College of Engineering, Architecture and Technology

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The mission of the College of Engineering, Architecture and Technology is to advance the quality of human life through strategically selected programs of instruction, research and public service, incorporating social, economic and environmental dimensions and emphasizing advanced level programs in engineering that are internationally recognized for excellence.

Engineers, engineering technologists and architects, working side by side, constitute one of the most powerful agents for change in our society. New ways are found to control the environment, to utilize the resources and forces of nature and to increase productivity of needed goods and services, in short, to improve the quality of life for all.

Most of the work of engineers, technologists and architects is concerned with the conception, design, fabrication, and maintenance and testing of devices, processes, installations, and systems that serve human needs. This work provides ample opportunity to express creativity. It requires an ability to make decisions.

The professionals and semi-professionals who will be largely responsible for the shape of the world in the next few decades include those now in higher education. The power they will exercise makes an exciting prospect and presents a sobering responsibility. The easy problems are usually solved first and are now a part of history. Many difficult problems remain. The need for talented and highly trained people is obvious; one will be embarking on a lifetime of challenge if he or she decides to prepare for a career in engineering, engineering technology or architecture at Oklahoma State University.

The College of Engineering, Architecture and Technology (CEAT) offers a complete spectrum of educational opportunities designed to give graduates the capability and the flexibility to meet the ever-changing requirements of society—a society heavily committed to technological innovation. To be prepared to make continuing contributions, engineers, architects and technologists must have at their command not only the modern tools and processes of industry, but a firm and rigorous education in mathematics, the physical sciences, analysis and design. In order that those contributions be sensitive to genuine human needs, the engineer, architect or technologist must also be schooled in the social sciences and humanities that provide the understanding of non-technical factors that must shape technological innovation and implementation. The study of social sciences and humanities also helps prepare the graduate to be an effective contributor within human organizations. With this firm foundation and a commitment to lifelong learning, graduates make contributions to society throughout their professional careers.

The curricula in each of the programs seek to provide the optimum combination of breadth in the enduring fundamentals that undergird technologically based society and specialization in a discipline. Each curriculum also sensitizes the student to ethical, social, cultural and global issues in order to equip the student to contribute to solutions at the cutting edge of technology. Curricula are continuously evolving to include current applications of the principles. With the combination of theory, practice and sensitivity to the educational experience should support one's following diverse interests and opportunities throughout the productive years of his or her life span.

Academic Programs

Academic programs offered in the College of Engineering, Architecture and Technology culminate in the following degrees:

Schools of Engineering:
Bachelor of Science in Aerospace Engineering, Biosystems Engineering with options in biomechanical, bioprocessing and biotechnology, environment and natural resources, and food processing; Chemical Engineering with options in environmental, biomedical/biochemical and premedical; Civil Engineering with an option in environmental; Computer Engineering; Electrical Engineering; Industrial Engineering and Management; and Mechanical and Aerospace Engineering with an option in premedical.

Master of Science in Biosystems Engineering, Chemical Engineering, Civil Engineering, Electrical Engineering, Engineering and Technology Management, Environmental Engineering, Industrial Engineering and Management, and Mechanical and Aerospace Engineering.

Doctor of Philosophy in Biosystems Engineering, Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering and Management, and Mechanical and Aerospace Engineering.

School of Architecture:
Bachelor of Architecture, Bachelor of Architectural Engineering.

Division of Engineering Technology:
Bachelor of Science in Engineering Technology with programs in construction management technology with options in building and heavy, electrical engineering technology with options in computer and telecommunications, fire protection and safety technology, and mechanical engineering technology.

Accreditation

Undergraduate engineering programs are separately accredited by the Engineering Accreditation Commission (EAC) of the ABET. EAC of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; phone: (410) 347-7700; e-mail: accreditation@abet.org. Specifics of accreditation are found in the sections devoted to each program on the following pages.

The Bachelor of Architecture program is accredited by the National Architectural Accrediting Board, Inc., 1735 New York Ave. NW, Washington D.C. 20006; phone (202) 783-2007.

The undergraduate engineering technology programs are separately accredited by the Technology Accreditation Commission (TAC) of ABET. TAC of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; phone: (410) 347-7700; e-mail: accreditation@abet.org. Specifics of accreditation are found in the program descriptions in the section "Division of Engineering Technology."

Special College Programs

—Cooperative Education. The Cooperative Education program provides students work opportunities in a supervised environment that assures professional development. Work periods alternate with academic

studies. Students enter the program at the end of their sophomore year and complete at least one calendar year of supervised work experience in two or more work periods prior to graduation.

—CEAT Scholars Program. This program provides educational experiences for a select group of gifted students that will develop their technical competence, world view, professional and public responsibility, and leadership skills. Approximately 25 freshmen are selected each year by application and interview to enter this four year program, based on demonstrated academic and leadership potential. Students participate in special lectures, tours, residence hall programs, seminars, personal development activities, faculty mentoring, and summer tours in the U.S. and abroad.

—CEAT Freshman Research Scholars Program. This program provides opportunities for accelerated intellectual development of a select group of students. Approximately 12 new freshmen students are identified from applications and interviews annually to participate in this program. Each student is assigned to a research faculty mentor and participates in a research program.

—ConocoPhillips Spirit Scholars Program. The ConocoPhillips Company sponsors this program to increase the number of outstanding graduates in engineering from Oklahoma State University. Freshman students are identified for this program from applications and interviews with both Oklahoma State University faculty and ConocoPhillips employees. The program includes a number of experiences to help students develop professionally, build leadership and teamwork skills, assess personal capabilities, achieve academic excellence, enhance interpersonal relationships, and increase the student's awareness of career opportunities. Special features include the assignment of a ConocoPhillips engineer to mentor each student, focused national and international trips and financial support.

—Women in Engineering, Architecture, and Technology (WEAT). Programs and resources are in place to develop and support female enrollment in the CEAT. Peer mentoring program, an active Society of Women Engineers, summer programs in engineering for high school students, a conference for high school and OSU students, and a vigorous recruiting effort are all directed at recruitment and retention of women in engineering, architecture and technology. Female faculty members and a coordinator of WEAT programs provide support to this program.

—Multicultural Engineering Program. These programs focus on increasing the number of minority graduates from the CEAT, and increasing the understanding of diverse cultures on the part of all students. Included are programs for recruitment and retention of qualified minority students. Industrial support provides scholarships, summer employment, and supplemental funds for recruitment and retention of minority students. Cultural awareness programming is designed to increase understanding of and sensitivity to the diverse cultures with which students will have to interact in today's world.

—Employment Service. The CEAT Career Services Office supports the University Career Services and assists students with on-campus interviews and job referrals for summer coop and permanent employment. Job vacancy listings, reference files, and resource materials on resume preparation, interviewing, and job search techniques, are available for student reference. Orientation meetings and various workshops are provided to prepare students for the process of seeking employment.

—CEAT Living Unit Programs. CEAT floors have been established in the Kerr-Drummond residence hall for both men and women CEAT students. Living/Learning Communities are also available for female (Maude's Quad) and multicultural (HOMES) freshmen. CEAT student staff live on the floors to provide programming and monitoring. Special activities are planned for the floors, including events with faculty and other resource persons. This arrangement provides a community where students can study together, have access to tutoring, and serve as role models for other students. The atmosphere on these floors is conducive to study.

Departmental Clubs and Honor Societies

Alpha Epsilon (biosystems and agricultural engineering honor society)
Alpha Pi Mu (industrial engineering and management honor society)
Alpha Rho Chi (architecture honor society)
Amateur Radio Club
American Indian Science and Engineering Society
American Institute of Architecture Students
American Institute of Aeronautics & Astronautics
American Institute of Chemical Engineers
American Society for Quality
American Society of Agricultural and Biological Engineers
American Society of Civil Engineers
American Society of Heating, Refrigeration and Air Conditioning Engineers
American Society of Mechanical Engineers
American Society of Safety Engineers
Architecture Engineering Institute
CEAT Student Council
Chi Epsilon (civil and architectural engineering honor society)
Construction Management Society
Construction Specifications Institute
Cowboy Motorsports Quarter Scale Tractor Team
Engineers Without Borders
Eta Kappa Nu (electrical and computer engineering honor society)
Fire Protection Society
Institute for Operations Research and the Management Sciences
Institute of Electrical & Electronics Engineers (two student branches)
Institute of Industrial Engineers
Institute of Transportation Engineers
Omega Chi Epsilon (chemical engineering honor society)
Pi Tau Sigma (honorary mechanical engineering society)
Sigma Gamma Tau (honorary aerospace engineering society)
Sigma Lamda Chi (Construction Management Technology honor society)
Society of Automotive Engineers
Society of Automotive Engineers Formula Racing Team
Society of Automotive Engineers Mini-Baja Team
Society of Black Engineers, Technologists & Architects
Society of Fire Protection Engineers
Society of Hispanic Professional Engineers
Society of Manufacturing Engineers
Society of Women Engineers
Student Association of Fire Investigators
Tau Alpha Pi (technology student's honor society)
Tau Beta Pi (engineering student's honor society)

CEAT Honors Program

The Honors College provides opportunities for challenges for undergraduate students of unusually high ability, motivation and initiative. Honors classes, seminars and independent study courses are structured to put interested students and teachers together in ways which encourage discussion and a mature approach to learning.

Each honors course completed with an "A" or "B" grade is identified on the student's transcript as such. A special bachelor's degree honors diploma is conferred upon graduation for successful completion of all Honors College requirements.

Qualified high school scholars are eligible for The Honors College beginning with their first enrollment at OSU as freshmen. Eligibility is based on a minimum composite ACT score of 27 and a high school grade-point average of 3.75 or higher. Students other than new freshmen may enter the Honors Program if they have an OSU and a cumulative grade-point average that satisfies the requirements specified by the Honors College. Students should contact The Honors College, 510 Edmon Low Library, for eligibility forms.

—Honors Recognition. The General Honors Award is earned by completing a minimum of 21 honors credit hours with grades of "A" or "B." At least three honors credit hours must be completed in each of four of the following areas: (1) English, speech communication and foreign languages (2000 level or higher), (2) humanities, (3) mathematics, statistics and computer science, (4) natural science, (5) social science, and (6) other courses with honors credit. Three of the 21 credit hours must be in a special honors seminar or an interdisciplinary honors course. A 3.50 or higher cumulative grade-point average is required at the time of the award. Completion of the General Honors Award is noted on the student's official transcript.

The College Honors Award is earned by completing a minimum of 12 honors credit hours in upper-division courses with grades of "A" or "B." The 12 credit hours must include a senior honors thesis or senior honors project with a public presentation of the results. A 3.50 or higher cumulative grade-point average is required at the time of the award. Completion of the College Honors Award is noted on the student's official transcript.

Students who earn a minimum of 39 honors credit hours with at least a 3.50 OSU and cumulative GPA and have received both the General Honors Award and the College Honors Award will be granted the bachelor's degree with honors. This recognition is reflected on the student's official transcript and on a special honors diploma.

Scholarships

Several scholarships are funded through private donations, alumni gifts, and industries, and vary in amounts from $400 to over $5,000 per year.

These scholarships are available for freshman through senior students, and are awarded primarily on the basis of academic achievement and leadership potential. However, during the selection process consideration may be given to financial need. Freshman students should normally have an ACT composite score of 29 or higher and be in the top 10 percent of their high school graduating class to be competitive for CEAT scholarships.

Each school or department within the College normally has scholarship funds available. These are administered through that school or department rather than through the College's scholarship committee. However, a separate application form is not required.

Scholarship application forms for transfer students may be obtained by contacting the Office of Student Academic Services, CEAT, 101 Engineering North, OSU, Stillwater, OK 74078.

Freshman scholarship applications should be completed and on file by February 1 preceding the academic year for which the student expects to receive the scholarship in order to assure full consideration. The OSU Freshman Fee Waiver and Scholarship form should be submitted to the Office of University Scholarships. Since copies of these applications are forwarded to CEAT, a separate application is not required.

Continuing students should submit scholarship applications to the Dean's office of student services and the head of the school in which they are majoring prior to April 1. In this manner they will also be considered for any departmental scholarships for which they may be eligible as well as for any CEAT scholarship. Students who have not selected a major should submit their applications to the Dean's Office of Student Services.

Concurrent Enrollment

If a student expects to apply credits toward a degree at OSU that are to be earned at another institution or through correspondence study or extension, while enrolled in one of the programs of the College of Engineering, Architecture and Technology, permission must be obtained in advance. It is the belief of the faculty of the College that such enrollment detracts from the educational process at this institution, and can be justified only in the most unusual circumstances. Normally, if the material for which such permission is sought is available at OSU, permission will not be granted, nor will retroactive permission be granted in any circumstances.

High School Preparation

Beginning engineering students who have completed two units of algebra and one each in plane geometry and trigonometry/analysis in high school should be prepared to enter at the expected level in mathematics. In addition, students who can should obtain high school credit in one unit of general chemistry, one unit of general physics, and a course in calculus, if available.

Oklahoma State University offers course work in algebra, trigonometry and preparatory chemistry for students who were unable to obtain this work during high school. However, such credit does not count toward the minimum number of semester hours specified for the BS degree in engineering.

General chemistry, college algebra and trigonometry credits may count toward BS degrees in engineering technology, and general chemistry may be used as an elective in architecture.

General Education Requirements

For students in Engineering, Architecture and Technology, courses in the humanities and social sciences provide both a broadening of the education and essential background for addressing the critical issues in society. Students in Engineering, Architecture and Technology must take General Education courses consistent with those specified in the degree requirement sheets. Each student should visit with his or her adviser to ascertain that appropriate courses are being selected. Engineering students must complete at least six credit hours of courses designated as (H) and six credit hours of course work designated (S). The student must also satisfy the international dimension and diversity course requirement. The international dimension can be satisfied by either taking a course designated (I) or by approved international experience. The diversity course requirement must be satisfied by taking a course designated (D). If this course work is taken at Oklahoma State University, the course must have been designated as (H), (S), (D) and/or (I) respectively at the time it was taken. If one or more of the courses were taken at another institution the course must transfer as equivalent to an Oklahoma State University course that was designated (H), (S), (D) and/or (I) respectively at the time that the transfer course was taken. Engineering students should verify their course selections in these categories with advisers in the CEAT Office of Student Academic Services before enrollment.

Schools of Engineering

Each of the schools of engineering offer bachelor's, Master of Science, and doctor of philosophy degree programs. The common curricular objectives for the engineering programs are to develop each student's: (1) capability to delineate and solve in a practical way the engineering problems of society, (2) sensitivity to the socially-related technical problems which confront the profession, (3) understanding of the ethical characteristics of the engineering profession and practice, (4) understanding of the engineering responsibility to protect both occupational and public health and safety, and (5) ability to maintain professional competence through life-long learning.

The Professional School Concept

In accord with the professional nature of a career in engineering, a student entering OSU is admitted into the pre-engineering program, consisting of the course work normally taken the first two years of an engineering curriculum. Near the completion of the pre-engineering course work, the student is considered for admission to one of the professional schools of the College to continue in the upper-division program. Upon meeting admission standards the student then pursues a curriculum leading to the BS degree or graduate education in his or her discipline.

—Pre-professional School. The content of the pre-engineering program is similar for most engineering specialties and includes course work devoted to mathematics through calculus and differential equations, communication skills, general chemistry, general physics, engineering sciences, social sciences, and humanities.

—Professional School**.** Upon formal admission to the professional school of his or her choice, the student proceeds through the junior and senior years of the degree program, fulfilling "Major Requirements" as listed on the degree requirements sheets in the publication *Undergraduate Programs and Requirements* that is considered a companion document to this *Catalog*. Upon completion of all degree requirements, the student is awarded the Bachelor of Science degree.

—Master of Science and Doctor of Philosophy. These degree programs are available in each engineering school to prepare engineers for careers in advanced engineering, research and development. The programs are described under each school's headings and in the "Graduate College" section of the *Catalog*.

The College of Engineering, Architecture and Technology also participates in interdisciplinary Master of Science programs in control systems engineering, engineering and technology management, health care administration, and telecommunications systems management. The Master of Manufacturing Systems Engineering is also offered in the College. All of these programs are available using distance learning technologies and most may be taken by resident students on campus. See the "Graduate College" section of the *Catalog* for further information.

Admission Requirements

All new engineering students at Oklahoma State University are first admitted to the pre-professional school program. Regardless of previous background all new engineering students must enroll in ENGR 1111, BAE 1012 (if the student plans to study biosystems engineering), or ARCH 1112 (if the student plans to study architectural engineering). New students who do not have a strong preparation in mathematics and science will be required to complete additional course work before enrolling in required courses in these subjects. Students transferring to pre-professional school from another major at OSU or University Academic Services must meet the same requirements for admission as a student transferring from another college or university.

Transfer students will be admitted directly to pre-professional school if they satisfy all OSU resident transfer student requirements and have a GPA of at least 2.00 not to include activity, performance or remedial courses in the most recent semester completed.

Students not directly admissible to pre-professional school, but those who meet OSU requirements for admission, may be admitted to University Academic Services for one or two semesters in order to fully evaluate their qualifications for admission to pre-engineering. After grades are received each semester, such students may be evaluated and, if qualified, will be admitted to pre-engineering.

International student applications must be received by June 15, November 1 and April 1 for the fall, spring and summer terms, respectively, to be considered for admission to pre-engineering.

—Admission to the Professional Schools. In each school of engineering the lower-division course work is devoted to preparing the student for professional school.

To be admitted to one of the professional schools of engineering, the student must have:

1. Completed a minimum of 60 credit hours in an accredited institution of higher learning.
2. Demonstrated an acceptable level of competence in subject material comparable to that covered in Pre-engineering, i.e., General Education and Common Pre-engineering. Such demonstration may be by completion of course work or by examination with not more than half the requirements satisfied by examination.
3. Demonstrated an acceptable level of professional potential, including academic integrity and ethical behavior, as determined by the professional school head.
4. Been formally accepted by a professional school. This acceptance may include any evaluation of the student's professional potential.

An acceptable level of competence for admission to a professional school may be demonstrated by:

a. Completion of the pre-professional school requirements as designated on the flow chart corresponding to the student's matriculation date and major, with an overall grade-point average of 2.30 or higher in these courses. Students may be deficient in no more than nine of these hours, and must have completed the required sequences in calculus, general physics, general chemistry, English composition, and at least two engineering science courses.

b. Final grades of "C" or better in all courses submitted to meet the University's English composition requirement.

c. Completion at OSU of at least 12 credit hours of courses required for the degree, with a grade-point average of 2.30 or higher in these courses. This must include at least nine hours of technical subjects with a GPA of 2.50 or higher.

d. Achievement of an overall grade-point average of 2.50 or higher in the required mathematics, physics, chemistry, engineering science and engineering courses completed prior to admission to a professional school and final grades of "C" or better in each of these courses.

For these purposes, all GPAs are calculated using only the last grade in repeated courses. Individual schools may impose higher standards for admission. Currently, the School of Electrical and Computer Engineering requires a 2.60 and 2.70 respectively where 2.30 and 2.50 are indicated in a., c., and d. above.

The School of Mechanical and Aerospace Engineering currently requires a 2.70 technical GPA (basic science and engineering courses including physics, biology, geology, engineering, engineering science and MAE courses on degree plan); a 2.70 math GPA (includes all required math and statistics courses on degree plan); and a 2.60 overall GPA.

The School of Chemical Engineering currently requires a 2.70 GPA or better in math, science and engineering courses required in the Chemical Engineering degree plan.

In addition, if the number of qualified professional school applicants to a given professional school exceeds the number that can be provided a quality program with the resources available, the number admitted each year to that professional school will be limited. In that event, priority for admission will be given to pre-engineering students on a best qualified basis as determined by the grade-point average in relevant courses taken and completed at OSU and professional potential, including academic integrity and ethical behavior. This practice will preserve the

high standards demanded of a quality educational experience sought by students and is necessary so that OSU graduates will continue to be highly regarded.

Students may enroll in no more than nine hours of upper-division major requirements prior to admission to professional school unless they secure permission from the head of the school. However, enrollment preference in such courses will be given to students admitted to the professional school.

Class Placement

The selection of the initial chemistry and mathematics courses for an entering student in the College of Engineering, Architecture and Technology is determined by: (1) the credit hours of and grades in mathematics and chemistry courses previously complete, (2) placement test scores, and (3) ACT test scores. When appropriate, students with a strong background can obtain academic credit by advanced standing examination or by College Level Examination Program (CLEP) tests.

Academic Advising

The College's Office of Student Academic Services provides advisement for all pre-engineering students. When a student has gained admission to a professional school of engineering, he or she will be assigned a faculty adviser in the school.

Each student is personally advised in the planning and scheduling of his or her course work and is counseled and advised individually on matters of career choice, his or her activities at OSU, and on other academic matters. An academic file is created for each student at the time of initial enrollment.

Each student and his or her adviser must carefully select elective courses to meet the curriculum objectives and accreditation criteria. Specific criteria include appropriate computer-based experiences, knowledge of probability and statistics, competence in written and oral communications, an understanding of ethical, social, economic and safety considerations, and engineering design experiences that are integrated throughout the curriculum. The engineering design experiences begin with ENGR 1322, 1332, 1342 or 1352 (depending on the student's major) and culminate with a major engineering design experience specified on the degree requirement sheet. The adviser assists the student in this effort and tries to assure accuracy and compliance; however, the ultimate responsibility for meeting degree requirements rests with the student.

General Education Requirements

Opportunities to satisfy General Education requirements with required courses in the schools of engineering include:

ENGLISH. Students in some programs are required to complete a course in technical report writing. Thus, students making an "A" or "B" in the first English composition course (ENGL 1113), need not take ENGL 1213, and may take ENGL 3323, to meet both the General Education requirement for English and specific program requirements.

—Humanities and Social Science. Engineering students must complete a minimum of 18 credit hours to satisfy this requirement. By taking American history and political science, six additional hours designated as social and behavioral sciences, and six hours designated as humanities, the 18 hours will meet the University's requirements in these areas. Humanities and Social Science courses must be selected with the assistance of a CEAT adviser in order to assure compliance with accreditation requirements and the University's requirement for an International Dimension.

Biosystems and Agricultural Engineering

Ronald L. Elliott, PhD, PE - *Professor and Head*

The School of Biosystems and Agricultural Engineering is administered jointly by the College of Agricultural Sciences and Natural Resources and the College of Engineering, Architecture and Technology.

Biosystems engineers are professionals who create and adapt engineering knowledge and technologies for the efficient and effective production, processing, storage, handling and distribution of food, feed, fiber and other biological products, while at the same time providing for a quality environment and preserving and protecting natural resources. Biosystems engineers directly address problems and opportunities related to food, water, energy, and the environment – all of which are critical to the quality of life in our society. Subject-matter specialization is provided through the following four undergraduate option areas: food processing, environment and natural resources, biomechanical, and bioprocessing and biotechnology.

Biosystems engineering courses integrate engineering sciences, physical sciences, and biological sciences, and teach students to address real-world challenges. With the guidance of experienced faculty, students work both as individuals and in teams to design creative solutions to complex problems.

The overall objective of the undergraduate biosystems engineering degree program is to provide the comprehensive education necessary to prepare students for successful, productive and rewarding careers in engineering for agricultural, food and biological systems. Graduates of the program will be:

- able to apply the mathematical, physical, engineering, and biological principles needed to understand, analyze, and solve problems in food, agricultural, environmental and/or biological systems.
- effective in oral, written and visual communications.
- effective in accomplishing tasks, both as an individual, and as a contributor to multi-disciplinary teams.
- able to understand the social, environmental, safety and economic impacts of their work in local and global contexts, and to perform in a professional and ethical manner.
- committed to enhancing knowledge and skills through continuing education.

The undergraduate educational program is divided into two components—pre-professional and professional. In the pre-professional portion of the biosystems engineering program (usually equivalent to two years of study) the focus is on the underlying biological, physical, chemical and mathematical principles of engineering, supplemented by appropriate general education courses in English, social sciences and humanities. Students who demonstrate proficiency in this portion of the program are eligible for admission to the professional school in biosystems engineering.

The professional school of biosystems engineering curriculum (typically two years) builds systematically upon the scientific knowledge acquired in the pre-professional curriculum. In professional school, students have the opportunity to focus on the option areas given above. The degree is accredited by the Engineering Accreditation Commission of the ABET under criteria for agricultural engineering and similarly named programs.

Each professional school course builds upon preceding engineering courses to develop in the student the ability to identify and solve meaningful engineering problems. The course work is specifically sequenced and interrelated to provide design experience at each level, leading to progressively more complex, open-ended problems. The course work incorporates the social and economic aspects of technical problems, and stresses the responsibilities as engineering professionals to behave ethically and promote occupational and public

safety. The program culminates in senior year design courses in which students integrate the analysis, synthesis and other abilities they have developed throughout the earlier portions of their study into a capstone experience. At this point, they are able to design components, systems and processes that meet specific requirements, including such pertinent societal considerations as ethics, safety, environmental impact and aesthetics. The students have also developed and displayed the ability to conduct experiments essential to specific studies and to analyze the experimental results and draw meaningful conclusions.

An integral part of this education continuum from basic science through comprehensive engineering design are learning experiences that facilitate the students' abilities to function effectively in both individual and team environments. Moreover, the program provides every graduate with adequate learning experiences to develop effective written and oral communication skills. State-of-the-art computational tools are introduced and used as a part of their problem-solving experiences. Finally, the students' experience in solving ever-more-challenging problems enables them to continue to learn independently throughout their professional careers.

A wide variety of employment opportunities are available for biosystems engineers in industry, public service and education. Some of these opportunities include positions in governmental agencies, consulting engineering firms, and agricultural and food equipment industries. Biosystems engineers are employed throughout the U.S. as well as internationally.

Students interested in a degree in biosystems engineering may initially enroll in the College of Engineering, Architecture and Technology or the College of Agricultural Sciences and Natural Resources. Students who enroll in the College of Agricultural Sciences and Natural Resources should request a biosystems engineering adviser and transfer to the College of Engineering, Architecture and Technology by the end of their first semester.

Graduate Programs

The School of Biosystems and Agricultural Engineering offers programs leading to the Master of Science and Doctor of Philosophy degrees in biosystems engineering. These degrees emphasize research and development.

Excellent laboratory and computer facilities are available for students to explore research and design in such areas as bioprocessing, food engineering, sensor and control technology, waste management and utilization, hydrology, water quality, porous media flow, and intelligent systems for agricultural machine design and production.

Research projects are supported by the Agricultural Experiment Station and by state, federal and private grants and contracts. A well-trained faculty, many of whom are registered professional engineers with research, consulting and design experience, guide the graduate students' activities and plan programs to meet students' needs. Graduate students design experiments and special equipment to conduct their work. They are expected to demonstrate, by supporting research or by designs, the ability to identify a problem, define alternatives, propose a solution, organize a design or an experimental investigation, carry it to completion and report the results.

—Admission Requirements. Admission to either the Master of Science or Doctor of Philosophy degree program requires graduation from an engineering curriculum accredited by the ABET. Students without accredited degrees may be admitted provisionally and may be required to take additional courses.

A student must be accepted by an adviser in the department prior to official admission to the graduate program.

—Degree Requirements. A candidate for either of the graduate degrees listed above follows an approved plan of study which must satisfy at least the minimum University requirements for that particular degree.

Chemical Engineering

Khaled A.M. Gasem, PhD - *Bartlett Chair, Professor and Head*

Chemical engineers use the language of mathematics to describe the chemical and physical behavior of molecules (solid, liquid, gas, or plasma). This ability is used to design and operate processes that produce useful products. Chemical engineers work in a wide range of industries that make pharmaceuticals, fuels, biochemicals, semiconductor materials, foods, plastics, paper, petroleum products and chemicals. Key to providing a benefit to society, chemical engineers are responsible for resource conservation, minimizing pollution, minimizing costs, and maximizing quality and safety of processes that make the products.

The emphasis on the chemical nature of everything people use is what makes chemical engineers different from other engineers. The emphasis on the processes that make the products is what makes chemical engineers different from chemists.

Chemical engineers often find themselves defining a problem or product, developing a process to do what is needed, and then designing the plant to carry out the process. After the plant is started, chemical engineers commonly manage operations, oversee equipment maintenance, and supervise control of product quality. They trouble-shoot the problems which hinder smooth operations, and they plan for future expansions or improvements. Their training and knowledge make them well qualified to market the products from a plant, the processing equipment for plants, or even the complete plant itself. The varied background and experience of chemical engineers make them ideally suited for advancement into top-level managerial and executive positions.

—Educational Objectives. Within the first few years after graduation OSU graduates will possess:

- Competencies - skill in tools and techniques that are fundamental to the job, many of which need to be learned after graduation.
- Professionalism - partnership in the mission and within the human context of the enterprise; ethics, effectiveness and awareness of the broad context of detailed work
- Balance - a wise self-direction to life, community, health, and self view that finds the right balance between personal choices, that energizes self and others and enables effectiveness in relationships with others.

The goal of the BS degree program is to produce graduates who possess broad-based knowledge, skills and judgment that prepares them to succeed in the profession of engineering or in further studies at the graduate level, including medical school. To achieve this goal, the program is designed to progressively develop both technical and human skills.

In the pre-professional portion of the chemical engineering program (usually equivalent to two years of study), the focus is on the underlying scientific and mathematical principles of engineering, supplemented by appropriate general education courses in English, social sciences and humanities. Students who demonstrate proficiency in this portion of the program are eligible for admission to the professional school.

The curriculum in the professional school (typically the second two years) builds systematically upon the scientific knowledge acquired in the pre-professional curriculum. In professional school, students have the opportunity to focus in one of four emphasis areas: (1) the regular course prepares a graduate for a wide range of employment opportunities; (2) the pre-medical option is for those who wish preparation for medical school; (3) the biomedical/biochemical option is for those who seek employment in bio-related professions; and (4) the environmental option is for those who wish to emphasize environmentally-related studies. Each emphasis area is accredited under the basic level EAC-ABET criteria for chemical engineering programs and each prepares a student for success in both employment and graduate study at OSU or other universities. A more complete description of exact degree

requirements for the bachelor's-level curricula is given in the publication *Undergraduate Programs and Requirements* at OSU.

—Admission Requirements for the Chemical Engineering Professional School. To be admitted into the CHE Professional School (and to be eligible to take the upper-level CHE courses) the student must:

- Complete at least 60 college-level credit hours (of which 12 must be from OSU)
- Complete MATH 2144, 2153, 2163, and 2233 (or 3263); PHYS 2014 and 2144; CHEM 1515 and 3053; CHEM 3153 and 3112 (or BIOC 3653 and 3723); ENSC 2213 and 3233; CHE 2033; ENGL 1113 or 1313. A final grade of "C" or better must be achieved in these courses. If a "C" is obtained in ENGL 1113 or 1313, ENGL 1213 or 1413 is also required.
- Earn a grade of "C" or better in additional math, science and engineering courses taken prior to professional school admittance which are part of the degree requirements.
- Maintain a GPA of 2.75 or better in the math, science and engineering courses on the Chemical Engineering degree requirements.

Each professional school course builds upon the preceding chemical engineering courses to develop the ability to identify and solve meaningful engineering problems. The course work is specifically sequenced and interrelated to provide design experience at each level, leading to progressively more complex, open-ended problems. The course work includes sensitizing students to socially-related technical problems and their responsibilities as engineering professionals to behave ethically and protect occupational and public safety. The program culminates in the senior-year design courses in which the students integrate the analysis, synthesis and other abilities they have developed throughout the earlier portions of their study into a capstone experience. At this point, they will be able to design components, systems and processes that meet specific requirements, including such pertinent societal considerations as ethics, safety, environmental impact and aesthetics. The students will have developed and displayed the ability to design and conduct experiments essential to specific studies, and to analyze the experimental results and draw meaningful conclusions within an enterprise context.

An integral part of this educational continuum from basic science through comprehensive engineering design are learning experiences that facilitate the students' abilities to function effectively in both individual and team environments. Moreover, the program provides every graduate with adequate learning experiences to develop effective written and oral communication skills. State-of-the-art computational tools are introduced and used as a part of their problem-solving experiences. Finally, the students' experience in solving ever-more-challenging problems gives them the ability to continue to learn independently throughout their professional careers.

Graduate Programs

The School of Chemical Engineering offers programs leading to the Master of Science and Doctor of Philosophy. A program of independent study and research on a project under the direction of a member of the Graduate Faculty will be satisfactorily completed by all graduate students. For the Master of Science candidate, the project may result in a thesis. For the Doctor of Philosophy candidate, the project will result in his or her dissertation.

—Admission Requirements. Admission to either the Master of Science or Doctor of Philosophy degree program requires graduation from a chemical engineering curriculum approved by the ABET (ABET) or a recognized equivalent from any international program.

Students with related undergraduate degrees, such as chemistry, automation engineering, etc. can be admitted conditionally, subject to completing prescribed undergraduate Chemical Engineering program courses. Admission is competitive based on undergraduate GPA, GRE and TOEFL (for international students), statement of interests, experience and recommendations.

—The Master of Science Degree. General requirements for the Master of Science degree in chemical engineering are 30 credit hours of work beyond the BS degree and an acceptable thesis. At least 18 hours must be in class work and a minimum of six hours of credit is required for thesis research. The courses taken must include CHE 5123, 5213, 5743 and 5843.

—The Doctor of Philosophy Degree. The general credit requirement is a minimum of 90 credit hours beyond the BS degree, including at least 36 hours of credit for research and at least 30 hours of class work. The courses must include CHE 5123, 5213, 5743, 5843, and 6703. Each student is responsible for consultation with his or her advisory committee in preparing the study plan.

Civil and Environmental Engineering

John N. Veenstra, PhD, PE - *Professor and Head*

Civil engineers build the future. The exceptional diversity of professional practice in civil and environmental engineering presents many career opportunities for students.

The concern of civil engineers is a person's environment—its design, construction, control, alteration and utilization. Civil engineers plan, design and construct, highways, waterway and railway systems, harbors and shipping facilities, systems for the treatment and distribution of water and for the collection and treatment of municipal and industrial waste, dams and hydroelectric works, airports and terminals, structures of every kind including buildings, bridges, towers, industrial plants, tunnels and subway systems, processes for the control of water and air pollution, and many other works of general benefit to society.

The professional curriculum in civil engineering is based on the pre-engineering courses in mathematics, physical sciences and engineering sciences. On this foundation, required courses train the student in the basic skills needed for the professional practice of civil engineering and provide the tools for more advanced study. Engineering theory and principles are developed in a way that will encourage their application to the solution of practical problems.

—Educational Objectives. The educational objectives of the BS degree program are:

- To design, coordinate and execute an undergraduate program in Civil and Environmental Engineering that produces graduates who have the following attributes:

  a. The understanding and technical skills necessary to develop engineering solutions that are technically feasible, economically acceptable, and environmentally sustainable;

  b. A background in the six major areas of civil engineering (construction management, environmental, geotechnical, water resources, structural, and transportation), at a level consistent with other full- term ABET-accredited programs in the nation;

  c. The communication and interpersonal skills necessary to learn and work both independently and in teams including both engineers and non-engineers; and

  d. The technical and personal attributes needed to meet the needs of external constituencies, and to contribute to society's infrastructure and the environment;
- To provide enrichment opportunities for students, including opportunities to interact with practicing professionals, opportunities to develop leadership skills and encouragement and motivation for life-long learning;
- To recruit and retain a faculty that is qualified by education,

experience and interpersonal skills to effectively provide the desired educational experiences and guidance to students; and

- To provide instructional facilities, equipment and other resources to students and faculty to enable them to achieve the program's objectives.

The curriculum is designed to achieve the educational objectives in conjunction with the program outcomes. These outcomes state that graduates of the program will have: (a) an ability to apply knowledge of mathematics, science, and engineering, (b) an ability to design and conduct experiments, as well as to analyze and interpret data, (c) an ability to design systems, components, or processes to meet desired needs within realistic constraints (such as economic, environmental, social, political, ethical, health, safety, and sustainability) (d) an ability to function on multi-disciplinary teams, (e) an ability to identify, formulate, and solve engineering problems, (f) an understanding of professional and ethical responsibility, (g) an ability to communicate effectively, (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context, (i) a recognition of the need for, and an ability to engage in life-long learning, including an understanding of the importance of professional licensure, (j) a knowledge of contemporary issues, (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice, (l) an ability to apply knowledge in six technical areas in civil engineering, and (m) an ability to explain basic concepts in management, business, public policy, and leadership.

The School provides a curriculum that is effective and balanced among the major areas of civil engineering practice. Design capabilities are developed throughout the curriculum, culminating in a comprehensive senior design experience, incorporating much of the previous course work. Some degree of specialization is provided through the choice of elective courses in structures, engineering mechanics, transportation engineering, soil mechanics and foundations, construction engineering and management, environmental engineering and water resources. There is a designated option for those students wishing to concentrate more heavily in the environmental area of practice. Program curricula requirements are outlined in the publication *Undergraduate Program and Requirements* that is considered a companion document to the *Catalog*. The general civil option and the environmental options are accredited together by the Engineering Accreditation Commission of the ABET under the criteria for civil and similarly named engineering programs.

—Oklahoma Transportation Center. Oklahoma State University, University of Oklahoma, and Langston University established the Oklahoma Transportation Center (OTC) as a cooperative venture with the Oklahoma Department of Transportation (ODOT), and other transportation agencies, operators and suppliers. This center has been designated as a University Transportation Center (UTC). The mission of the Center is to develop and transmit knowledge through research, training, technical assistance, and technology transfer to enhance the transportation systems that touch the lives of the people of Oklahoma and the nation. This mission is straightforward; it is to solve problems in all areas of transportation.

Graduate Programs

The School of Civil and Environmental Engineering offers three programs leading to post-baccalaureate degrees— the Master of Science degree in civil engineering, the Master of Science degree in environmental engineering, and the Doctor of Philosophy degree. The Master of Science degree is characterized by a technical specialization in a particular area of study. The Doctor of Philosophy degree is designed to prepare a student for research and for the teaching profession in engineering.

Major areas of study in the School are applied mechanics, structural analysis and design, transportation, construction engineering and management, geotechnical engineering, water resources, and environmental engineering. Research in all major fields is continuously pursued. Master of Civil Engineering candidates may choose either to specialize or to engage in a broadly based program of study, in accordance with an approved and purposeful plan of study.

—Admission Requirements. Candidates for the Master of Science or Doctor of Philosophy degree must have graduated from a civil engineering curriculum accredited by the ABET. Graduates from other curricula and schools should submit transcripts to the head of the School of Civil and Environmental Engineering for evaluation. Admission to the Master of Science in environmental engineering degree program is permitted for students who meet the minimum prerequisites as established by the School of Civil and Environmental Engineering.

—Degree Requirements. All degree programs follow an approved plan of study that must be submitted at a designated time. All programs are characterized by the flexibility available in a study plan that is designed to satisfy the particular needs of the student, while conforming to the general requirements implied by the title of the degree and specified by the University.

The Master of Science degree in either civil or environmental engineering requires the completion of at least 30 credit hours beyond the bachelor's degree, including a research thesis for which no more than six credit hours may be granted. The non-thesis option (32 credit hours) described in the "Graduate College" section may be permitted at the discretion of the student's advisory committee.

The Doctor of Philosophy degree requires the completion of at least 90 credit hours of course work beyond the bachelor's degree, including not more than 30 credit hours for the research thesis. In addition, the candidate must meet the equivalency of the language requirement (six hours) in selected areas at the discretion of his or her committee to facilitate his or her research. Generally, official admission as a candidate for the Doctor of Philosophy degree in any program offered by the School will not be granted until a member of the Graduate Faculty in the School agrees to serve as major (or thesis) adviser for the prospective candidate.

Electrical and Computer Engineering

Keith A. Teague, PhD, PE - *Associate Professor and Head*

Electrical Engineering and Computer Engineering are two related professional engineering disciplines that are responsible for many of the phenomenal technological advances that we often take for granted. For example, consider the global electronic media, instantaneous communications, the meteoric rise of the Internet, advances in medical technology, miniaturized electronic circuits, the availability of abundant cheap power, personal computing, and the cellular telephone. Both disciplines have made remarkable contributions to build the society we enjoy today and offer exciting opportunities in the future.

Electrical Engineering has its origins in the 1700s, with Benjamin Franklin, Alessandro Volta, Luigi Galvani and other early scientists who sought to understand what we now call electricity, but they wouldn't recognize the field today! Electrical Engineering deals with the study and application of the theory of electricity, electronics and electromagnetics. Electrical engineers perform research, design, develop, test, and oversee the manufacture of electrical and electronic systems and devices of all types. Examples include electronics and integrated circuits, communication systems, radio and television, radar, automatic control systems, robotics and computer vision, computers and digital electronics, power generation and distribution, waveguides and antennas, navigation systems, and optoelectronics. The field is very broad and growing.

Computer engineering is a relatively new engineering discipline that combines a strong foundation in electrical engineering with elements of computer science to deal with the many “digital” or computer-based systems and devices we encounter every day. As a result, computer engineers and electrical engineers have many things in common.

Computer engineers analyze, design, and develop computer-based systems and digital electronics, focusing on all aspects of computing, both hardware and software. Computer engineers understand digital logic design, computer architecture, digital data communications, computer and sensor interfacing, microprocessors, VLSI circuits, operating systems and software, computer arithmetic, and their application to solve important problems in diverse areas.

Electrical engineers and computer engineers have played a fundamental role in the development of many modern technologies and devices, including cellular telephones and wireless communications systems, global positioning systems, DVD and MP3 players, radio and television, micro-circuits, computers, automotive and aircraft electronic systems, home entertainment products, computer games, medical electronics and imaging systems, radar, electrical power generation and distribution systems, space electronics and remote sensing, solar cells, lasers, telecommunication networks, robotics and computer vision, artificial intelligence, parallel computer systems, and the Internet.

The technologies that electrical and computer engineers discover and develop have improved lives immeasurably, and future technologies will improve and change them even more. An undergraduate degree in electrical engineering or computer engineering provides the opportunity to be one of those who work in these exciting areas.

Beyond technical knowledge, engineers of tomorrow must be aware of the social, economic, ethical and environmental impact of these technologies. They must also be able to communicate their thoughts and ideas, possess excellent teamwork skills, and understand and be able to carry out the process of engineering design. The undergraduate programs in electrical engineering and computer engineering at Oklahoma State University addresses all of these aspects of engineering.

—Educational Objectives. Students gain skills that will benefit them their entire lives. These skills and attitudes define the educational objectives of the program.

The graduates of electrical and computer engineering at Oklahoma State University will:

- be widely employed across a range of disciplines and sub-disciplines in electrical engineering and computer engineering and will report the program provided the preparation needed to succeed in an engineering career.
- be able to succeed in obtaining a professional or graduate degree should they choose to. At least one-third of our graduates will earn or be pursuing an additional degree within five years following graduation.
- report that in their careers they can function on multidisciplinary teams, communicate effectively, and understand the engineering design process.
- follow ethical standards in their careers and engage in public and professional service activities.
- if they choose to pursue careers that require understanding the impact of social, economic, or environmental factors on engineering be successful in these careers.

The School of Electrical and Computer Engineering offers a full range of undergraduate and graduate program choices. A degree in electrical engineering or computer engineering is also an excellent foundation for graduate work in other professional fields such as medicine and law. Many graduates also pursue advanced programs in business and management after earning a degree in engineering.

The undergraduate electrical engineering and computer engineering programs at Oklahoma State University prepares each graduate for a life-long professional career. During the first two years, students complete a carefully designed pre-engineering program consisting of mathematics, physical sciences, engineering sciences, introductory electrical and computer engineering courses, and selected courses in the humanities and social sciences. During the final years of the program, each student concentrates his or her study on specific electrical engineering and/or computer engineering course work. In addition, students majoring in electrical engineering can elect from the following areas of specialization:

- energy and power systems;
- electronics and solid state devices;
- controls, communications, and systems;
- electromagnetics and photonics;
- computers and digital.

These areas of specialization tailor course choices to give electrical engineering students both a breadth of knowledge and a depth of understanding in their chosen area, while computer engineering students focus on their own challenging curriculum which also is designed to provide breadth and depth. By tailoring the program to align student interests with faculty strengths, faculty-student interaction is enhanced and students receive better academic and career guidance. All electrical engineering areas of specialization, as well as computer engineering, offer multiple engineering design experiences distributed throughout professional school. In addition to the laboratories devoted to research, separate instructional laboratories give students the opportunity for hands-on experience in areas such as microcomputers, digital logic design, electronics, electrical machinery, networks, instrumentation and electromagnetics. Laboratories include those that emphasize concepts learned in the classroom as well as those that emphasize engineering design. Engineering design labs have students solve open-ended problems that demonstrate the students' ability to apply fundamental concepts to solve realistic problems of practical importance. These problems have several possible solutions, and students must choose an acceptable approach and demonstrate that the desired outcomes have been met.

The capstone design experience consists of a two-course sequence typically taken during the student's last two semesters in the program. These courses integrate analysis, design, and other skills the students have developed over their entire course of study. Teamwork, communication skills, and the complete engineering design process, from problem definition to prototype, presentation and documentation, are emphasized. Student teams receive individual project mentoring from an appropriate faculty member who provides project management and supervision. The capstone experience concludes with a formal public design demonstration, oral presentation, and written documentation.

The BS degree in electrical engineering is accredited by the Engineering Accreditation Commission of the ABET under the criteria for electrical, computer, and similarly named engineering programs. The BS degree in computer engineering is a new program which first became available in 2008. Accreditation of this degree by the ABET, under the criteria for electrical, computer, and similarly named programs, is being sought at the earliest possible date (2009).

Graduate Programs

The School of Electrical and Computer Engineering offers two graduate degrees, both in electrical engineering: Master of Science and Doctor of Philosophy. New specialized MS degree options in 1) control systems and 2) optics and photonics are expected to be available beginning in 2009.

The Master of Science degree is designed for students interested in careers in industry and government service that emphasize advanced design, development, and research methods for high technology. This degree incorporates additional advanced course work and on-campus creative activities.

The Doctor of Philosophy degree is designed to prepare the student for high-level research and development positions in industry and

government and for the teaching profession in engineering and is distinguished by the emphasis on research and by the incorporation of a doctoral thesis.

Students may select course work and participate in research and design projects in the following areas:

- communication systems and networks;
- control systems;
- computer architecture and arithmetic;
- electromagnetics;
- microsystems and nanoengineering;
- photonics and electro-optics;
- signal, image and video processing;
- very large scale integration (VLSI);
- energy and power;
- bioengineering.

In addition, students may elect a multidisciplinary program that crosses departmental lines and emphasizes the application of electrical engineering and systems theory to complex problems involving the interaction of engineering systems and technology with social, economic and environmental processes. Multidisciplinary opportunities exist in control systems, biomedical engineering, photonics and nanotechnology and materials.

—Admission Requirements. Admission to the Graduate College, as described under "General Regulations" in the "Graduate College" section of the *Catalog* is the first step for those students proceeding toward advanced degrees. Graduation with high scholastic performance from an electrical engineering or computer engineering curriculum accredited by the ABET qualifies the student for admission to the School of Electrical and Computer Engineering as a candidate for the advanced degrees offered. Additionally a cumulative score of 1200 or greater on the GRE is required.

Graduates from non-engineering fields such as mathematics, physics and computer science are also admitted to the School of Electrical and Computer Engineering MS and PhD graduate programs if an evaluation of their transcripts indicates they are prepared to take graduate-level course work in electrical engineering, or can be expected to do so after a reasonable amount of remedial course work. This condition also applies to graduates of unaccredited engineering programs and engineering technology programs.

—Degree Requirements. The Master of Science degree is awarded to those students who successfully complete an approved plan of study under one of two possible options. If a thesis is written, 30 credit hours are required, including six hours credit for the thesis. If no thesis is written, 33 credit hours are required, including at least two hours that include an approved creative activity. To be approved, a plan of study will include, as a minimum, 18 hours of 5000-level courses in electrical and computer engineering. Most plans of study include additional 5000-level courses, depending upon the background and particular educational goals of the student, and the minimum stated above is allowed only when a specific interdisciplinary plan of study is approved by the faculty. Each student is encouraged to include courses in supporting disciplines such as mathematics, computer science, statistics, business or other engineering fields. As mentioned above, some remedial work in undergraduate electrical and computer engineering may be required in addition to the 30-33 hours specified above.

The Doctor of Philosophy degree is granted in recognition of high achievement in scholarship in course work selected from the broad field of electrical and computer engineering and an independent investigation of a research problem in a chosen field of specialization that leads to a contribution to knowledge, as presented in a dissertation. For this degree the Graduate College requires a minimum of 90 credit hours for acceptable academic work beyond the bachelor's degree, including credit for the dissertation.

The School of Electrical and Computer Engineering also participates in several interdisciplinary degree programs. (See "Graduate Programs" under "Industrial Engineering and Management," and "Telecommunications Management" in the "Graduate College" section of the *Catalog*.)

General Engineering

David R. Thompson, PhD - *Professor, Associate Dean and Head*

The School of General Engineering administers common engineering courses and interdisciplinary graduate programs.

Master of Science in Engineering and Technology Management

Terry Collins, PhD - *Director*

Brenda L. Johnson, MS - *Assistant Director*

The Master of Science in engineering and technology management (MSETM) degree is designed for today's fast-track engineer or scientist. Effective planning, selection, implementation and management of technology are essential to the success of any business in today's time-critical global market. Career paths and responsibilities of engineers and scientists often include project management, selection and supervision of people, and executive and strategic leadership. This program will help managers who must integrate rapidly changing technology and cost effective product and process design. Applying proven evaluation concepts and implementation strategies to fast-moving, technical management decisions can make the difference in both career and business success. Tomorrow's technical professionals need more than on-the-job training. OSU's MSETM curriculum is flexible; permitting the student to build a strong degree that directly addresses the student's needs and prepares the student for the future. The degree consists of 32 credit hours. The MSETM program is provided by the OSU colleges of Engineering, Architecture and Technology, Arts and Sciences and the William S. Spears School of Business.

—Admission Requirements. The guidelines for admission to the MSETM program are a bachelor's or higher degree, in engineering or the physical/mathematical sciences, with a 3.00 GPA, and at least three years employment in a technical field since graduation with a bachelor's degree. Applicants not meeting these standards may be granted provisional admission based upon their overall academic and professional practice history and accomplishments. Since many course assignments are integrated into current issues in the work environment, students must be managing or employed in a technical organization in order to be successful in the program. For this reason the program is not appropriate for full-time on-campus students. The MSETM student body is made up entirely of full-time employed, technical professionals who receive the courses through distance education technologies. Because technology and time constraints exist in some overseas delivery, distance may not be feasible in all countries. Contact the MSETM office prior to application if special circumstances exist. An applicant must submit the following documents to the MSETM office: (1) an official OSU Application for Graduate Admission, (2) an MSETM program application, (3) an official transcript of all academic work and degrees received, (4) an application fee of $40.00, (5) official results of the TOEFL with a minimum score of 600 (international students only). Application materials can be found online at http://etm.okstate.edu.

Master of Science in Control Systems Engineering

R. Russell Rhinehart, PhD - *Interim Director*

Today's technological demands impose challenging and varying control problems in many fields. The objectives of the Master of Science in the control systems engineering (MSCSE) program are to improve the participant's ability to implement modern control techniques; understand the latest control and data acquisition strategies; develop

systems for noisy, nonlinear and non-stationary processes; develop new production and quality control procedures; work with real-time, distributed software; develop advanced control procedures; and continue to learn concepts, tools and skills. Four different schools with the College of Engineering, Architecture and Technology are participating in the program: Chemical Engineering, Electrical and Computer Engineering, Industrial Engineering and Management, and Mechanical and Aerospace Engineering. Additional information regarding the MSCSE degree can be found at www.okstate.edu/ceat/mscse.

—Admission Requirements. The requirement for admission to the program is a bachelor's or higher degree in engineering or the physical/mathematical sciences from an ABET-accredited institution, with a 3.25 or higher GPA. There are two options for the MSCSE degree: research and creative component. On-campus students can pursue either option. Distance education (off-campus) students must follow the creative component option. The creative component project may be a control application for the student's employer that benefits the employer as well as demonstrating the student's ability to integrate a wide range of control relevant topics. Either option consists of 33 credit hours of core control courses and electives in five areas of control-relevant specialization. (Off-campus distance education offerings are selected from a limited subset of these courses). The five areas are signal processing, modeling, analytical/numerical methods and simulation, equipment/software/operating systems, and systems and control. An applicant must submit the following documents to the MSCSE office: (1) an official OSU Graduate Application for Admission, (2) an MSCSE program application, (3) two official transcripts of all academic work and degrees received, (4) a one-page written statement of qualifications, goals and objectives, (5) an application fee of $40.00 and (6) official results of the TOEFL with a minimum score of 600 (international students only).

Industrial Engineering and Management

William J. Kolarik, PhD, PE - *Professor and Head*

Industrial engineering and management focuses on production systems that provide products (goods and services) for customers throughout the world. Industrial engineers define, design, build, operate, and improve production processes that convert resources to products effectively (e.g., high quality), efficiently (e.g., high productivity), and safely.

People are the fundamental component of production systems–people provide the creativity and leadership essential to make things happen. Hence, industrial engineering is the most people-oriented discipline within the engineering family. Industrial engineers are trained to think in both broad and specific terms. Practicing industrial engineers understand business parameters as well as physical and social parameters within production systems. This breadth allows industrial engineers to function effectively in a wide spectrum of activities ranging from strategic business planning to detailed task design. The wide-angle vision of industrial engineering provides career flexibility, leading to high-level leadership or specialized technical responsibilities.

Industrial engineers are found in manufacturing organizations (e.g., automotive, electronics, medical, and food manufacturers), service enterprises (e.g., hospitals, banks, airlines, and consulting groups), and governmental organizations (e.g., public service and regulatory organizations).

The School of Industrial Engineering and Management's vision is to be internationally recognized by industry and academia for excellence in education, research, outreach and service. Its mission is to discover, verify, integrate and transfer knowledge and methodologies relating to enterprise design and management, information technology, and modeling and optimization for the benefit of students, research sponsors and the technical community. The faculty, students and staff work together to build and maintain learning and mentoring environments where:

- innovative practices are developed, tested and validated.
- knowledge and practices are shared.
- each individual develops to his or her full potential.
- professional ethics are practiced at all times.

—Educational Objectives and Outcomes. The educational objectives emphasize the application of technologies and tools in the short term, and the ability to discover, acquire, and adapt new knowledge and skills in the long term. Graduates are prepared to:

- define, analyze and solve complex problems within and between enterprises.
- discover, understand and incorporate appropriate new technologies in the design and operation of enterprises.
- lead and manage design, development and improvement efforts that benefit customers, employees and stakeholders.
- function in culturally diverse teams, communicate in a professional manner, and uphold the ethical standards of the engineering profession.

Graduating baccalaureate students possess an understanding of fundamental industrial engineering and management concepts, methodologies and technologies as demonstrated by:

- an ability to apply knowledge of mathematics, probability and statistics, science, engineering, engineering management and engineering economy.
- an ability to design and conduct experiments involving risk and uncertainty, as well as to analyze and interpret data.
- an ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environment, social, political, ethical, health and safety, manufacturability and sustainability.
- an ability to function on multi-disciplinary teams.
- an ability to identify, formulate and solve engineering problems involving physical, human and economic parameters.
- an understanding of professional and ethical responsibility.
- an ability to communicate effectively.
- the broad education necessary to understand the impact of engineering solutions in a global economic, environmental and societal context.
- a recognition of the need for, and an ability to engage in life-long learning.
- a knowledge of contemporary issues and the role of the human in enterprise activities.
- an ability to use the techniques, skills and modern engineering tools necessary for industrial engineering and management practice.

The curriculum consists of three primary parts: (1) general studies, (2) core engineering, and (3) professional school topics. General studies consist of courses such as math, statistics, chemistry, physics, English, behavioral science, history, humanities, and arts. Core engineering courses consist of engineering sciences such as materials, statics, electrical circuits, fluid mechanics, and thermodynamics. Professional school courses consist of topics such as systems thinking and analysis in engineering, economic analysis, manufacturing processes, computer-aided modeling, work analysis, operations research, quality control, experimental design, facility location and layout, management and leadership, production control, system simulation modeling, information systems, ergonomics and human factors, and energy and water management. A capstone design experience, working with a real-world organization, brings all of the classroom and lab work together in the senior year. Details regarding degree requirements are available in the *Undergraduate Programs and Requirements* publication.

The program is accredited by the Engineering Accreditation Commission of the ABET under the criteria for both industrial engineering and engineering management.

Each IE&M student, along with the faculty adviser, works out an individual plan of study which guides them through the curriculum. The course work is sequenced and interrelated to provide theoretical and applied knowledge, along with hands-on laboratory and project experience. Students work as individuals and as teams to integrate and apply mathematical, scientific, and engineering knowledge and concepts in order to address both traditional academic questions as well as open-ended design and analysis challenges. Instruction in experimental methods is integrated in the curriculum through the design, execution, analysis, and interpretation of experiments. Project work is used to develop both technical and communications skills. Technical skills are used to identify, formulate, and address engineering problems, both simple and complex. Communications skills are addressed and practiced in written, oral and team interaction formats.

The means to define and design detailed solutions to address customer needs from a system-wide perspective is introduced in the sophomore year, and reinforced through the capstone senior design project. Additionally, global perspectives of production systems are introduced and emphasized in the sophomore year so that students understand the nature of global customer bases as well as global competition early in their studies. The curriculum is continually updated to assure that contemporary issues, thinking, and tools are integrated in course content as well as instructional delivery. Professional responsibility and ethical behavior are introduced and reinforced throughout the curriculum. Additionally, the need for life-long learning after graduation is stressed.

Students are offered opportunities to enhance their classroom and laboratory experiences through student organizations such as the student chapter of the Institute of Industrial Engineers, the Institute for Operation Research and the Management Sciences, and the American Society for Quality. Outstanding scholars are recognized by Alpha Pi Mu, the national honor society for industrial engineering students. Additionally, opportunities for internship and co-op experiences are offered to IE&M students so that they can gain professional experience during their collegiate program. Please visit our Internet site http://iem.okstate.edu for more information.

—Graduation.

1. Grades of "C" or better in all technical courses in the pre-engineering curriculum.
2. Grades of "C" or better in all courses that are prerequisites for IEM courses.
3. 2.00 major (right hand side of requirement sheet) GPA.

Graduate Programs

The School of Industrial Engineering and Management offers graduate programs leading to the Master of Science Industrial Engineering and Management degree and the Doctor of Philosophy degree.

The Master of Science degree is characterized by a higher degree of technical specialization in a particular field of study. This degree program is designed to prepare students for professional practice that may include research or consulting components. The Master of Science degree is especially attractive to industrial engineering graduates, engineering graduates from other disciplines, and many science majors. It includes a strong technical component and an orientation to business and engineering management that is complementary to a technical background.

The Doctor of Philosophy degree is designed to carry the student to the leading edge of knowledge in the profession of industrial engineering and engineering management. It is intended to prepare students for highly specialized positions, such as research and consulting in industry, government and service organizations, and for teaching or research positions in colleges and universities.

The basic consideration in graduate education in industrial engineering and management is effective and efficient utilization of human, physical, and economic resources. Instruction in management embraces both qualitative and quantitative concepts, including analytical methodologies and social considerations pertinent to organizations.

Advanced degree programs are designed with major emphasis in fields of interest such as engineering management, manufacturing systems, operations research, quality and reliability, facilities, energy, environmental management, and enterprise modeling and supply chains. Students may complement industrial engineering and management courses with work in other branches of engineering, as well as economics, business administration, computer science, statistics, mathematics, psychology, and sociology.

ADMISSION REQUIREMENTS. Admission to the Graduate College is required of all students pursuing the MS or PhD degree. Graduation from an industrial engineering curriculum with scholastic performance distinctly above average qualifies the student for admission to the School of Industrial Engineering and Management as a candidate for the master's and doctorate degrees. Graduates from disciplines other than industrial engineering may be admitted if an evaluation of their transcripts and other supporting materials by the School of Industrial Engineering and Management indicates that they are prepared to take graduate-level course work in industrial engineering, or can be expected to do so after a reasonable amount of prerequisite work.

All international applicants must submit GRE scores. In addition, the Graduate College may require certain international applicants to submit TOEFL scores.

—Degree Requirements. The Master of Science degree in industrial engineering and management requires the completion of at least 30 credit hours beyond the bachelor's degree, including a research thesis of six credit hours. A 33 semester-credit-hour option is also permitted and must include a three credit-hour creative component. The creative component requirement can be met by completing a three credit-hour independent study project or a three credit-hour course approved by the student's committee.

The Doctor of Philosophy degree requires the completion of at least 90 credit hours of course work beyond the bachelor's degree or 60 credit hours of course work beyond the master's degree, normally including an 18 credit hour research thesis. In addition, the candidate must complete six credit hours of course work in an area such as mathematics, statistics, experimental techniques, or research methodology (as specified by the advisory committee).

The School of Industrial Engineering and Management also participates in the Master of Science in Engineering and Technology Management program. Current IE&M program information can be found on the School Web site http://iem.okstate.edu.

Mechanical and Aerospace Engineering

Lawrence L. Hoberock, PhD, PE - *Professor and Head*

No professions unleash the spirit of innovation like Mechanical Engineering and Aerospace Engineering. From research to real-world applications, mechanical and aerospace engineers constantly discover how to improve our lives by creating bold new solutions that connect science to life in unexpected, forward thinking ways. Few have such a direct and positive effect on people's everyday lives. We are counting on mechanical and aerospace engineers and their imaginations to help us meet the needs of the 21st century.

Mechanical and aerospace engineers know that life takes engineering, and that their disciplines provide freedom to explore, shape the future,

encompass an enterprising spirit, and call for limitless imagination. Engineering makes a world of difference and is essential to our health, hap[pines, and safety. Creative problem solving, turning dreams into reality, is the core of Mechanical and Aerospace Engineering. These are professional disciplines that involve the invention, design, and manufacture of devices, machines and systems that serve the ever-changing needs of modern society.

Mechanical engineering is an exceedingly diverse field that covers an exceptionally wide range of systems, devices and vehicles. Mechanical engineers are vitally concerned with all forms of energy production, utilization and conservation. They are the key professionals in bringing about the green revolution, finding ways to reduce or eliminate pollution, minimize waste, reduce energy usage, and re-use waste, scrap, and recycled goods. They deal with everything mechanical and energy-consuming, whether it is small or large, simple or complex—from fuel cells to nuclear power plants, gas turbine engines to interplanetary space vehicles, artificial limbs to life support systems, robotic manipulators to complex automatic packaging machines, precision instruments to construction machinery, household appliances to mass transit systems, heating and air-conditioning systems to off-shore drilling platforms, and powered home and garden appliances to vehicles of all types. In virtually every organization where engineers are employed, mechanical engineers will be found.

The BS degree program in mechanical engineering, together with the premedical option in mechanical engineering, is accredited by the Engineering Accreditation Commission of the ABET under the criteria for mechanical and similarly named engineering programs.

Aerospace engineering is concerned with the science and technology of flight, and the design of air, land and sea vehicles for transportation and exploration. This exciting field has already led people to the moon and continues to lead in the expansion of frontiers deeper into space and into the ocean's depths. Because of their unique backgrounds in aerodynamics and lightweight structures, aerospace engineers are becoming increasingly involved in solving some of society's most pressing and complex problems, such as high-speed ground transportation and pollution of the environment.

The BS degree program in aerospace engineering is accredited by the Engineering Accreditation Commission of the ABET under the criteria for aerospace and similarly named engineering programs.

The mission of the School of Mechanical and Aerospace Engineering is to support the mission of Oklahoma State University by:

- Providing the best possible education to students, grounded in engineering fundamentals, so that they are competitive in employment and advanced studies and are prepared for a lifetime of continuing development;
- Engaging in basic and applied research, making significant, innovative contributions to the engineering and science base on which industrial competitiveness is built, to solve problems of both immediate and long-range concern to society, and to support our instructional programs;
- Providing extension and public service activities where constituents' needs and School resources are compatible; and
- Emphasizing the practice of engineering and the needs of the State of Oklahoma in each of the above activities.

—Educational Objectives. The educational objectives of the mechanical and aerospace BS degree programs are:

- To educate engineers who can identify, formulate and provide effective solutions to real-life, complex problems;
- To prepare engineers for successful careers by providing them with an appropriate background in mathematics, humanities, the sciences and engineering, and to instill in them a recognition of the need for lifelong learning and of the need to remain current in their chosen disciplines;
- To educate engineers who can realize successful designs through proper use of classical and modern engineering tools while incorporating engineering standards and realistic constraints for a global world;
- To prepare engineers to contribute successfully within teams and to communicate their ideas and solutions effectively, especially with respect to written and oral communications.

The outcome for students graduating from the mechanical and aerospace engineering BS programs are: (a) an ability to apply knowledge of mathematics, science, and engineering to the mechanical and aerospace engineering disciplines; (b) an ability to design and conduct experiments and analyze and interpret data; (c) an ability to design a system, component or process to meet desired needs; (d) an ability to function on teams, some of which require consideration of multiple disciplines; (e) an ability to identify, formulate and solve engineering problems; (f) an understanding of professional and ethical responsibility; (g) an ability to communicate effectively; (h) an ability to understand the impact of engineering solutions in a societal context; (i) a recognition of the need for, and an ability to engage in, life-long learning; (j) a knowledge of contemporary issues; (k) an ability to use the techniques, skills and modern engineering tools necessary for engineering practice. For the BSME Program, there are 4 additional outcomes: MEP01 – a knowledge of chemistry and calculus-based physics with depth in at least one of the two; MEP02 – the ability to apply advanced mathematics through multivariate calculus and differential equations; MEP03 – a familiarity with statistics and linear algebra; and MEP04 – the ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations) to model, analyze, design, and realize physical systems, components, or processes to work professionally in both the thermal and mechanical systems areas. For the BSAE Program, there are 3 additional outcomes: AEP01 – knowledge of the following aeronautical topics: aerodynamics, aerospace materials, structures, propulsion, flight mechanics, and stability and control; AEP02 – knowledge of some of the following astronautical topics: orbital mechanics, space environment, attitude determination and control, telecommunications, space structures, and rocket propulsion; and AEP03 – graduates must have design competence which includes integration of aeronautical or astronautical topics.

Because mechanical engineering is perhaps the broadest of all engineering disciplines, the program provides not only excellent grounding in all engineering fundamentals, but also allows some flexibility in selecting controlled technical electives to suit the student's interests. However no one area may be unduly emphasized at the expense of another. For the aerospace engineering and premedical programs, prescribed course work has been selected to provide students with more focused development. Graduates of these programs are fully competent as mechanical or aerospace engineers, including their abilities in design, but also competent in their areas of concentration.

As a fundamental component of all BS programs, engineering design is strongly emphasized in the junior and senior years but is integrated throughout the curriculum. Most MAE courses at the 3000 and 4000 levels include some design content, ranging from a minimum of one-half to a maximum of four credit hours of design content. Each professional school course builds upon the preceding mechanical and aerospace engineering courses to develop in the student the ability to identify and solve meaningful engineering problems. The course work is specifically sequenced and interrelated to provide design experience at each level, leading to progressively more complex, open-ended problems. The course work includes sensitizing students to socially-related technical problems and their responsibilities as engineering professionals to behave ethically and protect occupational and public safety. The program culminates in a senior-year design course in which students integrate analysis, synthesis, and other abilities they have developed throughout the earlier portions of their study into a capstone experience. The design

experiences include the fundamental elements and features of design with realistic constraints such as economics, safety, reliability, social and environmental impact, and other factors. At this point, students are able to design components, systems and processes that meet specific requirements, including such pertinent societal considerations as ethics, safety, environmental impact and aesthetics. Students develop and display the ability to design and conduct experiments essential to specific studies and to analyze the experimental results and draw meaningful conclusions.

An integral part of this educational continuum from basic science through comprehensive engineering design are learning experiences that facilitate the students' abilities to function effectively in both individual and team environments. Moreover, the program provides every graduate with adequate learning experiences to develop effective written and oral communication skills. State-of-the-art computational tools are introduced and used as a part of their problem-solving experiences. Finally, the students' experience in solving ever-more-challenging problems gives them the ability to continue to learn independently throughout their professional careers.

The broad background and problem-solving ability of mechanical and aerospace engineers make them suited to engage in one or more of the following activities: research, development, design, production, operation, management, technical sales and private consulting. *Versatility* is their trademark. A bachelor's degree in mechanical or aerospace engineering is also an excellent background for entering other professional schools such as medicine, dentistry, law or business (MBA). The premedical option in mechanical engineering is available for students wishing to enroll in medical school.

In the professional school, (essentially the junior and senior years of the program) mechanical and aerospace engineering students extend their study of the engineering sciences and consider applications of fundamental principles and analysis tools to the solution of real technological problems of society. Some design courses involve students in the solution of authentic, current and significant engineering problems provided by industrial firms. Students may also help smaller firms that need assistance with the development of new products.

The student designs, with the guidance of an adviser, an individualized program of study consistent with his or her interests and career plans. Some students terminate their studies with a bachelor's degree, while others receive one of several graduate degrees.

Graduate Programs

The School of Mechanical and Aerospace Engineering offers programs leading to the degree of Master of Science in Mechanical and Aerospace Engineering, and the degree of Doctor of Philosophy in Mechanical and Aerospace Engineering. These degrees prepare the graduate for research and development positions in industry and government, or for the teaching profession in engineering. They are distinguished by the incorporation of a research component.

Students may select course work and participate in research or design projects in the following areas: aerodynamics, aeroservoelasticity, biomedical engineering, design, computational mechanics, heat transfer dynamic systems and controls, fluid mechanics, materials, manufacturing processes, refrigeration, solid mechanics thermal and HVAC systems, unmanned aerial systems, and web handling systems. Students are encouraged to take courses in mathematics and science and in other fields of engineering which fit into their programs.

—Admission Requirements. Admission to the Graduate College is required of all students pursuing the MS or PhD degree. Graduation from a mechanical or aerospace engineering curriculum accredited by the ABET, with scholastic performance distinctly above average, qualifies the student for admission to the School of Mechanical and Aerospace Engineering as a candidate for the MS and PhD degrees. Graduates from disciplines other than mechanical or aerospace engineering may be admitted if an evaluation of their transcripts by the School of Mechanical and Aerospace Engineering indicates they are prepared to take graduate-level course work in mechanical or aerospace engineering, or can be expected to do so after a reasonable amount of prerequisite work.

—Degree Requirements. All degree programs follow an approved plan of study designed to satisfy the individual goals of the student, while conforming to the general requirements of the School of Mechanical and Aerospace Engineering and the Graduate College.

The *Master of Science* degree program with the thesis option requires 24 credit hours of approved graduate-level course work, and a suitable research thesis of six credit hours. The non-thesis option requires 35 credit hours of which two must be for an acceptable, directed research activity that results in a written and oral report to the faculty.

The *Doctor of Philosophy* degree requires a minimum of 60 credit hours beyond the master's degree, including a dissertation for which no more than 30 credit hours may be awarded.

School of Architecture

Randy Seitsinger, M.Arch, AIA - *Professor and Head*

The School of Architecture, founded in 1909, offers professional degree programs in both architecture and architectural engineering. The integration of these programs through shared faculty, facilities and course work is a major strength of the School. It is one of the few such integrated programs in the United States, and as such produces graduates who are particularly prepared for the integrated team processes used in professional practice. The School of Architecture is a primary unit in the College of Engineering, Architecture and Technology, and therefore benefits from excellent state-of-the-art resources which significantly enhance the School's professional programs.

The School of Architecture is dedicated to providing a high quality and focused professional education to students whose career goals are to enter the practice of architecture or architectural engineering. Professional and liberal study electives provide opportunities for educational breadth or depth and a possible double degree in both architecture and architectural engineering.

The employment demand for OSU graduates consistently exceeds the supply potential of the School. Oklahoma State University graduates are recruited by the leading architectural and architectural engineering firms both in Oklahoma and nationally. The Oklahoma State University School of Architecture is particularly proud of having among its alumni many of the leaders of the best firms in the country, an AIA Gold Medalist (the highest award given to an architect), and presidents of the American Institute of Architects (AIA) and the National Architectural Accreditation Board (NAAB).

—Mission and Goals. Architecture is the difficult and complex art and science of designing and building a setting for human life. It is unique among today's professions in that its successful practice requires a blend, in roughly equal shares, of traits normally considered less than compatible: human empathy, artistic creativity, technological competence, and organizational and economic acumen. In contrast to other fine arts, architecture is rarely self-generated; it is rather a creative response to a stated or perceived human need. It must, therefore, be more user-oriented than fine art alone and more humane than pure science. Its design solutions must avoid the total subjectivity and detachment of other arts while striving to be functionally, technically and economically objective and sound. Yet, in a seemingly insoluble contradiction, the keenest technological and economic functionality will fall far short of becoming architecture unless it also strongly appeals to human spiritual and emotional values. When one thinks of the environment, one cannot help but see or recall architectural images: pyramids in Egypt, Greek and Roman temples, gothic cathedrals,

medieval castles, industrial cities, modern skyscrapers and dwellings or entire cities which significantly express the culture and values of the people who live or lived there.

The mission of the School of Architecture is to prepare future architects and architectural engineers to make vital contributions to humanity through the creation of architecture. The vision of the school is to be nationally recognized for outstanding professionally focused programs in architecture and architectural engineering with strengths in design and the collaboration between architecture and architectural engineering.

The School of Architecture endeavors to instill in each individual a sensitivity to human needs, a genuine concern for quality, integrity and high ideals, a positive attitude for life-long learning, and an appreciation for one's own self-esteem.

The School's primary goal is to provide excellence in professional education for students preparing to enter the private practice of architecture or architectural engineering. This professional focus is to educate not just qualified candidates for the degree, but graduates who, during their careers, will be licensed professionals and will assume positions of leadership within the profession and society.

—Accreditation. The School of Architecture offers two separately accredited professional degree programs. The Bachelor of Architecture degree, BArch, is accredited by the NAAB. The Bachelor of Architectural Engineering degree, BArchE, is accredited by the Accreditation Board for Engineering and Technology (ABET) as an engineering program. Both programs require a minimum of five years of study to complete.

In the United States, most state registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit U.S. professional degree programs in architecture, recognizes three types of degrees: the Bachelor of Architecture, the Master of Architecture, and the Doctor of Architecture. A program may be granted a six-year, three-year, or two-year term of accreditation, depending on the extent of its conformance with established educational standards.

Master's degree programs may consist of a pre-professional undergraduate degree and a professional graduate degree, which, when earned sequentially, comprise an accredited professional education. However, the pre-professional degree is not, by itself, recognized as an accredited degree.

The OSU School of Architecture offers an accredited, five-year, Bachelor of Architecture degree.

Architecture

Architecture is the complex synthesis of creatively solving problems involving both art and science through the disciplined orchestration of image making, activity organization, technological applications, legal constraints, and budgetary parameters which together express culture, enhance quality of life and contribute to the environment.

Education in architecture consists of campus-oriented classroom and studio courses, as well as off-campus studies. It is conducted in an intellectual climate which stimulates inquiry, introduces principles and values, and teaches the disciplines necessary to work in collaboration with others. The goal of the program is the education of future leaders within the architecture profession.

The design studio is the center of the School's educational program. It is the setting where students and faculty work most closely together, and where all specialized study and knowledge comes together and is synthesized in design. The record of OSU students' achievements in the design studios is evidenced by the success in national and international architectural design competitions. In addition to a student's design studio education, he or she is required to complete sequential courses in architectural history/theory, technology, and management that work in correlation with the design studio sequence.

The program has long been known as one of the strongest professional programs in the United States. OSU graduates are consistently offered employment opportunities in many of the best architectural offices in Oklahoma and throughout the United States. The program is fully accredited by the National Architectural Accreditation Board.

Architectural Engineering

Architectural engineering is a profession that combines the art and science known as architecture with a detailed background in fundamental and applied engineering principles. In its broadest sense, it involves the creative application of science and technology to the design of structures meant for human occupancy. Architectural engineering differs from architecture in its focus upon the design of elements, systems and procedures for buildings, rather than the design of buildings themselves. Architectural engineers practice in a wide variety of professional engineering settings such as consulting firms, architectural firms, industrial or commercial organizations and governmental agencies.

The objective of the Bachelor of Architectural Engineering program is to provide basic and professional education to engineering students in building-related structural engineering. OSU graduates will possess broad-based knowledge, skills, and judgment that prepare them to succeed in the profession of architectural engineering or in further studies at the graduate level. The program is designed to prepare students to contribute to society as professional engineers dealing with analysis, design and related activities within the construction industry. The program utilizes the broad resources of the University to exploit a close relationship with the architectural program and to provide in-depth understanding of the professional field and sensitivity to other less technical concerns related to the building environment faced by architectural engineers.

The primary focus of the architectural engineering program at OSU is the safe and economical design of structural systems used in buildings. These structural systems must withstand the various forces of nature such as gravity, winds and earthquakes, as well as the forces of man. These systems require a working knowledge of the mechanics of those materials commonly used for building structures such as steel, timber and reinforced concrete.

The study of architectural engineering is an integrated mix of liberal studies, design and technical education. Architectural engineers need to be able to conceptualize aesthetic issues and design complex technical systems.

In the pre-professional portion of the architectural engineering program (approximately two years of study), the focus is on the underlying scientific and mathematical principles of engineering and the basic design principles of architecture supplemented by appropriate general education courses in English, social sciences and humanities. These courses allow students to assimilate a beginning knowledge base in architecture and engineering along with a broader liberal based component to their education. Students who demonstrate proficiency in this portion of the program by meeting a specific set of admission criteria are eligible for admission to the professional program in architectural engineering.

The professional program in architectural engineering (typically three years) builds systematically upon the scientific and architectural knowledge acquired in the pre-professional curriculum. Students acquire detailed structural and architectural knowledge and problem-solving abilities through a series of progressively more detailed and comprehensive courses and studios.

Each architectural engineering course builds upon the preceding architectural engineering courses to develop in the student the ability to identify and solve meaningful architectural engineering problems. The course work is specifically sequenced and interrelated to provide design experience at each level, leading to progressively

more complex, open-ended problems. This course work includes sensitizing students to socially-related technical problems and their responsibilities as engineering professionals to behave ethically and protect public safety. The program culminates in a fifth year course in which the students integrate analysis, synthesis and other abilities they have developed throughout the earlier portions of their study into a capstone experience.

An integral part of this educational continuum from basic knowledge through comprehensive architectural engineering design are learning experiences that facilitate the students' abilities to function effectively in both individual and team environments. Students are exposed to a wide variety of problems dealing with contemporary issues in an international context. Moreover, the program provides every graduate with adequate learning experiences to develop effective written and oral communication skills. State-of-the-art computational and CAD tools are introduced and used as a part of the students' problem-solving experiences. Finally, the students' experience in solving ever-more-challenging problems gives them the ability to continue to learn independently throughout their professional careers.

—Educational Objectives. The educational objectives of the Bachelor of Architectural Engineering program to be successful as practicing structural engineers. The educational objectives expected of graduates from the program a few years after graduation are as follows. Graduates will:

- possess a basic education in building-related structural engineering.
- possess a professional education in building-related structural engineering.
- possess broad-based knowledge, skills, and judgment in the profession of architectural engineering.
- contribute to society as professional engineers dealing with analysis, design, and related activities within the construction industry.
- have utilized the broad resources of the University.
- have exploited the close relationship with the architecture program.
- have an in-depth understanding of the professional field.
- have sensitivity to other less technical concerns related to the building environment faced by architectural engineers.
- have a professional education that will prepare them to engage in the private practice of architectural engineering as a licensed engineer.
- have sensitivity to human needs.
- have a genuine concern for quality, integrity and high ideals, a positive attitude for life-long learning, and an appreciation for their own self-esteem.

The architectural engineering program has adopted the following program outcomes:

a) An ability to apply knowledge of mathematics, science and engineering.

b) An ability to design and conduct experiments, as well as to analyze and interpret data.

c) An ability to design a system, component, or process to meet desired needs.

d) An ability to function on multi-disciplinary teams.

e) An ability to identify, formulate, and solve engineering problems.

f) An understanding of professional and ethical responsibility.

g) An ability to communicate effectively.

h) The broad education necessary to understand the impact of engineering solutions in a global and societal context.

i) A recognition of the need for, and an ability to engage in life-long learning.

j) A knowledge of contemporary issues.

k) An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

The program outcomes were adopted with the concept that they would provide students with the educational experience necessary to successfully achieve the longer term program educational objectives.

Undergraduate Curriculum

The programs in architecture and architectural engineering are five years long and offer the professional degrees of Bachelor of Architecture and Bachelor of Architectural Engineering.

—Undergraduate Admission. Students who satisfy the University admission requirements are eligible to enroll for the first two years of the program (pre-architecture). Upon completion of these two years, the best qualified students are selected, upon application, by the School for admission to the upper division. Admission is based upon academic achievement and professional potential. Admission criteria are subject to annual review by the School and may be obtained directly from the School.

Transfer students are required to furnish transcripts and course descriptions for previous classroom courses, as well as examples of previous studio work. Evaluation and enrollment by the School is on a course-by-course basis for all transfer students.

—General Education. At least 12 semester hours of basic science and mathematics can be counted toward General Education requirements, and some required upper-division course work in History and Theory of Architecture can be used for General Education credit.

—Electives. Electives should be selected to comply with the appropriate undergraduate degree requirements for the program. (See 3.2 "Changes in Degree Requirements" in the "University Academic Regulations" section of the *Catalog*.) These requirements assure compliance with institutional and accreditation criteria.

—Foreign Study. The School of Architecture is committed to preparing its graduates for the professional opportunities presented by the expanding global economy. As part of this preparation, the School offers a nine-week Summer Foreign Study Program based in Versailles, France. This program has been designed to supplement the required curriculum. Students study, in an organized and disciplined fashion, major examples of modern and historic European architecture, including urban issues. Both analytic and artistic sketching skills are the main tools developed in this course of study.

Experience has shown that the Summer Foreign Program significantly increases a student's level of maturity, independent thinking, and cultural and social awareness of others. Knowing the values and accomplishments of other cultures not only deepens and broadens knowledge and abilities; it also makes a student a better and more responsible citizen of his or her own country.

Five weeks of the nine-week program are spent in France under the direct supervision and instruction of faculty from OSU. The remainder of the nine weeks is spent in independent travel study in other countries in western and central Europe. Housing while in Versailles is provided in French family homes, enriching the cultural experience of each student.

—Faculty and Facilities. In keeping with the professional orientation of the School, the faculty has extensive experience as successful practicing architects and architectural engineers, as well as outstanding scholastic records.

The School has recently received a $16.5M gift from the Donald W. Reynolds Foundation to renovate and expand the existing facilities. The new Donald W. Reynolds School of Architecture Building will be complete in 2009 and will include state of the art design studios, a greatly expanded architectural library, day lighting lab, computer lab, classroom facilities and many other amenities.

—Student Work. Projects submitted for regular class assignments may be retained by the School. All projects not retained will be available to the student.

—Student Body. With the curriculum based upon extensive and personalized student-faculty interaction, the student-faculty ratio in studio courses is set at approximately 15 to one. Annual student enrollment is approximately 325 students of whom approximately 22 percent are women, and approximately 18 percent are international students, thus providing a rich and diverse educational environment. A variety of student organizations and activities are available.

Academic Advising

The College's Office of Student Academic Services provides advisement for all pre-architecture students. When a student has gained admission to the upper-division of architecture, he or she will be assigned a faculty adviser.

Each student is personally advised in the planning and scheduling of his or her course work and is counseled and advised individually on matters of career choice, his or her activities at OSU, and on other academic matters. An academic file is created for each student at the time of initial enrollment.

Division of Engineering Technology

James E. Bose, PhD, PE - *Professor and Director*

Engineering technology education is concerned with the practical application of engineering achievement with emphasis upon the end product rather than the conceptual process. Whereas the development of new methods is the mark of the engineer, effective use of established methods is the mark of the technologist. Often the technologist will be expected to achieve what the engineer conceives.

Curricula

Engineering technology curricula at OSU are four-year programs which lead to the Bachelor of Science in Engineering Technology. Graduates of the program are known as "technologists" and are trained either to assist engineers or to provide independent support for engineering activities. The technologist receives an intensive education in his or her technical specialty and great depth in mathematics and technical sciences. The program provides breadth in related technical, communication and socio-humanistic studies. A "master of detail," he or she is capable of independent action in performance of technical activities and is frequently involved as a coordinator, expediter or supervisor of other technical personnel. His or her capability in technical sales and other public-contact positions is enhanced by his or her background in selected liberal studies.

Bachelor of Science in Engineering Technology Degree Programs

Construction Management Technology

Electrical Engineering Technology

Fire Protection and Safety Technology

Mechanical Engineering Technology

The Bachelor of Science in Engineering Technology degree requires either 124, 128 or 129 credit hours.

Engineering technology programs prepare graduates who:

1. Demonstrate an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines.
2. Apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology.
3. Conduct, analyze and interpret experiments and apply experimental results to improve processes.
4. Apply creativity in the design of systems, components or processes appropriate to program objectives.
5. Function effectively on teams.
6. Identify, analyze and solve technical problems.
7. Communicate effectively.
8. Recognize the need for and possess the ability to pursue lifelong learning.
9. Understand professional, ethical and social responsibilities.
10. Recognize contemporary professional, societal and global issues and are aware of and respect diversity.
11. Have a commitment to quality, timeliness and continuous improvement.

The engineering technology graduate is qualified to select from a broad array of engineering-related positions. Job titles of engineering technology graduates include field engineer, test engineer, associate engineer, product engineer, sales engineer, tool designer, production engineer, engineering technologist, estimator, scheduler, and project engineer.

Those less intrigued with theoretical concepts but who have the interest and aptitude toward applications are likely engineering technology majors. These students particularly appreciate the engagement of technical specialty courses beginning with the first semester and continuing throughout the course of study. The relevance of the technical science and related technical courses adds further satisfaction.

The Bachelor of Science in Engineering Technology program is composed of the following curricular subdivisions:

Mathematics and science—algebra, trigonometry, applied calculus, general physics, and chemistry or other science.

Technical specialty—technical science and related technical courses.

Communication—English composition, and written and oral technical communication.

Social sciences and humanities—history, government, religion, literature, art, music.

Electives—controlled and general.

Accreditation

Each Engineering Technology program is accredited by the Technology Accreditation Commission of the ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; phone: 410.347.7700; e-mail: accreditation@abet.org; online: www.abet.org/accredittac.asp.

—CO-OP Program. The College of Engineering, Architecture and Technology offers an experience-based program, Cooperative Education (Co-op). Co-op allows technology students to achieve a balanced education through the combination of theoretical and practical knowledge during their early years of professional development. The student's education is a cooperative effort between the University and industry. Students alternate semesters on campus with work semesters in industry during their junior and senior years. The periods of employment constitute an essential element in the educational process. Students gain practical knowledge which is carried back to the classroom, giving academic programs a sense of reality. By the time they receive their degrees, students have accumulated the equivalent of a year-and-a-half of progressively challenging work experience.

Participation in Co-op is voluntary; transfer students must successfully complete at least one semester at OSU prior to their first placement. Students may obtain further information about the program from the coordinator, 101A Engineering North.

Transfer Students

An important, contemporary educational development is the "two-plus-two" bachelor's program. Those completing an associate degree in technology-oriented curricula at other institutions are generally

admissible to the junior year with a minimum loss of academic time. The "two-plus-two" concept provides the attractive feature of two occupational-entry levels—technician or technologist.

Required course work in mathematics and basic science is utilized to meet up to 18 semester hours of General Education requirements also. The Scientific Investigation requirement is met as a part of the course work meeting professional requirements for basic science.

Construction Management Technology

Dana E. Hobson, PhD, PE - *Professor and Head*

The construction industry is the largest industry in the world. Leadership in this field requires a broad knowledge of labor, materials, equipment, capital and construction procedures. The interdisciplinary approach of the construction management technology program offers the student specialized course work in all phases of construction, designed to prepare him or her for responsible positions in industry.

The primary goal of the Department of Construction Management Technology (CMT) is to enhance the quality of the instructional program through effective management of the curriculum, teaching assignments and fiscal and physical resources. This goal includes providing instructional facilities, equipment and support services for faculty and students which maintain an excellent learning environment.

—Educational Objectives. The CMT educational objectives are:

1. Graduates who have the ability to apply fundamental mathematical, analytical and scientific skills and engineering technology concepts to solve problems in construction engineering design, estimating, planning, scheduling and project management.
2. Graduates that successfully work in teams and communicate effectively in written, oral and graphical forms.
3. Graduates that continue life-long career and professional growth actively interact with local industries and participate in their appropriate professional societies.
4. Graduates who are sensitive to ethical responsibilities, global environments and associated social issues.

Faculty with excellent credentials, including a balance of formal education, teaching ability and appropriate industry experience, are recruited nationwide and are provided opportunities for individual professional development and regular contact with the industry. Faculty members are encouraged to become involved in extension and research programs relating to the department's areas of strength or growth and to serve the needs for continuing education within the industry, particularly in the southwestern construction community.

These needs and opportunities for service are assessed regularly through close cooperation with local and regional construction professionals and industry associations. An active Construction Management Advisory Board, representing a broad cross-section of the industry, meets regularly to offer support and guidance necessary to preserve uncompromising excellence.

The bachelor's program in construction management technology is accredited by the Technology Accreditation Commission of the ABET (TAC of ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, phone: (410) 347-7700, e-mail: accreditation@abet.org. The educational objectives of the Department of Construction Management Technology are consistent with those required by TAC of ABET and are listed under "Division of Engineering Technology" in the *Catalog*.

—Undergraduate Admission. Students who satisfy the University admission requirements are eligible to enroll for the first two years of the program in the lower division of the curriculum for construction management technology. Upon completion of these two years, the best qualified students are selected, upon application to the upper division of the curriculum for construction management technology. Admission is based upon academic achievement, professional potential and available resources. Admission criteria are subject to annual review by the CMT department and may be obtained directly from the department.

Transfer students are required to furnish transcripts and course descriptions for previous classroom courses, as well as examples of previous academic work. Evaluation and enrollment by the CMT department is on a course-by-course basis for all transfer students.

The modern constructor must have a great deal of technical knowledge to keep abreast of rapidly changing equipment, materials and methods of construction. Specialized courses in estimating, surveying, structures, construction planning and scheduling, construction law and insurance, field and office management and construction procedures provide students with the background necessary for today's construction industry. These specialized courses, in addition to a blend of the basic sciences, business, and general studies, produce a well-balanced curriculum for students in construction management technology. Special attention is given to computer applications in construction estimating, and the development of graphic, written and oral communication skills is emphasized throughout the curriculum.

Students with an interest in building structures may select courses in the "building" option of the construction management technology curriculum, which provides them with knowledge of working drawings, mechanical and electrical equipment of buildings, and other course work for a career in building construction.

Students with an interest in civil engineering structures may select courses in the "heavy" option of the construction management technology curriculum, which provides them with knowledge of highways, soils, foundations and other course work for a career in the heavy and industrial construction industry.

The department attempts to identify and recruit highly qualified students who will benefit from the instructional program, and faculty members promote retention and ultimate graduation of construction management technology students through effective instruction and advisement. An active program of outcome assessment among graduates and their employers assures that the program continues to provide the academic training required for success. As one method of program assessment, each student, in the final semester, is expected to sit for the Level I Constructor Qualification Examination given once each semester. The student is responsible for the application process, including the appropriate fees. The test fee may be reimbursed to the student through the Office of University Assessment upon completion of the examination.

Graduates of construction management technology have shown the curriculum to be successful in their development as productive members of the construction industry, holding responsible positions as project managers, estimators, material and equipment salespersons, and construction managers at all levels.

Electrical Engineering Technology

Imad Abouzahr, PhD, PE - *Associate Professor and Interim Head*

The electrical engineering technology (EET) curriculum provides preparation for outstanding career opportunities not only in the electronics industry itself but also in many other areas in modern industry which depend upon electronics for control, communications or computation. Outstanding opportunities exist for graduates to work in diverse areas of electronics and computers.

The work of the electrical engineering technology graduate may range from assisting in the design and development of new equipment in the laboratory, applying modern microprocessors in the field, to the operation or supervision of production operations or field representatives.

The program provides the Bachelor of Science in Engineering Technology degree with an electronics major. To meet these diverse needs the program is laboratory-oriented and provides a strong foundation of mathematics and science, specialized course work in electronics technology and related technical areas, and courses in the area of communications and the social studies.

The electrical engineering technology graduate will:

1. have fundamental mathematical, analytical, and scientific skills and abilities to apply engineering technology concepts to a wide variety of problems.
2. combine laboratory/design experience and theory with focus on contemporary applications.
3. be able to work in teams and communicate effectively in written, oral and graphical form
4. be prepared for life-long career and professional growth, students will interact with local industries and be active in their appropriate professional societies.
5. demonstrate an awareness of the importance of ethical and social issues, and responsibilities associated with their engineering technology careers within diverse global environments.

The electrical engineering technology–computer option curriculum provides the preparation for graduates to enter the growing field of computer hardware and software. The demand for graduates having both computer hardware and software skills is quickly developing as the importance of automation, robotics, and artificial intelligence is recognized. Graduates of this program will be prepared for those opportunities in industry requiring considerable knowledge of both computer hardware and software.

The program provides the Bachelor of Science in Engineering Technology degree with an electronics major, and with a computer or telecommunication option. To meet the diverse needs that graduates will have, the program provides a strong foundation of mathematics, science, and specialized courses. Related courses in the humanities and social sciences are included to give the graduate an appreciation of the world in which the graduate will live and work.

The bachelor's program in the electronics major is accredited by the Technology Accreditation Commission of the ABET (TAC/ABET).

Fire Protection and Safety Technology

Michael D. Larrañaga, PhD, PE, CIH, CSP - *Associate Professor and Head*

The fire protection and safety technology (FPST) curriculum provides preparation for assessing and reducing the loss potential with respect to fire, safety, industrial hygiene, and hazardous material incidents. With respect to fire, reducing the loss potential might involve setting design criteria with a special emphasis on life safety or fire resistivity or specifying automatic detection or extinguishing systems. When considering safety, reducing accidents may require special protective equipment or clothing, or the redesign of machinery or processes. Reducing losses caused by environmental problems may require sampling air for contaminants, such as asbestos or toxic chemicals, or monitoring noise levels, and the development of procedures to address practical approaches to compliance with state and federal regulations. Addressing the problems of handling and disposing of hazardous chemicals, such as spill control, is often required. Managing risk and compliance with federal laws and regulations relative to occupational safety and health and hazardous materials is an increasingly important job activity.

The fire protection and safety engineering technology program has existed at Oklahoma State University since 1937. The demand by business and industry for loss control specialists has resulted in the evolution of the program into one that now places emphasis upon fire protection, safety, and occupational health. The program concludes with the Bachelor of Science in Engineering Technology degree in fire protection and safety.

—Program Objectives. The FPST program prepares graduates for careers in loss control. The loss control profession is segmented into three major areas: loss from fire, loss from physical accident, and loss from environmental exposure.

—Educational Objectives. The FPST program prepares students to have the following career and professional capabilities:

1. Recognize and anticipate hazards;
2. Evaluate hazards;
3. Conduct risk analysis and risk management activities;
4. Formulate control and mitigation strategies;
5. Maintain program and system effectiveness;
6. Apply and interpret applicable codes and standards; and
7. Demonstrate an understanding of the conduct of incident investigations, including associated legal responsibilities and record keeping.

The curriculum is designed to immediately introduce the student to studies in fire protection and safety. Therefore, students are able to measure their interest in a fire protection and safety career early in their academic program. The curriculum is rigorous in the areas of mathematics and the physical sciences. Two semesters of calculus are required as well as two semesters of chemistry and one semester of physics. Computer usage is an essential component of most fire protection and safety courses. Interested high school students should design their high school programs to prepare themselves for college level mathematics and science classes.

The Fire Protection and Safety Technology Professional School

In accord with the professional nature of a career in Fire Protection and Safety Technology (FPST), a student entering OSU is admitted into a Fire Protection and Safety Technology pre-professional program. Near the completion of this pre-professional course work, the student is considered for admission to the professional school of Fire Protection and Safety Technology to continue in the upper-division program. Upon meeting admission standards the student then pursues a curriculum leading to the BS degree in Engineering Technology.

—Pre-professional School. The content of the pre-professional program includes course work devoted to mathematics through calculus, communication skills, general chemistry, general physics, engineering sciences, and discipline specific foundation courses. This lower-division course work is devoted to preparing the student for professional school.

—Professional School. Upon formal admission to FPST professional school, the student proceeds through the junior and senior years of the degree program, fulfilling "Major Requirements" as listed on the degree requirements sheets located in the *Undergraduate Programs and Requirements* publication that can be found online at http://registrar.okstate.edu. Upon completion of all degree requirements, the student is awarded the Bachelor of Science degree in Engineering Technology, Fire Protection and Safety Technology.

—Admission to the Professional School. In Fire Protection and Safety Technology (FPST), the lower-division course work is devoted to preparing the student for professional school. To be admitted to the professional school, the student must have:

1. Completed a minimum of 60 credit hours in an accredited institution of higher learning.
2. Demonstrated an acceptable level of competence in subject material comparable to that covered in Pre-engineering

Technology, i.e., General Education and Common Pre-engineering Technology. Such demonstration may be by completion of course work or by examination, with not more than half the requirements satisfied by examination.

3. Been formally accepted by the FPST professional school.

An acceptable level of competence for admission to the professional school may be demonstrated by all of the following:

1. Completion of the pre-professional school requirements as designated on the flow chart corresponding to the student's matriculation date, with an overall grade-point average of 2.30 or higher in these courses. Students may be deficient in no more than six of these hours, and must have completed the required sequences in mathematics, physics, chemistry, English composition, and at least two engineering science courses.
2. Final grades of "C" or better in all courses submitted to meet the University's English composition requirement.
3. Completion at OSU of at least 12 credit hours of courses required for the degree, with a grade-point average of 2.30 or higher in these courses. This must include at least nine hours of technical subjects with a GPA of 2.50 or higher.
4. Achievement of an overall grade point average of 2.50 or higher in the required mathematics, physics, chemistry, engineering science and engineering technology courses completed prior to admission to professional school and final grades of "C" or better in each of these courses.

For these purposes, all GPAs are calculated using only the last grade in repeated courses.

If the number of qualified professional school applicants to the FPST professional school exceeds the number that can be provided a quality program with the resources available, the number admitted each year to the professional school will be limited. In that event, priority for admission will be given to pre-engineering/engineering technology students on a best qualified basis as determined by the grade-point average in relevant courses taken and completed at OSU and professional potential. This practice preserves the high standards demanded of a quality educational experience sought by students and is necessary so that OSU graduates will continue to be highly regarded.

Students may enroll in no more than six hours of upper-division major requirements prior to admission to professional school unless they secure permission from the head of the school.

The graduates of the fire protection and safety engineering technology program at Oklahoma State University are consistently recruited by the major businesses and industries of the United States. Graduate placement, salary offers, and advancement into managerial positions have been excellent due to the uniqueness and high technical quality of the OSU fire protection and safety technology program.

Mechanical Engineering Technology

James E. Bose, PhD, PE - *Professor and Head*

Mechanical engineering technology (MET) is that component of engineering that specializes in design and application. It includes the broad areas of mechanical design, mechanical power and manufacturing. Mechanical engineering technology is applied in robotics, automotive manufacturing, computer-aided drafting and design, computer-aided manufacturing, agricultural machinery and processing, mining, shipbuilding, spacecraft, electronics manufacturing, food processing, aircraft metals and plastics production—nearly the entire spectrum of the industry. In the power areas MET graduates are involved in vapor power cycles, gas power cycles, air conditioning, fluid power and power transmission. Manufacturing areas involving MET graduates include tool design, cost evaluation and control, plant operations, production planning and manufacturing methods.

An important element in MET is the use of laboratory experience as a teaching tool. The MET program has laboratories in fluid power, materials, fluid mechanics and applied thermal sciences, basic instrumentation, computer-aided design (CAD), and manufacturing. A senior capstone design course composed of student teams integrates the knowledge and skills learned during their course of study. These laboratories are supported with the latest computer software that supports the design function. Where appropriate, laboratories with modern computer data acquisition systems and on-screen displays are available.

In addition to the required mechanical engineering technology courses, students are provided a solid foundation in algebra, trigonometry and calculus, physics, chemistry, statics, dynamics, instrumentation, thermodynamics and computer science.

The mechanical engineering technology graduate will:

1. Have fundamental mathematical, analytical, and scientific skills and abilities to apply engineering technology concepts to a wide variety of problems. Specialty areas include manufacturing, graphical communications, and fluid power
2. Combine laboratory/design experience and theory with focus on contemporary applications.
3. Be able to work in teams and communicate effectively in written, oral and graphical form.
4. Be prepared for life-long careers and professional growth, students will interact with local industries and be active in their appropriate professional societies.
5. Demonstrate an awareness of the importance of ethical and social issues, and responsibilities associated with their engineering technology careers within diverse global environments.

Preparation for a specific industrial function can be accomplished by selecting courses that emphasize a given design area, such as fluid power, mechanical design, computer-aided design (CAD) power generation, and air conditioning and heating. Because the program focuses on the application of engineering principles to the pragmatic solution of problems, graduates are immediately productive with minimal on-the-job training, thus increasing their value to industry. Graduates of the MET program are prepared to function in the areas of product design, testing, and evaluation; product application and maintenance field engineering; and technical sales and liaison. Industries employing MET graduates include manufacturing companies of all types, (aircraft, automobile, compressor and turbine, fluid power manufacturers and others); energy companies (such as natural gas, electrical power generation, and the oil and gas industries); and service companies (transportation industry, architecture and professional engineering firms, and those supporting the oil and gas industry).

Companies utilizing the talents of MET graduates are diversified in their products, as well as geographical location, thus providing a variety of choices in respect to both type of work and place of residence and in diverse industrial, governmental and educational institutions.