Electrical and Computer Engineering (MSE)

The Chandra Family Department of Electrical and Computer Engineering currently offers three Master of Science in Engineering (MSE) programs to meet differing needs: the Traditional MSE program, the Integrated BSECE/MSE program, and the single-track Alternatively Scheduled MSE program with a concentration in Software Engineering. The latter program is offered through Texas Engineering Executive Education (TxEEE). The Traditional and Integrated BSECE/MSE programs share the same academic track advisors; the Alternatively Scheduled MSE program has its own academic advisor. Students in each of these MSE programs are expected to meet the same academic standards.

There are eight named academic concentrations spanning electrical and computer engineering around which admissions, course offerings, and advising are organized, as listed below. However, the interests and work of students and faculty alike may overlap more than one concentration.

Architecture, Computer Systems, and Embedded Systems. Computer architecture is at the interface of computer hardware and software. Its practitioners are responsible for specifying, designing, and implementing at the architecture level the hardware structures that carry out the work specified by computer software. Computer architects share the responsibility for providing mechanisms that algorithms, compilers, and operating systems can use to enhance the performance and/or energy requirements of running applications, ranging from small embedded IoT devices, autonomous systems, emerging quantum computing systems, to large cloud-based machine learning clusters. Computer architecture spans many dimensions, such as the scope of a processor (embedded processors, desktop systems, servers, and supercomputers); the target application (general-purpose versus domain-specific); the characteristics of the design objectives (speed, power consumption, cost, reliability, availability, and reconfigurability); and the measurement and analysis of resulting designs.

bioECE. Understanding, engineering, and interfacing with biological systems are among humanity's most important challenges, impacting numerous fields from basic science to health. Motivated by this larger vision, the bioECE track is focused on the intersection of electrical and computer engineering with biology and medicine. It includes biomedical instrumentation and sensing, neural engineering and interfaces, computational biology and bioinformatics, biophotonics and medical imaging, synthetic biology, biomimetic electronics, human-AI teaming, and other areas. Associated faculty have expertise in diverse topics: brain-machine interfaces and neuroprosthetics, neural engineering and neuromodulation, medical and computational imaging, contact tracing and disease-aware navigation, optical biosensing, wearable and flexible bioelectronics, health monitoring and activity recognition, digital biomarkers for disease detection, biomedical instrumentation and embedded systems, bioinformatics and computational genomics, molecular programming and synthetic biology, nanoscale manipulation and drug delivery, and soft robotics for biomedical applications

Decision, Information, and Communications Engineering. This concentration involves research and design in the following fields: (1) Communications and Networking: all aspects of transmission of data, including: wireless communications, communication theory, information theory, networking, queueing theory, sensor networks; (2) Artificial Intelligence and Machine Learning: all aspects of extraction of knowledge from data, including: algorithms, data mining, optimization, statistics, pattern recognition, predictive analytics, data science and engineering, generative AI, reinforcement learning; and (3) Controls, Signals, and Systems: estimation and detection; signal, image and video processing; computer vision.

Electromagnetics and Acoustics. This concentration includes the study of electromagnetic and acoustic phenomena ranging from ultralow frequencies to the visible spectrum. The activities in electromagnetics involve research in computational methods, microwave and millimeter-wave components and integrated circuits, guided wave devices and systems, wave-matter interactions, antenna design, radar scattering, bioelectromagnetics, wave manipulation using artificial materials, wireless propagation channels, electromagnetic forces (including electrostrictive and magnetostrictive forces), and Maxwell's stress tensor. The activities in acoustics involve research in transducers, microelectromechanical systems, radio-frequency and millimeter-wave piezoelectric resonators and filters, atmospheric and underwater acoustics, and noise and vibration control.

Electronics, Photonics, and Quantum Systems. This concentration focuses on the development and improvement of electronic, photonic, optoelectronic, spintronic, and micro-electromechanical (MEMS) materials, devices, and systems for a variety of applications including digital, neuromorphic and quantum computing, high-speed communications, displays, sensors, and power applications. Electronic devices include nano-scaled CMOS transistors and, post-CMOS devices, memory, and compute-in-memory devices including memristors and magnetic and ferroelectric tunnel junctions. Photonic devices include photodetectors, solar cells, optical interconnects, LEDs, and lasers, including those incorporating semiconductor heterostructures, and topological photonic, metamaterials, metasurfaces, and other novel nanophotonic structures. Sensors include those for acoustic, chemical, and biological applications. Material systems include unstrained and strained column-IV and III-V- materials in bulk and quantum-well heterostructures, intrinsically low-dimensional systems including carbon nanotubes (1D) and mono-layer or few-layer graphene or transition metal dichalcogenides structures (2D), and organic and polymer thin films. Thin layers and heterostructures can be created through molecular beam epitaxy or various forms of chemical vapor deposition. Naturally 2D material layers also can be pulled from the layer stacks and manipulated by methods including novel methods developed in-house.

Integrated Circuits and Systems. This concentration involves all aspects of analysis, design, synthesis, and implementation of digital, analog, mixed-signal, and radio frequency (RF) integrated circuits and systems for applications in computing, sensing, and communications. Research in the area spans levels of abstraction from devices to systems-on-chip (SoC), and involves transceiver architectures, data converters, memory technologies, signal processing systems, integrated bio-chips, neuromorphic computing, high-performance and low-power design, fault tolerance, design for manufacturability (DFM), design for test (DFT), verification, computer-aided design (CAD) and electronic design automation (EDA).

Power Electronics and Power Systems. This concentration involves research in the generation, transmission, distribution, conversion, storage, and management of electric energy. Research activities include but are not limited to advanced power semiconductor devices; high-frequency-power electronic conversion systems; GPU/accelerator power delivery and mangagement; high-frequency magnetics; medium voltage power electronics for applications in renewable energy, energy storage and smart grid systems; dc power grids; power system analyses; modeling and simulation of power systems across all time scales; grid data analytics; applications of AI to power systems; security and resilience of power grid infrastructures; protection systems; power system harmonics; and power quality.

Software Engineering and Systems. This concentration involves all aspects of engineering software systems. In addition to the problem of requirements, research and study in the area addresses architecting, designing, building, testing, analyzing, evaluating, deploying, maintaining, and evolving software systems. Problems investigated include theory, techniques, methods, processes, tools, middleware, and environments for all types of software systems in all types of domains and applications. This area of study also is available to working professionals through the Alternatively Scheduled MSE program with a concentration in Software Engineering administered by Texas Engineering Executive Education (TxEEE).

Traditional MSE Program

Students in the Traditional MSE program attend classes with students in the Integrated MSE program and the PhD program and have access to upper-division undergraduate courses and courses taught outside the Chandra Family Department of ECE.

Alternatively Scheduled MSE Program with a Concentration in Software Engineering

This is a single-track program administered by Texas Engineering Executive Education (TxEEE) and designed with full-time engineers and computer professionals in mind. Students attend classes in person taught by faculty from the Chandra Family Department of Electrical and Computer Engineering. However, they do so once a month on Fridays and Saturdays. Moreover, all courses offered in this program are at the graduate level, and this program has its own academic advisor. Additional information about this program is published by TxEEE.

Graduate Handbook

Graduate handbook information is updated and maintained by each program. Graduate handbooks are available within each program's office and online. Please contact the program with concerns or questions.

Objective

The objective of the faculty of the Chandra Family Department of Electrical and Computer Engineering and its Graduate Studies Committee is to provide a graduate program that continues to produce exceptional graduates via an education that is both broad and deep and access to world-class research facilities while advancing the state of the art within diverse subfields spanning electrical and computer engineering.

Admission

Admission to the graduate program in ECE is highly competitive and based on a holistic review of all application materials by admission committees composed of faculty within the applicant's chosen academic tracks. Standards for admission generally exceed the minimum standards established by the University. The Chandra Family Department of ECE neither requires nor considers GRE scores in the selection of students for admission.

Applicants to the graduate program of the Chandra Family Department of Electrical and Computer Engineering normally will have an undergraduate degree in this field. Applicants with a degree in another field also may be considered if their background is appropriate for the chosen area of specialization. However, if admitted, the student may be required to complete additional coursework (outside their Program of Work, as discussed below) to address any academic deficiencies.

Graduate students in the Chandra Family Department of Electrical and Computer Engineering are expected to be proficient speakers and writers of English. A newly admitted international student whose test scores indicate they may not meet the University's English proficiency standards must complete a speaking and/or writing screening conducted by the UT English Language Center before they can register for classes. Further coursework in English is required within the first year of graduate study for students who do not receive a passing score. The ESL course count toward the student's course load for the semester but do not count toward the fulfillment of course requirements for the graduate degree. International non native speakers of English with an offer of a Teaching Assistantship from ECE must successfully complete a *different* oral English screening to receive ITA English Certification.

Total Hours Required: 30

Requirements

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The Traditional MSE program offers thesis, report, and coursework-only options; the Alternatively Scheduled MSE program offers only the report and coursework-only options. The thesis option requires original research and satisfactory completion of a written thesis and two associated three-hour *Thesis* courses taken on the credit/no credit basis within the 30-hour MSE Program of Work. The report option requires satisfactory completion of a written report and one associated three-hour *Report* course taken on the credit/no credit basis within the 30-hour MSE Program of Work. Otherwise, all other courses that count toward the MSE Program of Work must be classroom courses and taken for a letter grade. Up to six semester hours (two semester-long courses) or the quarter system equivalent of graduate coursework taken elsewhere but not used for a prior degree may be used for the Program of Work with approval. A minimum grade point average of 3.00 (B) is required within the MSE Program of Work for coursework taken at The University of Texas at Austin as a Graduate student. The MSE Program of Work including graduate coursework taken at other institutions and taken at The University of Texas at Austin as an undergraduate and reserved for graduate credit should meet this standard also. Moreover, only one course with a grade less than B−, no course with a grade less than C, and no course with a grade of less than B taken at another institution may be counted within the MSE Program of Work. The student's MSE Program of Work must be approved by the student's academic track advisor or, in the case of the Alternatively Scheduled program, program advisor or by the student's individual supervisor, then by the graduate advisor of the Chandra Family Department of ECE, and finally by the Office of Graduate and Postdoctoral Studies at The University of Texas at Austin.

Code	Title	Hours
Please see the following links for more information about degree requirements and policies:		
Graduate Engineering Requirements		
Graduate University Requirements		

Consult departments/programs regarding the Graduate University Requirements as some departments/programs have stricter degree requirements.