6. College of Engineering

The College of Engineering offers five Bachelor of Science degree programs in: Biomedical Engineering (BME); Civil Engineering (CE); Computer Engineering (CpE); Electrical Engineering (EE); and Mechanical Engineering (ME). The three programs of CE, EE and ME are accredited by the Engineering Accreditation Commission (EAC) of ABET. The BME and CpE are newly established programs. While the latter are not currently ABET accredited, plans are underway for the accreditation of these programs.

The College has excellent laboratory facilities where students receive hands-on instruction by faculty. Computer-aided design (CAD) facilities, including state-of-the-art workstations, are routinely used in all programs. Some classes are taught by adjunct faculty from local industries, giving students the opportunity to interact with engineering professionals engaged in relevant engineering practice.

This engineering education incorporates demonstrable attributes of ABET-2000 criteria as core values. Graduates from the College of Engineering should have excellent opportunities for employment and pursuit of graduate degrees.

College Honors

The College of Engineering designates certain of its outstanding students as Honors students and provides the opportunity for advanced study under close faculty supervision. Selection for the honors designation is based on the student’s academic performance and recommendation by a faculty member in the student’s major discipline. To be eligible for the program, students must have a minimum UTSA grade point average of 3.25 and a minimum grade point average of 3.25 in their major at UTSA. These minimum averages must be maintained by the student to receive approval of the College Honors Committee. Students applying for College Honors must enroll in EGR 4993 Honors Research during their final two semesters. The completed research paper must be approved by the supervising faculty sponsor and by at least one of the faculty members in the student’s major discipline. Students interested in this program should contact a faculty advisor for additional information.

Admission to the College of Engineering

Freshman and Freshman Transfer Students

Pre-engineering students must complete a total of 30 credit hours. In the semester the student completes 30 credit hours, the student will be evaluated for admission. The following are the admission requirements for freshmen or freshmen transfer students (freshman transfers are evaluated for admission. The following are the admission requirements for freshmen or freshmen transfer students (freshman transfers are evaluated for admission. The following are the admission requirements for freshmen or freshmen transfer students (freshman transfers are evaluated for admission. The following are the admission requirements for freshmen or freshmen transfer students (freshman transfers are evaluated for admission. The following are the admission requirements for freshmen or freshmen transfer students (freshman transfers are evaluated for admission.

- Successfully completed evaluation under the Texas Success Initiative (TSI)
- Qualify for enrollment in MAT 1214 Calculus I, or a higher level mathematics course
- Qualify for enrollment in WRC 1013 Freshman Composition I (Q) or higher

After successfully completing 30 semester credit hours of required courses, including MAT 1214 Calculus I and WRC 1013 Freshman Composition I (Q) with grades of “C-” or better, pre-engineering majors who have at least a 2.50 overall and STEM (math, science, and engineering) GPA should meet with their assigned academic advisor to change their major from pre-engineering to a specific College of Engineering major.

New freshmen and freshman transfers who do not meet the requirements in the above criteria will be placed into University College as undeclared (UND) until they are college ready in math and English or meet transfer requirements for students with 30 or more hours.

Admission to the College of Engineering is competitive and not guaranteed.

Transfer Students

The following are the transfer requirements for direct admission to the College of Engineering majors including Biomedical Engineering (BME) Civil Engineering (CE), Computer Engineering (CpE), Electrical Engineering (EE), and Mechanical Engineering (ME) for transfer students who have earned 30 or more credit:

- Completed MAT 1214 Calculus I, or the equivalent with a grade of “C-” or better.
- Meet GPA requirements:
  a. Have a transfer grade point average of at least 2.50 and a grade point average of at least 2.50 in all mathematics, sciences, and engineering coursework,
  b. Have a transfer grade point average of at least 2.25 and a grade point average of at least 2.25 in all mathematics, sciences, and engineering coursework, and be granted admission to the College of Engineering major by holistic review by the College.

Transfer students not admitted directly into the College of Engineering will be changed to Undeclared (UND) and must choose another major outside of engineering.

Gateway Course

Students pursuing a degree in the College of Engineering must successfully complete MAT 1214 Calculus I, the Gateway Course, with a grade of “C-” or better in no more than two attempts. A student who is unable to successfully complete this course within two attempts, including dropping the course with a grade of “W” or taking an equivalent course at another institution, will be required to change his or her major outside of engineering.

“C-” Grade Rule

A grade of “C-” or better in any science, engineering or mathematics course required for an engineering degree or any other course that is a prerequisite to a required Biomedical Engineering (BME), Civil Engineering (CE), Computer Engineering (CpE), Electrical Engineering (EE), Mechanical Engineering (ME), or Engineering (EGR) course indicates satisfactory preparation for further engineering education. Any course assigned a grade below a “C-” must be repeated before enrolling in any course for which it is a prerequisite. This requirement is subject to the three-attempt limit.

Three-Attempt Limit for the College of Engineering

A student unable to achieve the “C-” Grade Rule in a required engineering course or in a prerequisite to a required engineering course
within three enrollments (attempts) shall be required to change his or her major to a field outside of the College of Engineering. Dropping a course with a grade of “W” is considered an attempt.

Cooperative Education in Engineering Program

The Cooperative Education in Engineering Program formally integrates University studies with institutionally supervised work experiences at cooperating organizations. Students participating in this program alternate periods of study at the University with periods of employment in industry. This combination of experiences enhances the student’s knowledge, personal development, and preparation for a professional career. Participants register at the University each semester. During the work periods, students register for the 3-semester-credit-hour EGR 3303 Engineering Co-op course. At the end of each work period, students submit reports covering the period. These reports are the basis of the student’s grades in the course. The cooperative education work periods also provide students with a source of income to help pay for their college expenses.

To qualify for the Cooperative Education in Engineering Program, a student must have declared a major in the College of Engineering and have a minimum cumulative grade point average of 2.50 and a minimum grade point average of 2.50 in their College of Engineering courses. Students are advised that many co-op employers require cumulative grade point averages higher than 2.50, and some require a minimum cumulative grade point average of 3.0. Transfer students may participate in the program after completing at least one semester at the University.

For more information and to apply to the Cooperative Education in Engineering Program, students should contact their academic advisor.

Degree Requirements Common to All Engineering Programs

During their first semester, students should specify their interest in a specific engineering program by selecting biomedical, civil, computer, electrical, or mechanical engineering as a major. Undecided engineering students should select a major closest to their area of interest (refer to the following program descriptions). Students may obtain additional information about each program from their academic advisor or a faculty advisor in the appropriate department.

Prerequisites for Biomedical Engineering (BME), Civil Engineering (CE), Computer Engineering (CpE), Electrical Engineering (EE), Mechanical Engineering (ME), and Engineering (EGR) courses must be completed with a grade of “C-” or better. A minimum grade of “C-” is required for all science and mathematics courses required in the Engineering programs. Students must satisfy the University’s Core Curriculum and ABET accreditation requirements. Recommended degree plans and current ABET requirements may be obtained from the College of Engineering.

All students admitted to the College of Engineering must complete at least 42 semester credit hours from their required major courses at UTSA before graduation.

Course requirements common to all engineering degree programs follow.

I. Core Curriculum requirements

Students seeking the Bachelor of Science degree in any engineering field must fulfill University Core Curriculum requirements in the same manner as other students at UTSA.

MAT 1214 Calculus I, PHY 1943 Physics for Scientists and Engineers I, and PHY 1963 Physics for Scientists and Engineers II (also listed under section II, General Engineering requirements) may be used to satisfy the Core Curriculum requirements for Mathematics and Life and Physical Sciences.

II. General Engineering requirements

All degree-seeking candidates in engineering must complete the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 1103</td>
<td>General Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>EGR 2323</td>
<td>Applied Engineering Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>MAT 1214</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MAT 1224</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>or EGR 1324</td>
<td>Calculus II for Engineers</td>
<td></td>
</tr>
<tr>
<td>PHY 1943</td>
<td>Physics for Scientists and Engineers I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; PHY 1951</td>
<td>and Physics for Scientists and Engineers I</td>
<td></td>
</tr>
<tr>
<td>&amp; PHY 1971</td>
<td>Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>PHY 1963</td>
<td>Physics for Scientists and Engineers II</td>
<td></td>
</tr>
<tr>
<td>&amp; PHY 1971</td>
<td>and Physics for Scientists and Engineers II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laboratory</td>
<td></td>
</tr>
</tbody>
</table>

Total Credit Hours 22

Certificate in Data Center Design

The certificate program in Data Center Design is designed so that students in mechanical, civil, and electrical engineering disciplines will take all the required courses in their disciplines, then, take additional courses from other majors (options A, B and C shown below). For instance, in order to be certified, a mechanical engineering student not only has to satisfy the mechanical engineering degree requirements, but also needs to complete courses in option A, shown below. All students must satisfy the prerequisites for courses in the option before registering for courses. Regardless of the option, all participating students must complete a 3 semester credit hour data center design project. The following exhibits the description of the project:

EGR 4953 Special Studies in Engineering: Overview of Data Center Design and Operation

The goal of this course is to provide the student with a broad overview of the application of technical course material and to utilize that knowledge in completion of an approved data center project. The scope of the project encompasses all of the requisite phases in planning for a system deployment into a data center. The phases are: planning, requirement analysis, facility design and installation, system deployment, check out and transitioning to operations. Students should propose the projects, an advisor will be assigned (either from UTSA or industry), and the project will be evaluated as the principal element of the student’s grade. Additionally, the course will include field trips to data centers, and guest lecturers to be provided. Some examples of the lecture topics include: Information Technology set up considerations, PSC management and systems monitoring, fire protection/detection at room and cabinet level, future power projections for servers and high performance computers, future cooling applications, physical security measures, etc. Successful
course completion includes completing a class project and project presentation.

Option A. Mechanical Engineering Students
Requires 15 semester credit hours in addition to the Bachelor of Science in Mechanical Engineering degree requirements. Mechanical Engineering students pursuing a certificate in Data Center Design must complete the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 3113</td>
<td>Structural Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CE 3213</td>
<td>Reinforced Concrete Design</td>
<td>3</td>
</tr>
<tr>
<td>EE 3413</td>
<td>Analysis and Design of Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>EE 4953</td>
<td>Special Studies in Electrical and Computer Engineering</td>
<td>3</td>
</tr>
<tr>
<td>EGR 4953</td>
<td>Special Studies in Engineering (Overview of Data Center Design and Operation)</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credit Hours 15

Option B. Civil Engineering Students
Requires 21 semester credit hours in addition to the Bachelor of Science of Civil Engineering degree requirements. Civil Engineering students pursuing a certificate in Data Center Design must complete the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 2213</td>
<td>Electric Circuits and Electronics</td>
<td>3</td>
</tr>
<tr>
<td>EE 3413</td>
<td>Analysis and Design of Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>EE 4953</td>
<td>Special Studies in Electrical and Computer Engineering (Power Electronics)</td>
<td>3</td>
</tr>
<tr>
<td>EGR 4953</td>
<td>Special Studies in Engineering (Overview of Data Center Design and Operation)</td>
<td>3</td>
</tr>
<tr>
<td>ME 3293</td>
<td>Thermodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>ME 4293</td>
<td>Thermodynamics II</td>
<td>3</td>
</tr>
<tr>
<td>ME 4313</td>
<td>Heat Transfer</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credit Hours 21

Option C. Electrical Engineering Students
Requires 18 semester credit hours in addition to the Bachelor of Science in Electrical Engineering degree requirements. Electrical Engineering students pursuing a certificate in Data Center Design must complete the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 4953</td>
<td>Special Studies in Electrical and Computer Engineering (Power Electronics)</td>
<td>3</td>
</tr>
<tr>
<td>EGR 4953</td>
<td>Special Studies in Engineering (Overview of Data Center Design and Operation)</td>
<td>3</td>
</tr>
<tr>
<td>ME 3293</td>
<td>Thermodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>ME 3663</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME 4293</td>
<td>Thermodynamics II</td>
<td>3</td>
</tr>
<tr>
<td>ME 4313</td>
<td>Heat Transfer</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credit Hours 18

Engineering (EGR) Courses
EGR 1313. Calculus with Engineering Applications. (3-2) 3 Credit Hours.
Prerequisite: Completion of precalculus or satisfactory performance on a placement examination. The first of a two-part integrated physics and calculus course. Calculus topics include an introduction to the concepts of limit, continuity, and derivative, mean value theorem, and applications of derivatives such as velocity and acceleration; introduction to the Riemann integral and the fundamental theorem of calculus. Physics topics include an introduction to vectors, force and Newton’s Laws of Physics. Classes meet weekly for three hours of lecture and two hours of problem solving tutorials.

EGR 1324. Calculus II for Engineers. (4-0) 4 Credit Hours. (TCCN = MATH 2414)
Prerequisite: MAT 1214. Methods of integration, applications of the integral, sequences, series, and Taylor expansions. Calculus topics are combined with physics applications including an introduction to vectors, parametric equations, gradients, and Newton’s Laws of Physics. (Credit cannot be earned for both EGR 1324 and MAT 1224.).

EGR 1343. The Impact of Modern Technologies on Society. (3-0) 3 Credit Hours.
Prerequisites: Basic background in high school mathematics and physical sciences. This course is designed to inform students of the social impact of modern technologies. The course explores the issues faced by society as technology becomes an integral part of human life. The course prepares students to think critically, practically, creatively and responsibly about technological and sociological challenges, and encourages them to examine solutions of their own. The course also explores and discusses the socio-technological interplay. May be applied toward the core curriculum requirement in Social and Behavioral Sciences.

EGR 1403. Technical Communication. (3-0) 3 Credit Hours.
Prerequisite: WRC 1013. Oral, written, graphical and visual communication; technical instructions; design project with presentation; team-work; and personal responsibility. May be applied toward the Core Curriculum requirement in the Component Area Option.

EGR 2103. Statics. (3-0) 3 Credit Hours. (TCCN = ENGR 2301)
Prerequisites: MAT 1224 and PHY 1943. Vector analysis of force systems applied to particles and rigid bodies and free body diagrams. Engineering applications of equilibrium; of moments, internal forces, and friction; and of centroids, centers of gravity, and moments of inertia. Generally offered: Fall, Spring, Summer.

EGR 2213. Statics and Dynamics. (3-0) 3 Credit Hours. (TCCN = ENGR 2303)
Prerequisites: MAT 1224 and PHY 1943. Force, moment, equilibrium, centroids and moments of inertia, kinematics, and kinetics of particles. Not open to students in Civil or Mechanical Engineering. May not be substituted for EGR 2103. Generally offered: Fall, Spring, Summer.

Engineering (EGR) Courses
EGR 1313. Calculus with Engineering Applications. (3-2) 3 Credit Hours.
Prerequisite: Completion of precalculus or satisfactory performance on a placement examination. The first of a two-part integrated physics and calculus course. Calculus topics include an introduction to the concepts of limit, continuity, and derivative, mean value theorem, and applications of derivatives such as velocity and acceleration; introduction to the Riemann integral and the fundamental theorem of calculus. Physics topics include an introduction to vectors, force and Newton’s Laws of Physics. Classes meet weekly for three hours of lecture and two hours of problem solving tutorials.

EGR 1324. Calculus II for Engineers. (4-0) 4 Credit Hours. (TCCN = MATH 2414)
Prerequisite: MAT 1214. Methods of integration, applications of the integral, sequences, series, and Taylor expansions. Calculus topics are combined with physics applications including an introduction to vectors, parametric equations, gradients, and Newton’s Laws of Physics. (Credit cannot be earned for both EGR 1324 and MAT 1224.).

EGR 1343. The Impact of Modern Technologies on Society. (3-0) 3 Credit Hours.
Prerequisites: Basic background in high school mathematics and physical sciences. This course is designed to inform students of the social impact of modern technologies. The course explores the issues faced by society as technology becomes an integral part of human life. The course prepares students to think critically, practically, creatively and responsibly about technological and sociological challenges, and encourages them to examine solutions of their own. The course also explores and discusses the socio-technological interplay. May be applied toward the core curriculum requirement in Social and Behavioral Sciences.

EGR 1403. Technical Communication. (3-0) 3 Credit Hours.
Prerequisite: WRC 1013. Oral, written, graphical and visual communication; technical instructions; design project with presentation; team-work; and personal responsibility. May be applied toward the Core Curriculum requirement in the Component Area Option.

EGR 2103. Statics. (3-0) 3 Credit Hours. (TCCN = ENGR 2301)
Prerequisites: MAT 1224 and PHY 1943. Vector analysis of force systems applied to particles and rigid bodies and free body diagrams. Engineering applications of equilibrium; of moments, internal forces, and friction; and of centroids, centers of gravity, and moments of inertia. Generally offered: Fall, Spring, Summer.

EGR 2213. Statics and Dynamics. (3-0) 3 Credit Hours. (TCCN = ENGR 2303)
Prerequisites: MAT 1224 and PHY 1943. Force, moment, equilibrium, centroids and moments of inertia, kinematics, and kinetics of particles. Not open to students in Civil or Mechanical Engineering. May not be substituted for EGR 2103. Generally offered: Fall, Spring, Summer.
EGR 2323. Applied Engineering Analysis I. (3-1) 3 Credit Hours.  
(TCCN = MATH 2321)  
Prerequisite: MAT 1224 or EGR 1324. Application of mathematical  
principles to the analysis of engineering problems using linear algebra  
and ordinary differential equations (ODE’s). Topics include: mathematical  
modeling of engineering problems; separable ODE’s; first-, second-, and  
higher-order linear constant coefficient ODE’s; characteristic equation  
of an ODE; non-homogeneous equations; Laplace transforms; shifting  
theorems; convolution; solution of an ODE via Laplace transform; matrix  
addition and multiplication; solution of a linear system of equations via  
Gauss elimination and Cramer’s rule; rank, determinant, and inverse of  
a matrix; eigenvalues and eigenvectors; existence and uniqueness of  
solutions; solution to system of ODE’s by diagonalization. One hour of  
problem solving recitation. Generally offered: Fall, Spring, Summer.

EGR 2513. Dynamics. (3-0) 3 Credit Hours. (TCCN = ENGR 2302)  
Prerequisite: EGR 2103. Kinetics of particles and plane rigid bodies,  
work and energy, impulse and momentum, equations of motion and  
engineering applications. Generally offered: Fall, Spring, Summer.

EGR 3303. Engineering Co-op. (0-0) 3 Credit Hours.  
Prerequisite: Acceptance into the Cooperative Education in Engineering  
Program. Designed for students participating in Cooperative Education  
in Engineering Program. Problems related to students’ work assignments  
during their work for co-op employers. No more than 3 semester credit  
hours of Engineering Co-op may apply to a bachelor’s degree. To apply  
3 semester credit hours of Engineering Co-op as a technical elective  
toward a degree in engineering, a student must petition and get approval  
of a faculty advisor prior to co-op activities. Formerly EGR 3301.

EGR 3323. Applied Engineering Analysis II. (3-1) 3 Credit Hours.  
Prerequisite: EGR 2323. Application of mathematical principles to the  
analysis of engineering problems using vector differential and integral  
calculus, partial differential equations, and Fourier series; complex  
variables; discrete mathematics; and use of software tools. One hour of  
problem solving recitation. Generally offered: Fall, Spring, Summer.

EGR 3713. Engineering Economic Analysis. (3-0) 3 Credit Hours.  
Prerequisites: ECO 2013 or ECO 2023, and MAT 1224. Time-value of  
money concepts; techniques for economic evaluation of engineering  
alternatives; depreciation and taxes; inflation and market rates;  
contracting practices; funding public projects and related public policy  
issues. Generally offered: Fall, Spring.

EGR 4953. Special Studies in Engineering. (3-0) 3 Credit Hours.  
Prerequisite: Consent of instructor. An organized course offering the  
opportunity for specialized study not normally or not often available as  
part of the regular course offerings. Special Studies may be repeated  
for credit when topics vary, but not more than 6 semester credit hours,  
regardless of discipline, will apply to a bachelor’s degree.

EGR 4993. Honors Research. (0-0) 3 Credit Hours.  
Prerequisite: Enrollment limited to candidates for college honors during  
their last two semesters; approval by the College Honors Committee.  
Supervised research and preparation of an honors thesis. May be  
repeated once with approval.