MS Engineering - Electrical and Computer Engineering Emphasis

Effective Fall Semester 2017 – Fall Semester 2018

Program of Study

The M.S. in Engineering with Electrical and Computer Engineering Emphasis requires a minimum of 33 semester hours in the Program of Study, which consists of:

► A minimum of 24 semester hours of coursework:

- 20 hours of graduate-level coursework
  - 12 hours of 8000-level courses from one or more of the ECE Emphasis Area tracks listed below.
  - 8 hours of 6000-level or higher coursework from any UGA school or college, exclusive of thesis (7300) and research (7000, 7010)
- 3 hours of Foundations for Engineering Research (ENGR 6910)
- 1 hour of Graduate Seminar (ENGR 8950)**

► A minimum of 6 hours of master's research (7000) or project-based research (7010). A typical student's research hours will exceed this minimum; however, at most 6 hours of 7000/7010 may be listed on the program of study.

► 3 hours of MS thesis preparation and writing (7300)

*** Only 1 hour of Graduate Seminar may apply on the Program of Study, although students are free to register for the course multiple times and are encouraged to continue regular attendance of speaker series presentations even if not registered for seminar.*

Students will work with their graduate advisor to select the most appropriate set of courses to ensure breadth of understanding as well as mastery of knowledge in a specific area consistent with their interests and research. In addition to completing 12 credit hours selected from the tracks below, students may work with their graduate advisor to develop an interdisciplinary plan of study drawing from the extensive graduate course offerings at UGA.

Emphasis Area Course List

Coursework fulfilling the ECE Emphasis Area credit hour requirement for the Ph.D in Engineering or M.S. in Engineering degree may be chosen from one or more of the areas below. Courses will be reviewed each academic year and updated as needed to reflect new areas in the field.

Track 1: Control Systems

Through this track, students can gain expertise in the analysis and design of controllers for complex, large scale systems. The need for improved safety and a cleaner environment have posed countless challenges that

can only be addressed through the design and implementation of intelligent feedback controls. Numerous emerging applications for controls include cyber-physical systems (e.g., smart grids and intelligent transportation systems) and biological networks.

- ENGR 8240 - Instrumentation programming
- CSCI(ENGR) 8940 - Computational intelligence
- ENGR 8990 - Optimization Theory and Applications
- ENGR 8990 - Nonlinear Control Systems
- ENGR 8990 - Stochastic Control Systems

Track 2: Electronics & Photonics

Students develop an understanding of the design and analysis of systems involving electromagnetic waves from RF electronics to photonic systems for signal processing and communication and optical systems for image capture and processing. High-speed communication and signal processing at gigabit speeds requires sophisticated electro-optic systems that must be understood at both the device and the systems level. Modern optical imaging systems use a wide variety of electrical and photonic technologies to achieve everything from imaging biological systems at the nanometer scale to imaging distant galaxies.

- ELEE 8510 - Microwave Photonics
- ENGR 8570 - Topics in Advanced Microscopy
- ELEE 8530 - Advanced Optics and Photonics
- PHYS 8201 - Advanced Electromagnetic Theory I
- PHYS 8202 - Advanced Electromagnetic Theory II
- ENGR 8270 - Computational Nanomechanics
- ENGR 8310 - MEMS Design
- ENGG 8840 - Advanced Image Analysis

Track 3: Cyber-physical Systems

This track develops in students an understanding of engineered systems that are built from, and depend upon, the seamless integration of computational algorithms and physical components. Advances in CPS will enable capability, adaptability, scalability, resiliency, safety, security, and usability that will far exceed the simple embedded systems of today. CPS technology will transform the way people interact with engineered systems -- just as the Internet has transformed the way people interact with information. New smart CPS will drive innovation and competition in sectors such as agriculture, energy, transportation, building design and automation, healthcare, and manufacturing.

- ENGR 8990 - Real Time Programming
- ENGR 8980 - Haptic/Tactile Sensors
- CSEE 8830 - AR/VR 3D User Interface Design
- ENGR 8240 - Instrumentation programming
- CSCI(ENGR) 8940 - Computational intelligence
- CSCI 8820 - Computer Vision and Pattern Recognition
- CSCI 8380 - Advanced Topics in Information Systems
- CSCI 8250 - Advanced Network Security Systems
- ENGG 8840 - Advanced Image Analysis
- ENGR 8990 - Optimization Theory and Applications
- INFO 8000 - Foundations of Informatics for Research and Practice

Selected Course Offerings

Students may want to consider the following courses in building their Programs of Study, as appropriate:

- ENGR 4210/6210 Linear Systems
- ENGR 4220/6220 Feedback Control Systems
- ENGR 4230/6230 Sensors and Transducers
- ENGR 4240 Introduction to Microcontrollers
- ENGR 4250/6250 Advanced Microcontrollers
- ENGR 4260/6260 Introduction to Nanoelectronics
- ELEE 4040 Communication Electromagnetics
- ENGR 4620/6620 Biomedical Imaging

In addition, graduate courses from other colleges that are relevant for ECE students include:

- PHYS 8101 Quantum Mechanics I
- PHYS 8102 Quantum Mechanics II
- PHYS 8201 Advanced Electromagnetic Theory I
- PHYS 8202 Advanced Electromagnetic Theory II
- CSCI 8820 Computer Vision and Pattern Recognition
- CSCI 8380 Advanced Topics in Information Systems
- CSCI 8250 Advanced Network Security Systems