electrical engineering courses. Those students who satisfy conditions 1 through 3 but who lack some of the electrical engineering background may be provisionally admitted to the program.

Admission to Candidacy

After removal of all deficiencies and upon completion of all the leveling courses (as described below), the student is required to submit a formal degree plan to his or her adviser and the dean of the School of Graduate Studies. Failure to fulfill these requirements may prevent a student from enrolling the following term/semester. Admission to candidacy is granted by the Dean of Graduate Studies after the degree plan has been approved.

Leveling Courses

- Mathematics through multivariable calculus
- Physics including mechanics, electricity and magnetism
- EENG 2620, Signals and Systems
- EENG 2710, Digital Logic Design
- EENG 3520, Electronics II
- EENG 3810, Communications Systems

All entering students must demonstrate knowledge of the material covered in these courses. An entering student may demonstrate the knowledge by:

- Completing the courses at UNT
- Completing similar courses at another recognized institution
- Evidence based on employment experience.

A student may be required to pass a placement examination to demonstrate his or her knowledge.

Degree Requirements

Option A: Thesis option with 24 semester hours of organized course work excluding undergraduate prerequisites and leveling courses, in addition to 6 hours of EENG 5950, Master's Thesis.

Option B: Non Thesis option with 30 semester hours of organized course work and 3 semester hours of EENG 5890, Directed Study.

Course Selection

- At least 12 hours of graduate electrical engineering courses.
- No more than 6 semester hours of special problems or directed study courses.
- Leveling courses: Students whose undergraduate majors were not electrical engineering must take additional leveling courses that will be determined by the EE graduate adviser on an individual basis.

Courses of Instruction

All Courses of Instruction are located in one section at the back of this catalog.

Course and Subject Guide

The "Course and Subject Guide," found in the Courses of Instruction section of this book, serves as a table of contents and provides quick access to subject areas and prefixes.

Department of Engineering Technology

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Albert Bill Grubbs Jr., Chair

Graduate Faculty: Foster, Grubbs, Kougianos, Kozak, McNeill, Mirshams, Nasrazadani, Plummer, Vaidyanathan, Wang, Yu.

The department serves two basic roles. In the broader sense, it provides exposure to technology for general understanding and interpretation of industry founded in theory and practice. In a more practical sense, the department provides technology-based education that results in professional careers in industry. Career opportunities for graduates are in industry/business.

Research

The research interests of the Department of Engineering Technology are focused on technological systems and processes with specific industrial applications. This research represents the university's desire to effect the transfer of theoretical knowledge from the laboratory to the industrial sector (technology transfer).

Specific interests in mechanical engineering include product design and development, quality assurance, composite materials, materials testing, production planning and management, manufacturing processes, computer-aided design (CAD), computer-aided manufacturing (CAM), computer numerical control (CNC), part programming, electromechanical design, robotics, liquid nitrogen automobile, nano-indentation, field emissions, corrosion and nano crystalline materials, and

computer-integrated manufacturing (CIM). The principal research interests in electronics include hardware/software interfacing, data acquisition and analysis, computer-aided software engineering (CASE), local area networks (LANs), digital signal processing, real-time control systems, distributed control systems, RF communication systems, biomedical optics, pulse oximetry, telemedicine, VLSI design of antenna array, SCADA systems, logic circuit design, applications of technology to education and solar energy research. Also of interest are international projects involving the transfer of electronics technology to the academic and industrial sectors.

Support for research projects in the department has come from the National Science Foundation; American Society for Heating, Refrigeration and Air-conditioning Engineers; American Cancer Society; Cadence Design Systems Inc.; Texas Instruments Inc.; American Society for Engineering Education; Texas Department of Transportation; TU Electric; Electrical Generation Technology; Associated General Contractors of America; Society of Manufacturing Engineers and the U.S. Air Force. Industrial support of graduate student thesis research has been provided by MEMC Southwest, Aerospace Optics, TXU, Manamatsu Photonics, Bell Helicopter-Textron, Texas Instruments, Halsey Engineering and Manufacturing, Molex Inc., Verizon, AT&T, Motorola, Montgomery KONE and Bateman Engineering.

Degree Program

The department offers a graduate program leading to the following degree:

- Master of Science with a major in engineering technology.

Admission Requirements

Admission to graduate study at UNT is described in the Admission section at the front of this catalog.

Applicants should hold an undergraduate degree in a technical field of study. Applicants not meeting this qualification may be admitted with a provision for removal of undergraduate deficiencies. In addition, applicants must meet departmental requirements for the Graduate Record Examination scores. Contact the department or the Toulouse School of Graduate Studies for information concerning acceptable admission test scores.

Master of Science Degree Program

The program of study for the Master of Science with a major in engineering technology is a comprehensive program, yet provides for a degree of specialization with the proper selection of courses in the major. Two options are available.

Option 1, Master of Science, Thesis

The graduate credit requirement for the MS degree is 30 semester hours chosen in one of the following specializations. A formal proposal and an oral defense of the thesis are required of all degree candidates.

Specialization in mechanical engineering technology:

1. Required courses: MSET 5000, 5040, 5950; MEET 5030, 5100, 5120 and 5130.

2. Electives: 8 semester hours selected in consultation with a department graduate adviser.

Specialization in electronics engineering technology:

1. Required courses: MSET 5000 and 5950, and ELET 5300, 5310, 5320, 5330 and 5340.

2. Electives: 8 semester hours selected in consultation with a department graduate adviser.

Option 2, Master of Science, Non-Thesis

The graduate credit requirement for the MS degree is 36 semester hours chosen in one of the following specializations. A project and/or examination is required of all degree candidates for the non-thesis option.

MSET 5000 is required of all students.

Specialization in mechanical engineering technology:

1. Required course: MSET 5040; MEET 5030, 5100, 5120 and 5130.

2. Electives: 20 semester hours selected in consultation with a department graduate adviser.

Specialization in electronics engineering technology:

1. Required courses: ELET 5300, 5310, 5320, 5330 and 5340.

2. Electives: 20 semester hours selected in consultation with a department graduate adviser.

Degree Plan

For advice regarding the procedure for obtaining a degree plan, which is to be submitted prior to the completion of 6 semester hours, see a graduate adviser in the departmental office, UNT Research Park, Room F115.

Financial Support

The department has scholarships and research/teaching assistantships available for full-time graduate students. For additional information, make inquiries to a department graduate adviser.

Courses of Instruction

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Department of Materials Science and Engineering

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Michael Kaufman, Chair

Graduate Faculty: Banerjee, Brostow, D'Souza, El-Bouanani, Gorman, Kaufman, Reidy, Scharf, Shepherd.

The Department of Materials Science and Engineering addresses the educational and technological challenges of creating, applying and characterizing new materials for manufacturing products for the 21st century. The department is committed to training students at the graduate level in all aspects of modern materials including metals, ceramics, polymers, electronic and optical materials, and materials characterization. Students have opportunities for hands-on research with modern equipment and facilities. The department has strong collaborative programs with other universities in the Dallas–Fort Worth region and with corporations throughout the world. Students have many opportunities to develop highly marketable skills for high-technology companies in electronics, chemical, electric power, automotive, aviation, biomedical and environmental industries, as well as academia.

Financial Support

Teaching assistantships funded by the department and research assistantships funded by individual faculty research grants support the majority of students. Out-of-state and international students who are funded at least half-time are eligible for in-state tuition rates. Contact the chair of the Department of Materials Science and Engineering regarding assistantships. Contact Student Financial Aid and Scholarships for student loan information.

Research

The **Electron Microscopy Laboratory** houses the new FEI TF20ST analytical high-resolution transmission electron microscope and the FEI Nova 200 Nanolab dual-beam scanning electron microscope/focused ion beam instrument. Recent acquisitions include a 3-D local electrode atom probe tomography system, an environmental scanning electron microscope and a high resolution X-ray diffraction system, an atomic force microscope, and a UV-VIS ellipsometer. Full optical microscopy, sample preparation, and electron microscopy computer simulation facilities are available. The multi-disciplinary, multi-user laboratory emphasizes the production and characterization of nanoscale materials and devices and the transfer of technology to industry.

The **Laboratory of Advanced Polymers and Optimized Materials (LAPOM)** focuses on the development of materials with improved mechanical, tribological and thermo-physical properties, including thermoplastics, thermosets, composites, nanohybrids and coatings. High strength, wide service temperature range, low thermal expansivity, low static and dynamic surface friction, high adhesion of coatings to ceramic and metal substrates, high scratch, wear and mar resistance.

The analytical characterization facilities include a new 200kV Tecnai G20 analytical high-resolution transmission electron microscope with EDS, PEELS, energy filter and HAADF; a new dual beam Nova 200 focused ionbeam/field emission SEM; a Phillips 420 TEM with EDS; a JEOL 5800 scanning electron microscope (SEM) with EDS; a JEOL T-300 SEM; and a Scintag e-ray diffractometer.

The **Polymer Mechanical and Rheological Laboratory** is engaged in investigations of interrelationships between morphology and mechanical properties through the influences of time and temperature of polymers, composites and hybrid organic-inorganic nanocomposites. A Mechanical Testing System (MTS810) equipped with an environmental chamber (-150° to 600° C), video and thermal wave imaging provide stress pattern-temperature relationships around propagating cracks and estimate residual stresses. A Torsional Rheometer provides visuelastic and rheological property evaluation. Reliability of dielectric property retention is being examined through simultaneous effects of radiation and electrical fields using thermally stimulated depolarization currents and thermoluminescence.

The **Materials Synthesis and Processing Laboratory** has research interests focused on the development of aerogels and other novel ceramics for dielectric, sensor and high temperature applications. A complete