOG 3450, GEOG 4425, GEOG 4435, or any other approved upper-level course in mathematics or science.
Social science or humanities electives: POLS 4324 or any advanced-level political science course or any advanced level history course.
Fine arts electives: ARTS 1303, ARTS 1304; MUSI 2306; MUSI 3306 or THEA 4308.
BCOM 3304 must be taken and passed with a "C" or better to satisfy the communication criteria and the Frank H. Dotterweich College of Engineering's communication skills requirement.

^For courses listed under Core Curriculum "Components" see "General Requirements for Graduation with a Baccalaureate Degree" in an earlier section of this Catalog.

Degree Requirements
Bachelor of Science in Civil Engineering
Accredited by the EAC of the Accreditation Board for Engineering and Technology

Freshman Year				**Junior Year**			
CHEM 1111	**1**	**Comp App Elective**	**3**	**Fine Arts Elective**	**3**	**CEEN 3144**	**1**
CHEM 1311	**3**	**ENGL 1302**	**3**	**CEEN 3143**	**1**	**CEEN 3145**	**1**
ENGL 1301	**3**	**HIST 1301**	**3**	**CEEN 3303**	**3**	**CEEN 3167**	**1**
^*Kinesiology*	**1**	**MATH 2414**	**4**	**CEEN 3342**	**3**	**CEEN 3304**	**3**
MATH 2413	**4**	**PHYS 2125**	**1**	**CEEN 3392**	**3**	**CEEN 3365**	**3**
MEEN 1201	**2**	**PHYS 2325**	**3**	**STAT 4303**	**3**	**^*Kinesiology***	**1**
MEEN 1310	**3**		**17**		**16**	**MEEN 3347**	**3**
	17					**POLS 2301**	**3**
							16
Sophomore Year				**Senior Year**		**CEEN 4289**	**2**
CEEN 2113	**1**	**BCOM 3304**	**3**	**CEEN 3317**	**3**	**CEEN 4359**	**3**
CEEN 2212	**2**	**CEEN 3311**	**3**	**CEEN 4279**	**2**	**EEEN 3331**	**3**
CEEN 2301	**3**	**^*Kinesiology***	**1**	**CEEN 4316**	**3**	**Engineering Elective**	**3**
HIST 1302	**3**	**MATH + Science Elect**	**3**	**CEEN 4362**	**3**	**Engineering Elective**	**3**
MATH + Science Elect	**3**	**MATH 3320**	**3**	**Engineering Elective**	**3**	**Soc. Sci. or**	
PHYS 2326	**3**	**MEEN 2302**	**3**	**POLS 2302**	**3**	**Hum. Elective**	**3**
PHYS 2126	**1**		**16**		**17**		**17**
	16						

Total Hours Required: 132

Computer applications electives: MEEN 1320 or any course containing computer programming using a scientific language such as FORTRAN or C++.
Engineering electives: CEEN 4314, CEEN 4315, CEEN 4317, CEEN 4320, CEEN 4326, CEEN 4336, CEEN 4364, CEEN 4367, CEEN 4368; CEEN 4369, EVEN 4317, EVEN 4357; MEEN 3145, MEEN 3344.
Mathematics and science electives:
Recommended: GEOL 1305 and GEOG 4425
CHEM 1312/CHEM 1112 or any approved upper-level chemistry course
MATH 3415, MATH 4341, MATH 4372, MATH 4374
BIOL 1306, BIOL 2421, GEOL 3407, GEOL 4425, GEOG 3450, GEOG 4435 or any other approved upper-level course in mathematics or science.
Social science or humanities electives: POLS 4324 or any advanced-level political science course or any advanced level history course.
Fine arts electives: ARTS 1303, ARTS 1304; MUSI 2306; or THEA 4308.
BCOM 3304 must be taken and passed with a "C" or better to satisfy the communication criteria and the Frank H. Dotterweich College of Engineering's communication skills requirement.

^For courses listed under Core Curriculum "Components" see "General Requirements for Graduation with a Baccalaureate Degree" in an earlier section of this Catalog.

Degree Requirements
Bachelor of Science in Civil Engineering
Environmental Engineering Option
Accredited by the EAC of the Accreditation Board for Engineering and Technology

Freshman Year				**Junior Year**			
CHEM 1111	**1**	**Comp App Elective**	**3**	**CEEN 3143**	**1**	**CEEN 3144**	**1**
CHEM 1311	**3**	**ENGL 1302**	**3**	**CEEN 3303**	**3**	**CEEN 3145**	**1**
ENGL 1301	**3**	**HIST 1301**	**3**	**CEEN 3342**	**3**	**CEEN 3167**	**1**
^*Kinesiology*	**1**	**MATH 2414**	**4**	**CEEN 3392**	**3**	**CEEN 3304**	**3**
MATH 2413	**4**	**PHYS 2125**	**1**	**Fine Arts Elective**	**3**	**CEEN 3365**	**3**
MEEN 1201	**2**	**PHYS 2325**	**3**	**STAT 4303**	**3**	**^*Kinesiology***	**1**
MEEN 1310	**3**		**17**		**16**	**MEEN 3347**	**3**
	17					**POLS 2301**	**3**
							16

Sophomore Year				**Senior Year**			
CEEN 2113	**1**	**BCOM 3304**	**3**	**CEEN 3317**	**3**	**CEEN 4289**	**2**
CEEN 2212	**2**	**CEEN 3311**	**3**	**CEEN 4279**	**2**	**CEEN 4359**	**3**
CEEN 2301	**3**	**^*Kinesiology***	**1**	**CEEN 4316**	**3**	**EEEN 3331**	**3**
HIST 1302	**3**	**MATH + Science Elect**	**3**	**CEEN 4362**	**3**	**Engineering Elective**	**3**
MATH + Science Elect	**3**	**MATH 3320**	**3**	**Engineering Elective**	**3**	**Engineering Elective**	**3**
PHYS 2326	**3**	**MEEN 2302**	**3**	**POLS 2302**	**3**	**Social Sci or Hum**	
PHYS 2126	**1**		**16**		**17**	**Elective**	**3**
	16						**17**

Total Hours Required: 132

Computer applications electives: MEEN 1320 or any course containing computer programming using a specific language such as FORTRAN or C++.
Engineering electives: EVEN 4317, any approved upper-level biology or chemistry course or approved upper-level engineering course.
Mathematics and science electives:
BIOL 1308/BIOL 1108, BIOL 2421, CHEM 1312/CHEM 1112 or any approved upper level chemistry course
MATH 3415, MATH 4341, MATH 4372, MATH 4374 or any other approved upper-level course in mathematics or science
Social science or humanities electives: POLS 4324 or any advanced-level political science course or any advanced level history course.
Fine arts electives: ARTS 1303, ARTS 1304; MUSI 2306 or THEA 4308.
BCOM 3304 must be taken and passed with a "C" or better to satisfy the communication criteria and the Frank H. Dotterweich College of Engineering's communication skills requirement.
^For courses listed under Core Curriculum "Components" see "General Requirements for Graduation with a Baccalaureate Degree" in an earlier section of this Catalog.

DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Sung-won Park, *Chair*
Engineering Complex 303. MSC 192. Extension 2004.

Professors
Challoo, Omar, Park, Schreur
Associate Professors
Boehm, Leung, Li, Nekovei
Assistant Professors
McLauchlan, Varvel
Lecturer
Hao
Faculty Emeritus
Gorakhpurwalla

The Educational Objectives of the Electrical Engineering Program are:

1. **To prepare graduates for careers as engineering professionals and/or for graduate studies.**

2. **To enable graduates to pursue state-of-the-art solutions to engineering problems and to evaluate and embrace new technologies.**

3. **To instill in graduates personal commitment to high ethical standards, sound business decisions and engineering excellence.**

COMPUTER SCIENCE (CSEN)

2303. Introduction to Computing Using Visual Basic and Excel. 3(3-0)
Problem solving methods and algorithm development. Computer programming using Visual Basic. How to use Excel. Designing, coding, debugging and documenting programs using techniques of good programming style. Prerequisites: MATH 1314 and MATH 1316 or equivalent.

2304. Introduction to Computer Science. (ENGR 2304) 3(3-0)
Introduction to computer systems, problem solving methods and algorithm development. Structured programming using a programming language such as C. Designing, coding, debugging and documenting programs using techniques of software development cycle. Prerequisites: MATH 1314 and MATH 1316 or equivalent.

2310. Object-Oriented Software Engineering. 3(3-0)
Introduction to objects, object-oriented analysis and modeling, object-oriented design, implementation using an object-oriented language, such as C++. Prerequisite: CSEN 2328.

2326. Introduction to Structured Programming. 3(2-3)
Development of discipline in programming design, style, expression, debugging and testing. Introduction to algorithmic analysis, string processing, recursion, internal search/sort methods and simple data structures. Use of a block-structured language such as C. Prerequisites: MATH 1314 and MATH 1316 or equivalent. Laboratory fee, $5.

2328. Data Structures. 3(3-0)
Algorithm analysis, lists, stacks, queues, trees, hashing, priority queues, sorting, graph algorithms and algorithm design. Prerequisite: CSEN 2304.

2330. Introduction to Computer Systems I. 3(3-0)
Basic concepts of computer systems and computer architecture. Machine instructions and basic data types. Representation of information. Arithmetic and logical operations. Addressing operands in storage. Assembly language programming. Prerequisite: CSEN 2304. Laboratory fee, $5.

In addition to the listed prerequisite for the following 4000 series courses, a student must have an overall grade point average of 2.0 or higher.

4201-4202. Senior Project. 4(1-3)
A major project of an original nature carried to completion over a period of two semesters. Normally taken in the final academic year prior to graduation. Prerequisite: senior standing in Computer Science. Laboratory fee, $5 each semester.

4314. Database Management Systems. 3(3-0)
File and database organization techniques. Network, hierarchical and relational data models. Normalization. Commercially-available DBMS. Query languages. DBMS design and implementation.

4315. Computer Graphics. 3(3-0)
Man-machine communication in graphical form. Graphics hardware and software. Use of a commercial graphics package. Representation and manipulation of two- and three-dimensional data. Use of color. Prerequisites: CSEN 2304 and MATH 1348.

4316. Software Engineering I. 3(3-0)
Introduction to formal software design principles. An engineering approach to software development. Software project management. Software requirements analysis, specification, design, development and validation. Prerequisite: 6 semester hours of Computer Science or Computer Information Systems.

4317. Software Engineering II. 3(3-0)
Advanced software design principles. An engineering approach to software development emphasizing advanced techniques for validation and verification. Prerequisite: CSEN 4316.

4320. Computer Networks. 3(3-0)
Data communication networks and ISO reference model, the electrical interface, data transmission, data link and its protocols, local area network and its protocols, wide area network and its protocols, internetworking. Prerequisite: 6 hours of upper level Computer Science.

4335. Selected Topics. V:1-3
One or more topics of computer science. May be repeated for a total of 6 semester hours. Prerequisite: consent of instructor.

4336. Special Problems. V:1-3
Individual solution of selected problems in computer science conducted under direct supervision of a faculty member. May be repeated for up to 6 semester hours. Prerequisite: consent of instructor.

4361. System Software. 3(3-0)
The study of system software components such as assemblers, macros and macro processors, compilers, linkers and loaders. The function and development of these components are emphasized. Prerequisite: CSEN 2330 or EEEN 3449.

4362. Operating Systems. 3(3-0)
Study of operating system principles, including process management, memory management, resource allocation and input, output and interrupt processing. Prerequisite: CSEN 2330 or EEEN 3449.

4363. Numerical Methods. 3(3-0)
A computer-oriented introduction to numerical methods. Interpolation, numerical differentiation and quadrature, linear systems of equations, solution of nonlinear equations, solutions of differential equations. Prerequisites: MATH 3320 and either CSEN 2304 or equivalent.

4366. Programming Languages. 3(3-0)
Formal definition of programming languages including specification of syntax and semantics. Precedence, infix, prefix and postfix notation. Global properties of algorithmic languages. List processing, string manipulation, data description and simulation languages. Run-time representation of program and data structures. Prerequisite: CSEN 2328.

ELECTRICAL ENGINEERING (EEEN)

2323. Network Analysis I. 3(3-0)
Introduction to linear network analysis techniques. Phasor analysis and sinusoidal steady-state response. Single-phase and polyphase circuits. Prerequisites: MATH 2414; Corequisites: PHYS 2326/PHYS 2126 and MATH 3320.

2340. Digital Logic Design. 3(3-0)
Hardware implementation of arithmetic and logical functions, organization and design of digital systems. Prerequisites: CSEN 2304.

3112. Electronic Devices and Circuits Laboratory I. 1(0-3)
Laboratory course to correlate with the basic theory presented in sophomore and first semester junior courses. Prerequisite: credit for or registration in EEEN 3325. Laboratory fee, $5.

3133. Electrical Engineering Laboratory. 1(0-3)
Introduction to instruments. AC/DC machines, circuits and electronic analog computer applications. Prerequisite: credit for or registration in EEEN 3332. Laboratory fee, $5.

3212. Circuits and Electronics Lab. 2(1-3)
Laboratory course to correlate with circuits and electronics. Prerequisite: credit for or registration in EEEN 3325. Laboratory fee, $5.

3321. Network Analysis II. 3(3-0)
Two-port networks, Fourier analysis, time domain response, transient response and Laplace transform techniques. Prerequisites: EEEN 2323, CSEN 2304 and MATH 3320.

3324. Electromagnetics. 3(3-0)
Vector analysis, electrostatics, steady magnetic fields. Maxwell's equations, uniform plane waves, circuit concepts, propagation and radiation. Prerequisites: PHYS 2326/PHYS 2126 and MATH 3320.

3325. Electronics I. 3(3-0)
Solid state fundamentals. Nonlinear devices and networks. Fabrication of integrated circuits. Two-port models. Prerequisites: EEEN 2323 and PHYS 2326/PHYS 2126.

3326. Elements of Dynamic Systems. 3(3-0)
Modeling of mechanical systems, analogy between mechanical and electrical systems, modeling of hydraulic and pneumatic systems, transfer functions and responses of first and second order systems, frequency response, block diagrams and transient response specifications of second order systems, analog computation. Prerequisites: MATH 3320 and EEEN 3321.

3331. Circuits and Electromagnetic Devices. 3(3-0)
General network analysis, steady-state AC/DC circuits. Energy conversion and applications. Prerequisite: PHYS 2326/2126.

3332. Electronics and Instrumentation. 3(3-0)
Principles of electronics, amplifiers and electronic circuits. Feedback and electronic analog computation. Transducers and instrument systems. Prerequisite: EEEN 3331.

3333. Linear Systems and Signals. 3(3-0)
Signal representation, sampling and quantization, Laplace and z-transforms, transfer functions and frequency response, convolution, stability, Fourier series, Fourier transforms and applications. Prerequisite: EEEN 3321.

3334. Random Signals. 3(3-0)
Probability, random variables, white noise and band-limited system, narrowband Gaussian process, pseudorandom signals and random signal response of linear systems. Prerequisite: MATH 2414.

3424. Principles and Applications of Engineering Electromagnetics. 4(3-3)
Vector analysis, electrostatics, steady magnetic fields. Maxwell's equations, uniform plane waves, circuit concepts, propagation and radiation. Prerequisites: PHYS 2326/2126 and MATH 3320. Laboratory fee, $5.

3449. Microprocessor Systems. 4(3-3)
Basic computer structure, the instruction set, addressing modes, assembly language programming, assembly language subroutines, arithmetic operations, programming in C, implementation of C procedures, elementary data structures, input and output and a survey of microprocessor design. Prerequisites: EEEN 2340. Laboratory fee, $5.

In addition to the listed prerequisite for the following 4000 series courses, a student must have an overall grade point average of 2 or higher.

4124. Electrical Engineering Projects Laboratory. 1(0-3)
Participation in engineering design activity. Prerequisite: EEEN 4152. Laboratory fee, $5.

4152. Advanced Electronics Laboratory. 1(0-3)
Analysis and design of electronic circuits and systems. Prerequisite: EEEN 3113. Laboratory fee, $5.

4224. Electrical and Computer Engineering Projects Laboratory. 2(0-6)
Participation in engineering design activity. Prerequisite: EEEN 4252. Laboratory fee, $5.

4252. Advanced Laboratory. 2(1-3)
Analysis and design of electrical, electronic and digital systems. Prerequisites: EEEN 3212 and EEEN 3449. Laboratory fee, $5.

4310. Introduction to VLSI Circuit Design. 3(3-0)
Introduction to design and fabrication of micro-electronic circuits via Very Large Scale Integrated (VLSI) circuitry; structured design methods for VLSI systems, use of computer-aided design (CAD) tools and design projects of small to medium scale integrated circuits. Prerequisites: EEEN 3325 and EEEN 2340.

4328. Speech Processing and Communications. 3(3-0)
Fundamentals of digital signal processing, waveform coding, speech spectrum, vocoders, linear predictive coding and introduction to speech recognition.

4329. Communications Engineering. 3(3-0)
Transmission of information. Probability, stochastic process and spectral analysis. Sampling, quantization, decision theory, coding and decoding. Digital communication system and secure communications. Introduction to DSP. Prerequisites: EEEN 3333 and EEEN 3334.

4332. System Analysis and Design. 3(3-0)
Integration of fundamental physical principles and mathematical methods into the engineering environment. Modeling, optimization and solution of selected design problems. Prerequisite: senior standing in electrical engineering.

4334. Real Time Digital Signal Processing. 3(2-3)
Developmental tools for real-time signal processing. Processor implementation of DSP applications. Features of the microprocessor as well as digital signal processing are introduced. Prerequisites: EEEN 3449 and EEEN 3333. Laboratory fee, $5.

4335. Special Problems. V:1-3
Individual solution of selected problems in electrical engineering conducted under direct supervision of a faculty member. May be repeated for up to 6 hours. Prerequisite: consent of instructor.

4336. Selected Topics. V:1-3
One or more topics of electrical engineering. May be repeated for up to a total of 6 semester hours. Prerequisite: consent of instructor.

4330. Power Electronics. 3(3-0)
Classical and modern design and analysis methods of power electronic circuits and the feedback control designs of power electronic converters. Topics include power-pole building blocks, DC-DC converters and associated controls, diode rectifiers, thyristor converters, power-factor correction and control, isolated switch-mode power supplies, inverters for DC and AC drives and applications of power electronic converters. Prerequisite: EEEN 3325 or consent of instructor.

4342. Electronics II. 3(3-0)
Analysis and design of analog electronic circuits; differential, multistage and power amplifiers; frequency response; feedback and stability. Prerequisite: EEEN 3325.

4343. Microprocessor-based Control Systems. 3(3-0)
Design of microprocessor-based real-time control systems. Application of theoretical principles in electrical engineering to control small-scale systems, such as a mobile robot incorporating sensors, actuators and intellegence. Controller design; signal conditioning and drive circuits for interfacing with various sensors and actuators; programming and programmable logic controllers. Prerequisites: EEEN 3333 and EEEN 3449.

4344. Computer Architecture and Design. 3(3-0)
Basic computer organization, data representation and arithmetic, instruction sets and addressing modes, assembly language, data path and control, memory, input and output and communication. Prerequisites: EEEN 3449 or CSEN 2330, EEEN 2340.

4354. Linear Control Systems. 3(3-0)
Analysis and design techniques for linear feedback control systems. Controller functions and compensation, applications to serve and process control problems. Prerequisite: EEEN 3333.

4355. Digital Systems Engineering. 3(2-3)
Principles in digital system design and testing, digital integrated circuits, digital system design with PLDS and FPGAS, introduction to an HDL, memory, microprocessors and design for testability. Prerequisites: EEEN 3325 and EEEN 2340. Laboratory fee, $5.

4422. Electric Drives. 4(3-3)
Introduction to power electronic converters for motor drives and controls, single and three phase transformers, DC motors and generators, feedback control design of DC motor drives, PMAC drives, synchronous generators, induction motor drives, speed and vector control of induction motor drives. Laboratory experiments to identify electric machine parameters and characteristics, and DC/AC motor drive controls, by designing and conducting experiments using digital computers. Prerequisite: EEEN 3321. Laboratory fee, $5.

Degree Requirements
Bachelor of Science in Computer Science

Freshman Year							
CSEN 2304	**3**	**CSEN 2328**	**3**	**Junior Year**			
ENGL 1301	**3**	**ENGL 1302**	**3**	**BCOM 3304**	**3**	***Approved Elective**	**3**
****Fine Arts Elective**	**3**	**HIST 1302**	**3**	**CSEN 4315**	**3**	**CSEN 4314**	**3**
HIST 1301	**3**	**^*Kinesiology***	**1**	**EEEN 3334**	**3**	**CSEN 4316**	**3**
MEEN 1201	**2**	**MATH 2413**	**4**	**MATH 3370**	**3**	**EEEN 3449**	**4**
Science I	**4**	**Science I**	**4**	****Social Sciences**		**MATH 3415**	**4**
	18		**18**	**Elective**	**3**		**17**
					15		
Sophomore Year							
EEEN 2340	**3**	**CSEN 2310**	**3**	**Senior Year**			
****Humanities Elective**	**3**	**EEEN 2323**		***Approved Elective**	**3**	***Approved Elective**	**3**
^*Kinesiology*	**1**	**^*Kinesiology***	**1**	**CSEN 4201**	**2**	**CSEN 4202**	**2**
MATH 2414	**4**	**MATH 3320**	**3**	**CSEN 4317**	**3**	**CSEN 4320**	**3**
PHYS 2325/PHYS 2125	**4**	**PHYS 2326/PHYS 2126**	**4**	**CSEN 4361**	**3**	**CSEN 4362**	**3**
POLS 2301	**3**	**POLS 2302**	**3**	**EEEN 4344**	**3**	**CSEN 4366**	**3**
	18		**17**		**14**		**14**

Total Hours Required: 134

The sciences to be taken in the freshman and sophomore years include a one-year sequence in one science followed by another one-year sequence in physics. The sciences from which a student may choose the freshman sequence are biology, chemistry, geology and astronomy. *The three approved electives must be selected with the consent of the student's adviser and would normally be more advanced courses in computer science, computer information systems, mathematics, statistics or one of the sciences taken in the freshman and sophomore years. However, a meaningful sequence of courses in any discipline, such as engineering or agriculture, may be taken with the consent of the student's adviser, except that all such courses must be taken at the 2000-level or above.
***** The fine arts elective must be either ARTS 1303, ARTS 1304, MUSI 2306, THEA 3302 or THEA 4308.***
*****The social sciences elective must be either PSYC 2301, SOCI 1301, SOCI 1306, SOCI 4307, PHIL 3311, PHIL 3322, HIST 4336, HIST 4338 or any political science course exclusive of POLS 2301, POLS 2302 or POLS 3351.***
******The humanities elective must be either PHIL 3323, POLS 3351 or any literature course.***
BCOM 3304, Business Communication, A grade of "C" or better is required.

Degree Requirements
Bachelor of Science in Electrical Engineering
Accredited by the EAC of the Accreditation Board for Engineering and Technology

Freshman Year			
CHEM 1111	**1**	**CSEN 2304**	**3**
CHEM 1311	**3**	**ENGL 1302**	**3**
ENGL 1301	**3**	****Fine Arts Elective***	**3**
HIST 1301	**3**	**HIST 1302**	**3**
^*Kinesiology*	**1**	**^*Kinesiology***	**1**
MATH 1348	**3**	**MATH 2413**	**4**
MEEN 1201	**2**		**17**
	16		
Sophomore Year		**EEEN 2323**	**3**
EEEN 2340	**3**	**EEEN 3449**	**4**
^*Kinesiology*	**1**	**MATH 3320**	**3**
MATH 2414	**4**	**PHYS 2326/PHYS 2126**	**4**
PHYS 2325/PHYS 2125	**4**	**POLS 2302**	**3**
POLS 2301	**3**		**17**
	15		

^For courses listed under Core Curriculum "Components" see "General Requirements for Graduation with a Baccalaureate Degree" in an earlier section of this Catalog.

Junior and Senior Year

Electrical engineering majors may choose either of the options listed for their junior and senior year courses. However, for either choice a student must complete all requirements of one of the listed options.

Computer Science Emphasis

Junior Year			
EEEN 3321	**3**	**BCOM 3304**	**3**
EEEN 3325	**3**	**CSEN 2328**	**3**
EEEN 3334	**3**	**EEEN 3212**	**2**
MATH 3415	**4**	**EEEN 3333**	**3**
MEEN 2355	**3**	**EEEN 4355**	**3**
	16	**MATH 3370**	**3**
			17
Senior Year			
******Approved Elective**	**3**	******Approved Elective**	**3**
******Approved Elective**	**3**	**CSEN 4362**	**3**
CEEN 3317	**3**	**EEEN 4224**	**2**
EEEN 4252	**2**	**EEEN 4329**	**3**
EEEN 4310	**3**	**EEEN 4343**	**3**
EEEN 4344	**3**	**Social Sci. or Humanities Elective**	**3**
	17		**17**
		Total Hours Required:	**132**

A list of acceptable courses to satisfy the required social science humanities (upper level course) is available in the office of the department chair.
****The fine arts elective must be either ARTS 1303, ARTS 1304, MUSI 2306, THEA 3302 or THEA 4308.***
*****Must be chosen from the following: CHEN 3347, MEEN 3347 or PHYS 3333.***
******Approved electives must be chosen as a sequence of courses to satisfy a professional objective and must be chosen with the consent of the department chair.***

Electrical Systems Emphasis

Junior Year			
EEEN 3321	**3**	**BCOM 3304**	**3**
EEEN 3325	**3**	**EEEN 3212**	**2**
EEEN 3334	**3**	**EEEN 3324**	**3**
MATH 3415	**4**	**EEEN 3333**	**3**
MEEN 2355	**3**	**EEEN 4355**	**3**
	16	**MATH 4341**	**3**
			17
Senior Year			
******Approved Elective**	**3**	******Approved Elective**	**3**
EEEN 4252	**2**	******Approved Elective**	**3**
EEEN 4354	**3**	**CEEN 3317**	**3**
EEEN 4342	**3**	**EEEN 4224**	**2**
EEEN	**4**	**EEEN 4329**	**3**
*****Thermodynamics**	**3**	**Social Sci. or Humanities Elective**	**3**
	18		**17**
		Total Hours Required:	**133**

A list of acceptable courses to satisfy the required social science humanities (upper level courses) is available in the office of the departmental chair.
****The fine arts elective must be either ARTS 1303, ARTS 1304, MUSI 2306 or THEA 4308.***
*****Must be chosen from the following: CHEN 3347, MEEN 3347 or PHYS 3333.***
******Approved electives must be chosen as a sequence of courses to satisfy a professional objective and must be chosen with the consent of the departmental chair.***
^For courses listed under Core Curriculum "Components" see "General Requirements for Graduation with a Baccalaureate Degree" in an earlier section of this Catalog.

DEPARTMENT OF ENVIRONMENTAL ENGINEERING

Kim Jones, *Chair*
Engineering Complex 376. MSC 213. Extension 3046.

Associate Professors
John, Jones, Uddameri
Assistant Professors
Clapp, Martinez, Ren

ENVIRONMENTAL ENGINEERING (EVEN)

4317. Environmental Engineering Fundamentals. 3(3-0)
Introductory course in Environmental Engineering: science basis, law and regulations, protection of human health and the environment from air, water, solid/hazardous and product pollution. Structure of the environmental industry. Prerequisite: junior standing in B.S. program in physical science, engineering or agriculture.

4357. Environmental Aspects of Engineering Works and Products. 3(3-0)
Environmental transformations, contaminant transport, ideal reactor models, design and application of exposure assessment models to solve waste load allocation problems. Prerequisite: senior standing in engineering.

DEPARTMENT OF INDUSTRIAL TECHNOLOGY (ITEN)

Bruce Marsh, *Interim Chair*
Gross Industrial Technology Building 100. MSC 203. Extension 2608.

Associate Professors
Heidari, Marsh, Mullen
Lecturer
Rosenkranz

The department prepares students for a wide variety of management-oriented technical professions.

A minor in Industrial Technology requires the following course work: ITEN 1311, ITEN 1315, ITEN 2301 and at least three approved advanced ITEN courses in a specified concentration.

1300. Introduction to Technology Systems. 3(3-1)
An overview of the various technological systems affecting our society. Modular laboratory activities will explore technological systems in manufacturing, construction, communication, energy, transportation and biotechnology. Laboratory fee, $5.

1311. Technical CAD. 3(2-2)
An introduction to a variety of mechanical drafting applications and techniques, including orthographic projection, pictorials, geometric dimensioning and tolerancing in pencil and Computer Assisted Drafting and Design. Laboratory fee, $5.

1315. Metalworking Processes. 3(3-1)
An introduction to the processes and standards utilized in the manufacture of products from metal. Laboratory experiences include foundry, sheetmetal fabrication, welding and basic machine tool operation. Laboratory fee, $5.

2301. Industrial Electronics. 3(3-1)
Industrial applications of electricity and electronics, including passive components, power utilization, solid state devices and electronic production techniques. Laboratory fee, $5.

2320. Industrial Materials. 3(3-1)
An introduction to the sources, properties and testing of a variety of industrial materials. Laboratory experiences include destructive and nondestructive materials testing. Prerequisite: CHEM 1405 or equivalent and PHYS 1375 or equivalent. Laboratory fee, $5.

2321. Architectural CAD. 3(2-2)
Planning, design and drafting of residential and commercial buildings. Prerequisite: ITEN 1311 or equivalent. Laboratory fee, $5.

2323. Cost Estimating and Project Planning. 3(3-0)
A survey of practical methods used in the development of cost estimates and project plans in manufacturing and construction. Emphasis is placed on the application of computer software to these problems.

2330. OSHA for General Industry. 3(2-2)
An introduction to OSHA's general industry standards and an overview of the requirements of the more frequently referenced standards. Standards will be reinforced with laboratory exercises and related problems. Laboratory fee, $5.

2331. Construction Safety. 3(2-2)
Study of plant layout and safety procedures, including information for employees, accident reporting, first aid practices, emergency procedures, fire prevention and plant environmental conditions. Laboratory fee, $5.

3300. Manufacturing Technology. 3(2-2)
An introduction to basic manufacturing concepts, processes and tools, with examples in machine tool operations and mass production. Laboratory fee, $5.

3308. Industrial Plastics. 3(2-2)
A survey of the characteristics and the processes utilized in producing products from industrial plastics. Includes laboratory experiences in fabrication, injection molding, laminating and vacuum-forming. Prerequisites: CHEM 1405 and ITEN 3300 or equivalent. Laboratory fee, $5.

3310. Fluid Power. 3(3-1)
Systems, instruments and concepts utilized in the area of fluid power. Course emphasizes fundamental theories of operation, system design, component selection, maintenance and safety considerations. Includes an overview of fluid logic and electrical controls. Prerequisite: PHYS 1305/PHYS 1105 or equivalent. Laboratory fee, $5.

3311. Manufacturing Facilities. 3(3-0)
Study of principles, methods and techniques utilized in planning, operating and maintaining manufacturing and industrial facilities.

3313. Energy and Power Technology. 3(3-1)
An introduction to the basic principles of energy and power transmission for industrial technologists and non-engineers. Prerequisite: PHYS 1305/PHYS 1105 or equivalent. Laboratory fee, $5.

3315. CAD/CAM. 3(3-1)
Application, economics and programming of Computer Numerical Control (CNC) machine tools. Prerequisite: ITEN 1315 or equivalent. Laboratory fee, $5.

3324. Industrial Controls. 3(3-1)
Digital electronics and the application of microprocessors to industrial control. Laboratory experiences include problems in programming and control system interfacing. Prerequisite: ITEN 2301 or equivalent. Laboratory fee, $5.

3331. Construction Technology. 3(2-2)
Systems, materials and equipment utilized in residential and commercial construction. Includes regulatory and economic analysis of construction projects. Laboratory fee, $5.

3343. Advanced Manufacturing Processes. 3(3-0)
A survey of the latest manufacturing processes that are used in order to produce products that cannot be produced with conventional manufacturing processes. Processes covered will include, non-traditional machining methods, abrasive machining, advanced casting methods, specialized welding methods and other high-end manufacturing processes used in manufacturing industries.

3349. Manufacturing Productivity. 3(3-0)
Planning workstations, developing work methods and establishing time standards for manufacturing operations. Prerequisite: junior standing.

3352. Inspection and Gaging. 3(3-1)
Systems, instruments and concepts utilized in the area of inspection and gaging with emphasis on traditional instruments and overviews into in-process and post-process inspection, contact and noncontact gaging and digital gaging. Prerequisite: ITEN 1300. Laboratory fee, $5.

3399. Industrial Internship. 3(0-6)
Supervised on-the-job experience in an industrial/technical area. Can be repeated for up to 6 semester credit hours. Prerequisite: junior or senior standing.

4303. Selected Topics. 3(3-0)
Investigations with industrial experts on one or more topics in current technologies. May be repeated up to a total of 6 semester hours. Prerequisite: senior standing.

4332. Hazardous Waste and Fire Safety. 3(3-1)
Study of fire prevention and hazardous substances. Hazard mitigation and containment polities will be reviewed. Laboratory fee, $5.

4334. Automation. 3(3-1)
Current practice in automated manufacturing and materials handling, including group technology, robotics, CAD/CAM and CIM technology. Prerequisite: ITEN 3315. Laboratory fee, $5.

4335. Senior Projects. 3(3-0)
Individual solution of selected problems in industrial technology under the direct supervision of a faculty member. Prerequisite: senior standing in industrial technology.

4336. Industrial Employment Seminar. 3(3-1)
Survey of job opportunities in construction and manufacturing through class discussion, field trips and independent research. Includes job hunting skills development, resume writing and job interviewing. Prerequisite: junior standing.

4352. Quality Assurance. 3(3-1)
Methods used to ensure quality production through the measurement and maintenance of desired product characteristics in manufacturing processes. Prerequisite: MATH 1316 or equivalent. Laboratory fee, $5.

4353. Construction Management. 3(3-1)
Study of management techniques to solve the unique problems associated with a construction project. Emphasis on the management of manpower, materials, money and machinery. Prerequisite: ITEN 3331 or equivalent. Laboratory fee, $5.

4362. Data Analysis and Decision Making. 3(3-1)
Concepts of data analysis, distributions, probability, regression analysis and other statistical analysis techniques with technological and industrial applications, reinforced by laboratory exercises using a spreadsheet application program. Prerequisite: ITEN 4352. Laboratory fee, $5.

Degree Requirements
Bachelor of Science in Industrial Technology
with a Minor in Business Administration
Accredited by The National Association of Industrial Technology (NAIT)

Freshman Year				**Junior Year**			
CISA 1301	**3**	**ENGL 1302**	**3**	**ACCT 2301**	**3**	**ACCT 2302**	**3**
ENGL 1301	**3**	**HIST 1302**	**3**	**BCOM 3304[3]**	**3**	**^*Arts Elective***	**3**
HIST 1301	**3**	**ITEN 1300**	**3**	**ITEN 2320**	**3**	**Free elective**	**3**
ITEN 1315	**3**	**ITEN 1311 or**		**ITEN 3310 or**		**ITEN Adv. Elective[4]**	**3**
^*Kinesiology*	**1**	**ITEN 2321**	**3**	**ITEN 3313**	**3**	**ITEN Adv. Elective[4]**	**3**
MEEN 1201	**2**	**^*Kinesiology***	**1**	**ENGL 2314**	**3**	**ITEN 3300**	**3**
	15	**MATH 1314**	**3**	**^*Kinesiology***	**1**		**18**
			16		**16**		
Sophomore Year				**Senior Year**			
CHEMISTRY[1]	**3-4**	**ECON 2302**	**3**	**Adv. Bus. Elective[5]**	**3**	**Adv. Management**	**3**
ECON 2301	**3**	**Free Elective**	**3**	**Adv. ITEN Elective[4]**	**3**	**ITEN Adv. Elective[4]**	**3**
ITEN 2330 or		**ITEN 2301**	**3**	**ITEN 3315**	**3**	**ITEN 3399 or**	
ITEN 2331	**3**	**PHYSICS[2]**	**3-4**	**ITEN 3324**	**3**	**ITEN 4335**	**3**
MATH 1316	**3**	**POLS 2302**	**3**	**ITEN 3349**	**3**	**ITEN 4336**	**3**
POLS 2301	**3**		**15-16**		**15**	**ITEN 4352**	**3**
	15-16						**15**

Total Hrs Reqd: 125-127

Notes:

All majors must pass a departmental exit exam to graduate.
^For courses listed under Core Curriculum "Components" see "General Requirements for Graduation with a Baccalaureate Degree" in an earlier section of this catalog.
[1]Any chemistry course will meet this requirement.
[2]Any physics course with a laboratory will meet this requirement excluding Astronomy and PHYS 1471.
[3]A grade of C or better is required to meet the Frank H. Dotterweich College of Engineering English proficiency requirement.
[4]Chosen from ITEN 3308, ITEN 3311, ITEN 3331, ITEN 3343, ITEN 3352, ITEN 3399, ITEN 4303, ITEN 4332, ITEN 4334, ITEN 4335, ITEN 4353 and ITEN 4362. A lower division ITEN course may be substituted for one of these courses if 45 hours of advanced work is otherwise included.
[5]Chosen from any advanced course in: Accounting, Computer Information Systems, Quantitative Methods, Economics, Finance, Management or Marketing.

Minor In Industrial Technology
A minor in Industrial Technology requires the following course work:

ITEN 1311 or ITEN 2321,
ITEN 1315 or ITEN 3300,
ITEN 2301 or ITEN 3324, and
at least three approved advanced ITEN courses in a specific concentration.

Total Hours Required: 18

DEPARTMENT OF MECHANICAL ENGINEERING AND INDUSTRIAL ENGINEERING

Robert A. McLauchlan, *Chair*
Engineering Complex 303. MSC 191. Extension 2003.

Professors
Abdul-Razzak, Elkassabgi, McLauchlan
Associate Professors
Ozcelik, Peel
Assistant Professors
Jin, Zhou
*Lecturer*s
Cholkar, Wright

The Educational Objectives of the Mechanical Engineering Program are:

1. **To prepare undergraduate students for a lifetime career as practicing professional mechanical engineers.**

2. **To prepare students to advance their studies and to engage in lifelong learning.**

3. **To give students an understanding of professional responsibilities with respect to the economic, societal and ethical impacts of their actions.**

INDUSTRIAL ENGINEERING (IEEN)

2301. Introduction to Industrial and Systems Engineering. 3(3-0)
An overview of industrial and system engineering methodologies including manufacturing processes, facility layout, material handling, work measurement, operations planning, quality control, human factors, operations research, simulation and systems management.

2310. Applied Methods in Engineering Statistics I. 3(3-0)
Introduction to probability and statistical problems and the appropriate solving techniques typically encountered by engineers, including data sets, sample space, events, sampling, sample points, probability theory, Bayes' rule, random variables, discrete and continuous probability distributions, sampling distribution, point estimation, curve fitting, tests of hypothesis, confidence intervals and the use of statistical software packages. Corequisite: MATH 2414.

3310. Applied Methods in Engineering Statistics II. 3(3-0)
Review of point estimation, curve fitting, simple linear regression, test of hypothesis and confidence intervals, analysis of variance, control charts, full factorial design, surface fitting analysis and other experimental designs. Applications in engineering design and manufacturing. Prerequisite: IEEN 2310.

3312. Work Methods and Measurements. 3(2-3)
Methods, time study and wage payment; development of motion and time study; graphic tables such as operation process chart; operation analysis; process of manufacturing; set up and tools; working conditions; material handling; plant layout; principles of motion economy; man and machine relationship; motion study; micromotion study; evaluation and installation of the proposed method; job analysis and evaluation; time study requirements; elements of time study; performance rating; allowances such as personal delays; fatigue; standard time; standard data; synthetic basis motion time (MTM); work sampling studies.

3314. Engineering Methods in Quality Assurance. 3(2-3)
Objectives of statistical quality assurance, control charts, X-bar and R charts, mathematics of quality assurance, fundamental concepts in acceptance sampling, AQL system for lot-by-lot acceptance, acceptance inspection for continuous production and life testing and reliability, military standards and International Standards Organization certification and registration. Prerequisite: IEEN 2310.

3315. Computer Based Production and Inventory Control. 3(3-0)
Modeling, design and optimization of systems for production and inventory control, forecasting and market analysis, time series analysis, fixed order size systems, batch type production systems, fixed order interval systems, discrete demand systems, Wagner-Whitin Algorithm, Silver-Meal Algorithm, Part-Period Algorithm, material requirements planning, just-in-time and group technology. Corequisites: IEEN 3321 and MATH 3415.

3321. Operation Research Methods in Engineering I. 3(3-0)
Study and design of systems typically encountered by industrial engineers and the appropriate problem solving techniques including linear programming (problem formulation, simplex method, sensitivity analysis), integer programming, queuing theory and decision analysis; use of operations research software packages. Corequisite: MATH 3415.

3325. Engineering Economic Analysis I. 3(3-0)
Cash flow diagrams, simple and compound interest, interest factors, present worth, future worth, equal payment series, gradient series, depreciation, some tax considerations, the economic evaluation single project, minimum annual revenue requirements, rate of return calculations, benefit/cost evaluations, replacement analysis, inflation and cost estimation, capital budgeting, break-even models, cost comparisons, cost of capital and minimum acceptable return of return. Prerequisite: junior standing.

3331. Fundamentals of Manufacturing Processes. 3(2-3)
Selection criteria for manufacturing processes, processing of castings, bulk deformation process, sheet metal working, polymer and polymer-matrix composite production, machining and welding processes. Robotics and automation.

4163. Senior Design Project I. 1(1-0)
Capstone design course emphasizing quantitative analysis including statistical methods, operations research and simulation as applied to the design process. Integrates knowledge gained from all required industrial engineering courses in a system design project. Prerequisite: senior standing and IEEN 3312.

4316. Facilities Design and Plant Layout. 3(2-3)
Single facility design, multiple facility design, computerized layout planning location analysis with fixed costs, continuous facility location, product development, automation and manufacturing processes, production charts, selection of machines and labor material handling, storage, office layout, computer-aided plant layout, site selection, computer-aided design, computer-aided manufacturing.

4325. Engineering Economics Analysis II. 3(3-0)
Taxes, cost comparisons, capital budgeting, minimum annual revenue requirements, minimum acceptable rate of return and the cost of capital to the firm, risk consideration, probabilistic models, decision trees, simulation, measuring costs in industry, aggregate investment decision making, capital budgeting, decision matrices, Bayesian analysis, project scheduling and project management. Prerequisite: IEEN 3325**.**

4328. Application of Computer Simulation. 3(2-3)
Basic simulation modeling, discrete event simulation, simulation of queuing systems, simulation of inventory systems, steps in a discrete-event simulation, continuous simulation, combined discrete and continuous simulation, simulation using general purpose languages, system structure, random number generators, special purpose simulation languages, simulation of manufacturing system. Corequisite: IEEN 3310.

4332. Principles of Engineering Management. 3(3-0)
Techniques relating to managing engineering activities, engineer's transition into management, engineering managerial functions, motivation of individual and group behavior, productivity assessment/improvement, managing the quality function and communications.

4335. Special Problems. V:1-3
Individual solution of selected problems in industrial engineering conducted under the direct supervision of a faculty member. May be repeated for up to 6 hours. Prerequisite: senior standing.

4338. Cost Engineering. 3(3-0)
Fundamentals of accounting, fundamentals of cost accounting, business organization, financial management and cost control, analysis and interpretation of financial statements such as the balance sheet and the income statement, production cost system, manual accounting systems, computerized accounting systems, financing, investment principles of auditing, revenue recognition, differed income taxes, interim financial reporting, government and nonprofit accounting.

4341. Human Engineering and Man-Machine Systems. 3(2-3)
Human capability and limitation within a system, ergonomics, design, information processing, illumination and workstation design, vibration, noise, cold and heat, hand tool design, human physical ability and physical testing. Individual or group class project will be required from graduate students taking this class for graduate credit. Prerequisite: IEEN 3312.

4351. Reliability and Advanced Topics in Quality Control. 3(3-0)
Reliability measures, reliability and hazard functions, product life, failure density functions and system failure models, extreme value distribution, important distribution function models, static reliability and unreliability models, probabilistic design, combination of random variables, interference theory and reliability computation, time dependent stress-strength models, reliability estimations, sequential life testing, Bayesian reliability in design and testing quality control management, topics in total quality control such as business quality management, application of total QC in the company. Prerequisite: IEEN 4325.

4352. Engineering Biomechanics. 3(3-0)
Human motion, lever systems within the human body, kinetic elements, kinetic chains, anatomical failure points in man-task systems, anthropometry, industrial seating, the physical dimensions of work place, work tolerance, posture, man-equipment interface, effective kinesiology, hand tools, force optimization, distribution of pressures and stresses, biomechanical consideration of tools design, manual material handling and lifting, dynamometry, myography, analysis of muscle and joint functions.

4353. Environmental Biotechnology. 3(3-0)
Review of physiology, industrial toxicology, standards of quality for the work environment, evaluating the occupational environment, emission spectroscopy, quality control for sampling and laboratory analysis, physics of sound, physiology of hearing, noise measurement and acceptability criteria, vibration, illumination, radiation, physiology of heat stress, air, ground water and noise pollution, thermal standard and measurement techniques, protective device control of noise exposure, controls of exposures to heat and cold, principles of ventilation, exhaust systems, design of ventilation systems.

4354. System Safety Engineering. 3(3-0)
Application of system safety analytical techniques during the design process. Emphasis is on the management of a system safety or product safety program and also its relationship with other disciplines such as reliability, maintainability, human factors and product liability applications relative to the design of systems for government, military and general industry.

4360. Computer Integrated Manufacturing Systems. 3(3-0)
Systems concept of Computer Integrated Manufacturing System, definition of manufacturing and its various levels, planning and control of product movement through the production system, successful use of automation, robotics, just-in-time manufacturing and knowledge-based systems. Prerequisite: IEEN 3331.

4364. Senior Design Project II. 3(3-0)
Capstone design emphasizing analysis and design of manufacturing systems, cellular design, flexible manufacturing systems and manufacturing integration. Integrates knowledge gained from all required industrial engineering courses in a system design project. Prerequisite: IEEN 4163.

MECHANICAL ENGINEERING (MEEN)

1201. Engineering as a Career. 2(2-0)
Definition and role of the engineer in society. Engineering skills, tools and techniques applied to problem solving and academic and professional survival strategies. The course is designed to promote critical and analytical thinking, contains a writing component and the use of the computers (spreadsheets/charting and graphing). For students planning to pursue a career in engineering.

1310. Computer Based Graphics and Design I. 3(2-3)
Introduction to computer-aided engineering design and analysis; principles of graphics, solid modeling, integrated applications of software in engineering drafting, design and problem solving.

1320. Computer Based Graphics and Design II. 3(2-3)
Problem-solving and programming logic, computer generated charts and graphs; computer-aided analysis and design; application of numerical techniques to the solution of engineering problems using high level programming language and numerical computing software.

2146. Engineering Measurements. 1(0-3)
Basic experimental techniques and instrumentation commonly found in industry. Experimental planning and analysis. ASTM methods introduced. Data acquisition means studied. Significance of data and presentation (written and oral). Computer usage and report writing emphasized. Prerequisites: MATH 2414, PHYS 2326/2126, MEEN 1320 or CSEN 2304 and CEEN 2301. Laboratory fee, $5.

2302. Mechanics II (Dynamics). (ENGR 2302) 3(3-0)
Kinematics of particles and rigid bodies; motion relative to translating and rotating reference frames. Kinetics of particles and rigid bodies: Newton's second law, work-energy and impulse and momentum. Introduction to vibrations. Prerequisites: CEEN 2301, MATH 2414 and MEEN 1320 or CSEN 2304.

2355. Statics and Dynamics of Rigid Bodies. (ENGR 2303) 3(3-0)
Resultants of force systems. Equilibrium of rigid bodies. Friction. Centroids and moments of inertia. Kinematics and kinetics of particles and rigid bodies. This course cannot be taken for credit by CEEN and MEEN majors. Prerequisites: PHYS 2325/2125 and MATH 2414.

3145. Material Science Laboratory. 1(0-3)
Tensile, impact, fatigue, hardness and hardenability, creep, phase and microstructure, corrosion testing and microscopic analysis. Ferrous and non-ferrous materials and polymers are studied. ASTM methods are introduced and applied. Introduction to data acquisition and recording. Reporting in both written and oral format. Prerequisite: CEEN 2301 or MEEN 2355 and MEEN 1310. Corequisite: MEEN 3344. Laboratory fee, $5.

3344. Materials Science. 3(3-0)
Atomic and crystal structure of materials. Chemical, mechanical, electrical and magnetic properties of engineering materials. Prerequisites: CHEM 1412 and MATH 2413. Corequisite: PHYS 2326/2126.

3347. Thermodynamics. 3(3-0)
Basic laws governing energy transmission. Thermodynamic properties of liquids and vapors, the ideal gas law and the behavior of ideal gases. Concept of reversible process. Prerequisites: MATH 2414, MEEN 1320 or CSEN 2304.

3348. Heat Transfer. 3(3-0)
Fundamental laws relating to heat transfer including steady and transient heat conduction, forced, convection, natural convection and radiation. Introduction to heat exchanger design. Prerequisites: MEEN 3347, CHEN 3392 or NGEN 3392 and MATH 3320.

3349. Fundamentals of Manufacturing Processes. 3(2-3)
Selection criteria for manufacturing processes, processing of castings, bulk deformation process, sheet metal working, polymer and polymer-matrix composite production, machining and welding processes. Robotics and automation. Prerequisite: junior standing in Engineering.

3350. Design of Machine Elements. 3(2-3)
Application of principles of mechanics and physical properties of materials to the design of machine elements, such as shafts, springs, power screws, gears. Prerequisites: CEEN 3311, MEEN 2302 and MEEN 3344. Laboratory fee, $2.

3352. Kinematic Analysis of Machines. 3(2-3)
Linkages, instant centers, velocities, accelerations and synthesis of mechanisms, cams, gears and dynamic analysis of machines. Prerequisites: MATH 2414 and MEEN 2302. Laboratory fee, $2.

3354. Operations Research Methods in Engineering. 3(3-0)
Development and application of fundamental deterministic methods and models including simplex method, linear programming, network analysis, integer programming, forecasting and networking. Prerequisite: junior standing.

In addition to the listed prerequisites for the following 4000 series courses, a student must have an overall grade point average of 2 or higher.

4131. Mechanical Engineering Laboratory. 1(0-3)
Experimental investigation of mechanical engineering systems: engines, fluid flow, air conditioning, heat transfer devices, pumps and mechanical systems. Prerequisites: MEEN 3146, MEEN 3348. Laboratory fee, $5.

4263. Mechanical Engineering Design Projects I. 2(1-3)
Capstone design course emphasizing quantitative analytical/computer and experimental methods including optimization and simulation as applied to the design process for a broad range of practical problems in mechanical engineering. Integrates knowledge gained from all required mechanical engineering courses in a major system design project. Prerequisite: MEEN 3350. Laboratory fee, $5.

4264. Mechanical Engineering Design Projects II. 2(1-3)
Capstone design course emphasizing the application of analytical/computer and experimental methods to the solution of a broad range of practical problems in mechanical engineering. Integrates knowledge gained from all required mechanical engineering courses via the completion of a system design project. Prerequisite: MEEN 4263. Laboratory fee, $5.

4317. Internal Combustion Engines. 3(3-0)
Thermodynamics of cycles, comparison of characteristics and performance of several forms of internal combustion engines including Otto and Diesel types of piston engines. Fuels, combustion, injection and supercharging. Prerequisite: MEEN 3347.

4335. Special Problems. V:1-3
Individual solution of selected problems in mechanical engineering conducted under direct supervision of a faculty member. May be repeated for up to 6 semester hours. Prerequisite: senior standing.

4336. Selected Topics. V:1-3
One or more topics of mechanical engineering. May be repeated when topic changes. Prerequisite: senior standing.

4341. Application of Thermodynamics. 3(2-3)
Design of power and refrigeration systems, mixing (or separation), multiphase, air conditioning and energy conversion processes. Prerequisite: MEEN 3347 and MATH 3415.

4343. Dynamics of Systems. 3(3-0)
Analysis of dynamic-mechanical, electrical, fluid and thermal system elements; modeling, analysis and design of physical, dynamic systems composed of these elements. Prerequisites: MATH 3320, MEEN 2302 and MEEN 1320.

4344. Control of Systems. 3(3-0)
Analysis and design of controlled, dynamic, linear mechanical, electrical, fluid and/or thermal systems; introduction to concepts of stability, controllability, observability and to discrete time; sampled data control systems; optimal control systems and nonlinear control theory. Prerequisite: senior standing in Engineering.

4345. Engineering Vibrations. 3(3-0)
Free and forced vibrations, degrees of freedom, energy methods, transients, harmonic analysis, damping. Prerequisites: MATH 3320 and MEEN 2302.

4346. Computational Methods in Mechanical Engineering. 3(3-0)
Applications of numerical techniques to the solution of mechanical engineering problems. Prerequisites: MEEN 1320 and credit for or registration in MEEN 3348 or MEEN 3350.

4348. Gas Dynamics. 3(3-0)
Basic concepts and fundamental equations of gas dynamics. Emphasis on the subsonic and supersonic steady flow. Analysis of shock wave phenomena. Prerequisites: MATH 3320 and credit for or registration in MEEN 3348.

4349. Air Conditioning. 3(3-0)
Application of factors of temperature and humidity to the design of air conditioning systems. Design and applications of heating and cooling requirements, total energy systems, etc. Prerequisite: MEEN 3347.

4351. Machine Design. 3(2-3)
Design techniques of brakes, clutches, bevel, worm and helical gears, thick cylinders, fly wheels, impact and elastic bodies, curved beams, flat plates and cams. Prerequisite: MEEN 3350. Laboratory fee, $2.

4352. Design of Turbomachinery. 3(3-0)
Design and application of centrifugal and axial flow pumps and turbines, consideration of similarity parameters, real machine performance characteristics, materials and methods of construction, selection process for various applications. Prerequisites: MEEN 4341 and CHEN 3392/NGEN 3392.

4354. Computational Methods and Finite Element Principles. 3(2-3)
Principles and applications of computational methods, with emphasis on finite element/difference principles. Topics: solution of algebraic, partial and ordinary differential equations; approximations and curve-fitting; and matrix operations. Finite element/difference concepts, types and uses. Use of modeling/analysis software. Prerequisites: MEEN 1320, MATH 3320, CEEN 3311, CEEN 3392/CHEN 3392.

4355. Robotics and Automation. 3(3-0)
Analysis of methods of design and operation of robots and robotic systems. Kinematics and dynamics of manipulators, trajectory planning and motion control, sensing and vision, discussion of command languages and planning of job assignments. Prerequisite: senior standing.

Degree Requirements
Bachelor of Science in Industrial Engineering

Freshman Year				**Junior Year**			
CHEM 1111	**1**	**ENGL 1302**	**3**	**CHEN 3392**	**3**	***BCOM 3304**	**3**
CHEM 1311	**3**	**^*Kinesiology***	**1**	**^*Kinesiology***	**1**	**CEEN 4303**	**3**
ENGL 1301	**3**	**MATH 2413**	**4**	**MATH 3415**	**4**	**EEEN 3331**	**3**
HIST 1301	**3**	**MEEN 1320**	**3**	**MEEN 3347**	**3**	**MATH Elective**	**3**
MEEN 1201	**2**	**PHYS 2325/PHYS 2125**	**4**	**MEEN 3349**	**3**	**MEEN 3348**	**3**
MEEN 1310	**3**		**15**	**MEEN 3352**	**3**	**MEEN 3350**	**3**
	15				**17**		**18**
Sophomore Year				**Senior Year**			
CEEN 2301	**3**	**CEEN 3311**	**3**	**Engineering Elective**	**3**	**Engineering Elective**	**3**
HIST 1302	**3**	**MATH 3320**	**3**	**MEEN 4131**	**1**	**Engineering Elective**	**3**
^*Kinesiology*	**1**	**MEEN 2146**	**1**	**MEEN 4263**	**2**	**Fine Arts Elective**	**3**
MATH 2414	**4**	**MEEN 2302**	**3**	**MEEN 4341**	**3**	**MATH/Science Elective**	**3**
PHYS 2326/PHYS 2126	**4**	**MEEN 3145**	**1**	**MEEN 4344**	**3**	**MEEN 4264**	**2**
POLS 2301	**3**	**MEEN 3344**	**3**	**MEEN 4351**	**3**	**Soc. Sci or**	
	18	**POLS 2302**	**3**	**MEEN 4354**	**3**	**Humanities Elective**	**3**
			17		**18**		**17**

Total Hours Required: 135

Engineering electives: MEEN 4317, MEEN 4343, MEEN 4349, MEEN 4352, MEEN 4335, MEEN 4336, CEEN 4316, MEEN 4348, MEEN 4345, MEEN 4355, MEEN 3354, CEEN 3303.
Mathematics electives: MATH 4370, MATH 4371, MATH 4341, MATH 4321, MATH 4372, MATH 4373, STAT 4350, STAT 4303, CSEN 4363.
Science electives: any advanced-level science course.
Social science or humanities: any advanced-level political science course or any advanced-level history course.
Fine arts electives: ARTS 1303, ARTS 1304, MUSI 2306, THEA 3302 or THEA 4308.
****BCOM 3304: This is a required course. Students must pass with a "C" or better to satisfy the Frank H. Dotterweich College of Engineering's communication skills requirement.***
Students 23 or older may substitute three academic course hours for the Kinesiology requirement.

^For courses listed under Core Curriculum "Components" see "General Requirements for Graduation with a Baccalaureate Degree" in an earlier section *of this Catalog.*

Degree Requirements
Bachelor of Science in Mechanical Engineering
Accredited by the EAC of the Accreditation Board for Engineering and Technology

Freshman Year				**Junior Year**			
CHEM 1111	**1**	**ENGL 1302**	**3**	**CHEN 3392**	**3**	**CEEN 3317**	**3**
CHEM 1311	**3**	**HIST 1302**	**3**	**MATH 3415**	**4**	**EEEN 3331**	**3**
ENGL 1301	**3**	**^*Kinesiology***	**1**	**MEEN 3347**	**3**	**MEEN 3348**	**3**
HIST 1301	**3**	**MATH 2413**	**4**	**MEEN 3349**	**3**	**MEEN 3350**	**3**
^*Kinesiology*	**1**	**MEEN 1320**	**3**	**MEEN 3352**	**3**	**MEEN 4341**	**3**
MEEN 1201	**2**	**PHYS 2325/PHYS 2125**	**4**		**16**	**POLS 2302**	**3**
MEEN 1310	**3**		**18**				**18**
	16						
Sophomore Year				**Senior Year**			
CEEN 2301	**3**	**BCOM 3304**	**3**	**Engineering Elective**	**3**	**Engineering Elective**	**3**
****Fine Arts Elective**	**3**	**CEEN 3311**	**3**	**MEEN 4131**	**1**	**Engineering Elective**	**3**
^*Kinesiology*	**1**	**MATH 3320**	**3**	**MEEN 4263**	**2**	**MATH/Science Elective**	**3**
MATH 2414	**4**	**MEEN 2146**	**1**	**MEEN 4344**	**3**	**MEEN 4264**	**2**
PHYS 2326/PHYS 2126	**4**	**MEEN 2302**	**3**	**MEEN 4351**	**3**	**Soc. Sci or**	
POLS 2301	**3**	**MEEN 3145**	**1**	**MEEN 4354**	**3**	**Humanities Elective**	**3**
	18	**MEEN 3344**	**3**	**STAT 4303**	**3**		**14**
			17		**18**		

Total Hours Required: 135

Electives are selected from the following:
Engineering design electives: MEEN 4317, MEEN 4343, MEEN 4345, MEEN 4349, MEEN 4352, MEEN 4335, MEEN 4336, CEEN 4316.
Engineering science electives: MEEN 3354, MEEN 4335, MEEN 4336, MEEN 4348, MEEN 4355, CEEN 3303.
Mathematics electives: MATH 4320, MATH 4370, MATH 4371, MATH 4341, MATH 4321, MATH 4372, MATH 4373, STAT 4350, CSEN 4362.
Social science or humanities: any advanced-level political science course or any advanced-level history course exclusive of Texas and/or United States History.
****BCOM 3304: This is a required course. Students must pass with a "C" or better to satisfy the Frank H. Dotterweich College of Engineering's communication skills requirement.***
*****Fine arts electives: ARTS 1303, ARTS 1304, MUSI 2306, THEA 3302 or THEA 4308.***
Students 23 or older may substitute three academic course hours for the Kinesiology requirement.

^For courses listed under Core Curriculum "Components" see "General Requirements for Graduation with a Baccalaureate Degree" in an earlier section *of this Catalog.*

SOUTH TEXAS ENVIRONMENTAL INSTITUTE

Director

Engineering Complex 376. MSC 213. Extension 3046

The South Texas Environmental Institute was established in 2001 with the mission to promote regional sustainability by fostering the ideals of environmental protection while encouraging regional economic growth. The Institute promotes applied research, technology development and transfer and environmental education to the South Texas region by 1) promoting the use of innovative sustainable technologies in all aspects of South Texas life, 2) fostering applied research for the development and transfer of technologies that ensure an equitable balance between ecological, environmental and occupational health and continued economic growth of the region, 3) providing individuals, institutions and communities access to resources that ensure a knowledgeable populace equipped with an understanding of environmental issues for making informed decisions and 4) promoting and providing for coordination and consolidation environmental activities on a regional scale. Trans-boundary environmental issues with Mexico and the Gulf of Mexico along its coast are a key focus area in the Institute's charter. Activities such as the South Texas Environmental Conference Series, held annually in both the Coastal Bend and the Rio Grande Valley, in addition to the regional research emphasis, has resulted in partnerships and collaborations with organizations and individuals from throughout the South Texas region.