Electrical Engineering (Ph.D.*, M.S.E.E.)

View PDF of Electrical Engineering Admissions Checklist
Prospective students should use this checklist to obtain specific admissions requirements on how to apply to Graduate School.

View PDF version of the Electrical Engineering catalog description

Faculty

Dale W. Callahan, Associate Professor (Electrical and Computer Engineering); Wireless Communication, Digital Signal Processing, Telecommunication

David A. Conner, Professor and Chair Emeritus (Electrical and Computer Engineering); Electrical Networks, Electromagnetics, Mathematical Modeling of Electrical Phenomena

Gregory A. Franklin, Assistant Professor (Electrical and Computer Engineering); Electric Utility Power Systems, Power System Protection and Control, Power Line Communication

David G. Green, Instructional Associate Professor (Electrical and Computer Engineering); Computer Networking, Software Engineering, Embedded Computer Systems

Mohammad. R. Haider, Assistant Professor and Graduate Program Director (Electrical and Computer Engineering); Analog, Mixed-signal, and RF Circuit and System Design, Low-power Electronics, Implantable Systems, Inductive Powering, Energy Harvesting, Impulse-based Wireless Communication

Thomas C. Jannett, Professor (Electrical and Computer Engineering); Control Systems, Biomedical Instrumentation, Modeling and Simulation, Intelligent Sensor Networks

Karthikeyan Lingasubramanian, Assistant Professor (Electrical and Computer Engineering), Digital Integrated Circuits design, Design of Secure and Reliable VLSI Systems, Low Power Digital VLSI Design

Jon R. Marstrander, Instructor (Electrical and Computer Engineering); Electronics, Digital Systems, Digital Signal Processing, Image Processing

Dalton Nelson, Assistant Professor (Electrical and Computer Engineering); Control systems, Fuzzy Logic, Intelligent Control, and Medical instrumentation

Allen R. Tannenbaum, Professor and Interim Chair (Electrical and Computer Engineering); Systems and Control; Image Processing, Computer Vision, Medical Imaging

Murat M. Tanik, Professor (Electrical and Computer Engineering); Software Systems Engineering, Integrated Systems Design, Process Engineering, Quantum Computing and Quantum Electrodynamics

Gregg L. Vaughn, Professor (Electrical and Computer Engineering); Digital Signal Processing, Applications of Microprocessors, Digital Communication

Program Information

The Master of Science in Electrical Engineering (M.S.E.E.) prepares students for a professional career in industry or entry into a doctoral program or professional school. The M.S.E.E. program builds upon the broad foundation provided by a Bachelor of Science in Electrical Engineering by supplying depth in specific areas of electrical and computer engineering through advanced coursework and a thesis or project experience.

Admission Requirements

Requirements for admission to the electrical engineering master's degree program include the following:

1. A bachelor's degree in electrical or computer engineering.
2. A 3.0 (A = 4.0) or better GPA in all junior and senior electrical and computer engineering and mathematics courses attempted;
3. Three letters of evaluation concerning the applicant's previous academic and professional work; and
4. An acceptable score on the GRE General Test and the TOEFL, if applicable.

Financial Support

Limited financial assistance may be available for well-qualified students admitted into the M.S.E.E. program. In order to be considered for financial aid for the coming academic year, the completed application materials must usually be received at UAB by April 1.
There are a number of minority fellowships available through the Graduate School. Contact the UAB Graduate School directly for further information.

Program Requirements
Assuming that a student possesses appropriate academic preparation for this degree, 33 semester hours of course work will be required beyond the bachelor's degree. This work must be distributed as follows:

Plan I (Thesis Option)
1. Twelve semester hours of graduate-level courses appropriate to the student's area of technical specialization;
2. Six semester hours of graduate-level courses in an area related to the student's area of technical specialization; and
3. Six semester hours of courses having a mathematical emphasis; and
4. Successful completion and oral defense of a thesis developed through registration for at least nine semester hours of EE 699.

Plan II (Nonthesis Option)
1. Twelve semester hours of graduate-level courses appropriate to the student's area of technical specialization;
2. Twelve semester hours of graduate-level courses in an area related to the student's area of professional emphasis (these courses may address technical subjects or subject matter appropriate to an emphasis in engineering management or entrepreneurship);
3. Six semester hours of courses having a mathematical emphasis; and
4. Successful completion of a project developed through registration for at least 3 semester hours of EE 697.

Additional Information
For detailed information, contact Dr. Mohammad Haider, Graduate Program Director UAB Department of Electrical and Computer Engineering, BEC 255E 1720 Second Avenue South, Birmingham, Alabama 35294-1170.

Deadline for Entry Term(s): Fall, Spring, Summer
Deadline for All Application Materials to be in the Graduate School Office: Six weeks before term begins
Number of Evaluation Forms Required: Three
Entrance Tests GRE (TOEFL and TWE also required for international applicants whose native language is not English.)
Comments GRE and evaluation forms requirements waived for persons holding registration as professional engineers
Graduate Catalog Description www.uab.edu/engineering/graduate

For detailed information, contact Dr. Mohammad Haider, Graduate Program Director UAB Department of Electrical and Computer Engineering, BEC 255E 1720 Second Avenue South, Birmingham, Alabama 35294-1170.

Telephone 205-934-8440
E-mail mrhaider@uab.edu
Web www.uab.edu/engineering/graduate

Course Descriptions
Unless otherwise noted, all courses are for 3 semester hours of credit. Course numbers preceded with an asterisk indicate courses that can be repeated for credit, with stated stipulations.

Electrical and Computer Engineering (EE)

518. Wireless Communications. Wireless communication system topics such as propagation, modulation techniques, multiple access techniques, channel coding, speech and video coding, and wireless computer networks. Prerequisite: Coursework in systems analysis or permission of instructor.

523. Digital Signal Processing. Digital filter analysis and design. FFT algorithms. Applications of digital signal processing in engineering problems such as data acquisition, control, and I/O. Lecture and computer laboratory. Prerequisite: Coursework in systems analysis or permission of instructor.

527. Industrial Control. Power control devices and applications. Relay logic and translation to other forms. Programmable logic controllers. Proportional-integral-derivative and other methods for control techniques. Modern laboratory instrumentation and man-machine interface software. Lecture and laboratory. Prerequisites: Coursework in programming, systems analysis, and basic electronics, or permission of instructor.
531. **Analog Integrated Electronics**. Advanced analysis and design using op-amps, with emphasis on error analysis and compensation. Applications include signal conditioning for instrumentation, instrumentation amplifiers, nonlinear and computational circuits, Butterworth and Chebyshev filter design, power amplifier design, voltage regulator design, and oscillators. A-to-D and D-to-A conversion methods. Laboratory exercises emphasize design techniques. Lecture and laboratory. Prerequisites: Coursework in systems analysis and basic electronics, or permission of instructor. 4 hours.

532. **Introduction to Computer Networking**. Computer networking and engineering standards related to networking. Networking hardware, software, and protocols including TCP/IP protocol suite. Internetworking, LANs, and typical applications. Required use of computer laboratory's networking. Lecture and computer laboratory. Prerequisites: Coursework in programming and digital logic.

533. **Engineering Software Solutions**. Project planning, specification, design, implementation, and testing of software solutions for engineers. Waterfall model of development and agile development methods. Lecture and computer laboratory. Prerequisite: Coursework in object-oriented programming or permission of instructor.

537. **Microprocessor Applications**. Application of microprocessors in engineering problems such as data acquisition, control, and real-time input/output. Lecture and laboratory. Prerequisite: Coursework in microprocessors and assembly language programming, or permission of instructor.

538. **Intermediate Microprocessors**. Advanced microprocessor topics including cache design, pipelining, superscalar architecture, design of control units, microcoding, and parallel processors. Comparison of advanced contemporary microprocessors. Prerequisite: Coursework in microprocessors and assembly language programming, or permission of instructor.

542. **Computer Networking Protocols**. Hands-on laboratory course covering topics in networking. TCP/IP, routing, LAN configurations, Windows and Linux configurations, protocol analysis. Lecture and computer laboratory. Prerequisite: Coursework in networking.

544. **Real-Time Process and Protocols**. Hands-on laboratory course covering topics in real-time computer systems such as algorithms, state-machine implementations, communication protocols, instrumentation, hardware interfaces, multitasking, and interrupt handling. Prerequisite: Coursework in programming and microcomputers.

547. **Internet/Intranet Application Development**. Development of model and applications using Internet/Intranet technologies such as Java, JavaScript, Dynamic HTML, server side scripting, multi-tier models, and XML. Lecture and computer laboratory. Prerequisite: Coursework in object-oriented programming or permission of instructor.

548. **Software Engineering Projects**. Object-Oriented concepts and design. Unified Modeling Language and Design Patterns. Provides a project environment for implementation of systems using object-oriented techniques. Lecture and computer laboratory. Prerequisite: Coursework in object-oriented programming or permission of instructor.

552. **VHDL Digital Systems Design**. Digital system design, verification, and simulation using VHDL. Lecture and laboratory. Prerequisite: Coursework in microprocessors and assembly language programming.

558. **Medical Instrumentation**. Fundamental operating principles, applications, and design of electronic instrumentation used in measurement of physiological parameters. Class design project. Prerequisite: Coursework in electronics.

561. **Machinery II**. Physical principles of DC machines. Mathematical analysis of generator designs using equivalent circuits and magnetization curves. Calculation of motor speed, torque, power, efficiency, and starting requirements. Solid-state speed control systems. Prerequisite: Coursework in electrical machinery.

571. **Power Systems I**. Components of power systems. Performance of modern interconnected power systems under normal and abnormal conditions. Calculation of inductive and capacitive reactances of three-phase transmission lines in steady state. Prerequisite: Coursework in electrical machinery.


under fault conditions. Protective devices and protective relaying units. Protection schemes and relay coordination for transformers, transmission lines, buses, and generators. Prerequisite: Coursework in electrical machinery.


585. Engineering Operations. Economic, procedural, planning, and control aspects of engineering projects. Ethics and Civic Responsibility are significant components of this course (QEP). Prerequisite: Permission of instructor.

*590. Special Topics in (Area). Prerequisite: Permission of instructor. 1-12 hours.

*591. Special Problems in (Area). Prerequisite: Permission of instructor. 1-12 hours.

*595. Integrated System Design. Successful completion and oral defense of a team design project. Prerequisite: Permission of instructor.

601. Electrical and Computer Engineering Seminar. Research presentations delivered by faculty, students, and invited guests. Technical writing and development of verbal presentations. Writing a research paper. Maximum of 3 credit hours applicable toward the M.S.E.E. degree. Prerequisite: permission of instructor. 1-3 hours.

610. Technical Communication for Engineers. Workshop-oriented course producing technical memoranda, proposals, and conference/paper proposals. Prerequisite: Graduate standing in Engineering and successful performance on a written pretest.

621. Random Variables and Processes. Theory underlying analysis and design of communication, stochastic control, data gathering, and data analysis systems. Prerequisite: Coursework in communication systems or permission of instructor.


624. Digital Communications. Design of digital communication systems. Prerequisites: Coursework in communication systems and random variables and processes.

625. Coding and Information Theory. Entropy, channels and channel capacity, RLL codes, error correcting codes, cyclic codes, cryptography, convolutional codes, trellis coded modulation. Prerequisite: Coursework in random variables and processes.

626. Digital Image Processing. Digital image processing fundamentals, image transformations, image enhancement, image restoration, image compression, image segmentation, and image presentation. Prerequisite: Coursework in communication systems analysis.

628. Telecommunications I. Advanced topics. Prerequisite: Permission of instructor.

629. Telecommunications II. Advanced topics. Prerequisite: Permission of instructor.


633. Experiments in Computer Networking. Detailed exploration of particular issues in network protocols and network application models. Development of series of programs to explore the details of network protocols and network application models. Prerequisite: Coursework in computer networking including TCP/IP protocols.

635. Telecommunication Systems. System organization and structure. Data transmission. Prerequisite: Permission of instructor.

639. Advanced Microprocessors. Topics covering both hardware and software issues. Individual or group term project. Prerequisite: Permission of instructor.


641. Modern Control I. Discrete-time and sampled-data systems. State variable models, state feedback and estimation. Optimal control and estimation. Predictive control. Prerequisite: Coursework in control systems or permission of instructor.

643. **System Identification and Adaptive Control.** Modeling of systems using structure identification, parameter estimation, and model validation. Controller design based on input-output models. Parameter adaptive control. Prerequisite: Permission of instructor.

650. **Software Engineering.** Introduces classical software lifecycles and software development paradigms. Provides state of the art practical experience in proposal development and software design. Develops integrated skills drawing experience from computer engineering, computer science, communication, systems engineering, and problem solving. Prerequisite: Permission of instructor.

651. **Software Engineering Large Systems I.** Introduces advanced integrated software systems development paradigms. Notions of process and integrated system views. Modeling-in-the-large and modeling-in-the-small are discussed and related to levels in Object Oriented Design and programming. Prerequisite: Permission of instructor.

652. **Software Engineering Large Systems II.** Builds on the advanced integrated software systems development paradigms. Components are introduced as elements of large system implementations. In the context of a design taxonomy, advanced Object-Oriented design and development techniques are reviewed. Prerequisites: Permission of instructor.

657. **Enterprise Information Architecture Engineering.** Study and practice of the enterprise architecture engineering for developing multi-tiered enterprise level systems. Methodologies for design and implementation of large-scale information systems. Distributed computing, clients, servers, operating systems and databases. Prerequisite: Permission of instructor.

661. **Advanced Electrical Machinery I.** Synchronous machine theory. Prerequisites: Permission of instructor.

662. **Advanced Electrical Machinery II.** Induction machine theory. Prerequisite: Permission of instructor.

663. **Control of Synchronous Machines.** Methods for control of synchronous machines. Prerequisite: Permission of instructor.

671. **Computer Applications in Power Systems.** Analysis of power systems operation. Prerequisite: Permission of instructor.

672. **Power System Overvoltages.** Events causing overvoltages. System protection. Prerequisite: Permission of instructor.

673. **Reliability of Power Systems.** Component reliability using standard industrial techniques. Prerequisite: Permission of instructor.

674. **Economic Operation and Control of Power Systems.** Economic control of thermal generating stations and hydrothermal stations. Computer control of power systems. Prerequisite: Permission of instructor.

682. **Multivariable Systems.** Analysis and design of multiple-output, multiple-input control systems. Prerequisite: Permission of instructor.

*690. **Special Topics in (Area).** Prerequisite: Permission of instructor. 1-12 hours.

*691. **Special Problems in (Area).** Prerequisite: Permission of instructor. 1-12 hours.

*697. **Project.** Graduate project for Plan II Master's students. Prerequisite: Permission of instructor. 3 hours.

*698. **Nonthesis Research.** Does not count towards a degree. 1-12 hours.

*699. **Master's Thesis.** Master's thesis for Plan I Master's students. Prerequisite: Admission to candidacy. 1-12 hours.