College of Engineering

The College of Engineering offers the following graduate programs:

- Graduate Certificate in Cloud Computing (p. 2)

Department of Biomedical Engineering (http://catalog.utsa.edu/graduate/engineering/biomedicalengineering)

- Master of Science in Biomedical Engineering (http://catalog.utsa.edu/graduate/engineering/biomedicalengineering/#degreestext)
- Doctor of Philosophy in Biomedical Engineering (http://catalog.utsa.edu/graduate/engineering/biomedicalengineering/#degreestext)

Department of Civil and Environmental Engineering (http://catalog.utsa.edu/graduate/engineering/civilenvironmentalengineering)

- Master of Civil Engineering (http://catalog.utsa.edu/graduate/engineering/civilenvironmentalengineering/#degreestext)
- Master of Science in Civil Engineering (http://catalog.utsa.edu/graduate/engineering/civilenvironmentalengineering/#degreestext)
- Doctor of Philosophy in Civil Engineering (http://catalog.utsa.edu/graduate/engineering/civilenvironmentalengineering/#degreestext)
- Doctor of Philosophy in Environmental Science and Engineering (http://catalog.utsa.edu/graduate/engineering/civilenvironmentalengineering/#degreestext)

Department of Electrical and Computer Engineering (http://catalog.utsa.edu/graduate/engineering/electricalcomputerengineering)

- Master of Science in Electrical Engineering (http://catalog.utsa.edu/graduate/engineering/electricalcomputerengineering/#degreestext)
- Master of Science in Computer Engineering (http://catalog.utsa.edu/graduate/engineering/electricalcomputerengineering/#degreestext)
- Master of Science in Advanced Materials Engineering (http://catalog.utsa.edu/graduate/engineering/electricalcomputerengineering/#degreestext)
- Doctor of Philosophy in Electrical Engineering (http://catalog.utsa.edu/graduate/engineering/electricalcomputerengineering/#degreestext)
- Integrated Bachelor's/Master's Program (http://catalog.utsa.edu/graduate/engineering/electricalcomputerengineering/#degreestext)

Department of Mechanical Engineering (http://catalog.utsa.edu/graduate/engineering/mechanicalengineering)

- Master of Science in Advanced Manufacturing and Enterprise Engineering (http://catalog.utsa.edu/graduate/engineering/mechanicalengineering/#degreestext)
- Master of Science in Mechanical Engineering (http://catalog.utsa.edu/graduate/engineering/mechanicalengineering/#degreestext)
- Doctor of Philosophy in Mechanical Engineering (http://catalog.utsa.edu/graduate/engineering/mechanicalengineering/#degreestext)

These programs offer opportunities for advanced study and research designed to prepare students for leadership roles in engineering careers with industry, government, educational institutions, and research organizations. For master's degree programs, a thesis option is recommended for students who are planning a career in research or who contemplate pursuing a doctorate in one of the engineering disciplines. A nonthesis option is also available for students who desire a practical industrial applications-oriented degree.

The Department of Biomedical Engineering offers a matrix of academic tracks based on segments of biomedical engineering and/or areas of clinical emphasis. Specifically, the program has emphases in the following areas: biomaterials, biomechanics, and bioimaging. The biological areas covered are orthopedics/dental tissues, cardiovascular systems, and neural systems. The Department of Civil and Environmental Engineering includes programs of study in structures, environmental engineering—transportation, water resources, hydrology, geotechnical engineering, solid mechanics, and materials. The Department of Electrical and Computer Engineering includes programs of study in Computer Engineering, Systems and Control, Digital Signal Processing, Communications, and Electronic Materials and Devices. The Department of Mechanical Engineering includes programs of study in thermal and fluid systems, mechanical systems and design, mechanics and materials, and manufacturing engineering and systems.

All College of Engineering departments offer Master's programs from their own discipline and research emphases: Department of Biomedical Engineering offers M.S. in Biomedical Engineering, Department of Civil Engineering offers M.S. in Civil Engineering and Master of Civil Engineering, Department of Electrical and Computer Engineering offers M.S. in Electrical Engineering and M.S. in Computer Engineering, and Department of Mechanical Engineering offers M.S. in Mechanical Engineering and M.S. in Advanced Manufacturing and Enterprise Engineering. In addition, the College of Engineering offers an interdisciplinary Master of Science degree in Advanced Materials Engineering that features state-of-the-art technical knowledge and multidisciplinary courses with focus in two concentration areas:

1. Multifunctional Electronic, Dielectric, Photonic and Magnetic Materials; and
2. Multifunctional Biomedical Materials.

The M.S. in Advanced Materials Engineering degree program is administered by the Department of Electrical and Computer Engineering.

A Doctor of Philosophy degree in Biomedical Engineering will train students in the fundamental sciences and engineering related to medicine. Areas of focus include biomechanics, biomaterials, bioimaging, and the following systems: musculoskeletal/dental, cardiovascular, and neurological.

A Doctor of Philosophy degree in Electrical Engineering offers an in-depth and integrated study focused in one of the following areas: Computer Engineering, Systems and Control, Digital Signal Processing, Communications, and Electronic Materials and Devices.

A Doctor of Philosophy degree in Environmental Science and Engineering offers research emphases in Water Resources, Environmental Quality, Environmental Remediation, Pollution Control, Conservation Ecology, Spatial Analysis, Remote Sensing, and Natural Hazards.

A Doctor of Philosophy degree in Mechanical Engineering offers an in-depth and integrated research focus on three concentration areas: Thermal and Fluid Systems, Design and Manufacturing Systems, and Mechanics and Materials.

A limited number of assistantships and fellowships are available to qualified students. Financial assistance is awarded on a competitive basis.

Graduate Certificate in Cloud Computing

The graduate certificate in Cloud Computing is a 12-semester-credit-hour program designed to equip technical professionals with the knowledge and technical skills necessary for a career in an organization that leverages cloud computing. The wide-range of use of cloud computing in today's business, government and academic environments requires a broad range of competencies and understanding of how cloud computing influences a particular area. This certificate is designed to give a common framework of understanding cloud computing, as well as allow for specialization in specific areas, such as, cyber-security, cloud-infrastructure, and applications in cloud.

The certificate is administered by the College of Engineering in conjunction with the College of Business and the College of Sciences. The course requirements for each program focus may be found under the College of Engineering, the Department of Computer Science (http://catalog.utsa.edu/graduate/sciences/computerscience/#certificatestext), and the Department of Information Systems and Cyber Security (http://catalog.utsa.edu/graduate/business/informationsystemscybersecurity/#certificatestext).

Certificate Requirements

To satisfy the requirements for the Graduate Certificate in Cloud Computing, students must complete 12 semester credit hours as follows:

A. Required Course		3
Select one entry course:		
EE 5243	Topics in Systems and Control (Topic: Concepts in Cloud Computing)	
Or a cross-listed course in CS and IS. The entry course is taught through team teaching in which instructor from each college contributes to the subjects outlined in the course syllabus.		
B. Track Electives		6
Select two courses from one of the following tracks:		
Applications Track		
CS 5233	Artificial Intelligence	
CS 5263	Bioinformatics	
CS 5443	Database Management Systems	
CS 5463	Topics in Computer Science	
CS 5473	Data Mining	
CS 5493	Large-Scale Data Management	
CS 5573	Cloud Computing	
CS 6243	Machine Learning	
CS 6293	Advanced Topics in Bioinformatics	
EE 5243	Topics in Systems and Control (Topic: Data Analytics with Cloud Computing)	
EE 5243	Topics in Systems and Control (Topic: Programming Techniques for the Cloud)	
EE 6973	Special Problems (Topic: Machine Learning with Big Data)	
IS 6703	Introduction to Data Mining	
ME 5013	Topics in Mechanical Engineering (Topic: High Performance Computing)	
Security Track		
CS 6353	Unix and Network Security	
CS 6393	Advanced Topics in Computer Security	
IS 5513	Fundamentals of Information Assurance	
IS 6363	Computer Forensics	
Infrastructure Track		
CS 5103	Software Engineering	
CS 5123	Software Testing and Quality Assurance	
CS 6463	Advanced Topics in Computer Science	
CS 6463	Advanced Topics in Computer Science (Topic: Parallel and Distribute Systems Software)	
CS 6523	Distributed Operating Systems	
CS 6543	Networks	
CS 6553	Performance Evaluation	
CS 6643	Parallel Processing	
EE 5103	Engineering Programming	
EE 5453	Topics in Software Engineering (Topic: Advanced Data Structures and Algorithms)	
C. Capstone Project		3
Select one course from the following (topics should be in the field of Cloud Computing):		
CS 6953	Independent Study	
EE 6943	Graduate Project	
EE 6953	Independent Study	
IS 6953	Independent Study	
Total Credit Hours		12

Engineering (EGR) Courses

EGR 5023. Numerical Techniques in Engineering Analysis. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing in engineering or consent of instructor. Advanced methods of applied mathematics, including numerical linear algebra, initial value problems, stability, convergence, partial differential equations, and optimization.

EGR 5213. Topics in Systems Modeling. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing in engineering. Systems analysis approach to formulating and solving engineering problems. Topics include operational research, mathematical modeling, optimization, linear and dynamic programming, decision analysis, and statistical quality control. Topic 1: Applied Operations Research. Application of operations research methods to practical engineering problems. Topic 2: Engineering Systems Modeling. Modeling of modern engineering systems for operational and management control. May be repeated for credit as topics vary. (Same as CE 5013. Credit cannot be earned for both EGR 5213 and CE 5013).

EGR 5233. Advanced Quality Control. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing in engineering or consent of instructor. Methods and techniques for process control, process and gage capabilities, inspection plans, American National Standard, and recent advanced techniques. Tour of manufacturing industry. Case studies in process control, outgoing quality, and costs. A project, assigned by a manufacturing company, is required, along with a final presentation of the project.

EGR 5703. Advanced Scientific Visualization. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing in engineering or consent of instructor. Topics include 3D image display and generation techniques, visual thinking process, interaction with visualization, efficiency of visualization on sparse grid, haptic rendering and control, and immersive 3D programming.

EGR 5713. High Performance Computing. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing in engineering or consent of instructor. Topics include scientific computing in UNIX/LINUX environment, instruction on several import UNIX applications, various parallelization styles of computing, and application programming interfaces (APIs) in scientific applications.

EGR 6013. Advanced Engineering Mathematics I. (3-0) 3 Credit Hours.
Prerequisites: EGR 2323 and EGR 3323, or equivalent courses. Advanced methods of applied mathematics, including vector differential calculus, linear algebra, functional space and their applications to engineering problems. (Same as BME 6033. Credit cannot be earned for both EGR 6013 and BME 6033.) (Formerly titled “Analytical Techniques in Engineering Analysis”).

EGR 6023. Advanced Engineering Mathematics II. (3-0) 3 Credit Hours.
Prerequisites: EGR 2323 and EGR 3323, or equivalent courses. Advanced methods of applied mathematics. Topics may include solution methods of partial differential equations, complex analysis, optimization theory, other topics in engineering mathematics and their applications to engineering problems. May be repeated for credit as topics vary.

EGR 6033. Linear and Mixed Integer Optimization. (3-0) 3 Credit Hours.
Prerequisite: ME 2173 or equivalent. Graduate standing in engineering or consent of instructor. Introduction to the theory of linear programming and duality, algorithms for solving linear programs, network simplex, integer and mixed integer programming (e.g., simplex, branch and bound and branch and cut). This course provides an overview of optimization theory and algorithms as well as emphasizes its applications in different areas of Engineering.