Advising Information for EE and CmpE Juniors
2013-2014 Catalog (not valid prior to SUMMER 2012)

General Information
This information sheet, distributed as part of the mandatory junior year advising session, is intended to provide guidance on completing your degree requirements for the BS in Electrical Engineering or BS in Computer Engineering. Both of these degree programs have been designed to allow students substantial flexibility in selecting courses to meet their individual needs and interests. Thus, you need to plan your schedule to ensure that you will satisfy relevant degree requirements, course prerequisites, and schedule limitations.

Additional information is available through the following options:

- The ECE website at [http://www.ece.gatech.edu](http://www.ece.gatech.edu) includes degree requirements, course descriptions and outlines, and projected schedules for future terms.
- You may send questions to an advisor via email to undergraduate@ece.gatech.edu
- You may meet with an advisor in the ECE Academic Office to obtain individual assistance. For general help, such as planning your schedule for future terms or evaluating transfer credit, please visit during periods when registration is not in progress.

Requirements listed below are based on the 2013-2014 General Catalog ([www.catalog.gatech.edu](http://www.catalog.gatech.edu)) and is NOT applicable to students graduating under earlier catalogs. Additional information is available on the ECE website, or you may contact the ECE Academic Office if you have specific questions.

Requirements for Electrical Engineering Majors
EE majors are required to complete five specified junior-level computer engineering courses (ECE 3025, ECE 3040, ECE 3043, ECE 3072 and ECE 3084) and 20 credit hours of ECE electives. Note that these hours do not include the senior design sequence (ECE 4011/4012), which is part of the ECE Core. At least 9 of these hours must be completed at the 4000-level or higher. Additional restrictions also apply.

In choosing ECE electives, some students focus on a specific area of specialization while others opt for a broad coverage of several areas. Good arguments can be made for both approaches. In either case, it is important to check prerequisites and the projected schedule of classes to plan properly for your remaining courses.

ECE 4011 and ECE 4012 form the two-semester culminating design sequence required of all EE majors graduating under the 2013-2014 catalog. These two courses, which must be taken sequentially, consist of a team-based design project, with significant presentations and written reports. Note that ECE 4012 will NOT be taught during summer terms, so students graduating in the summer must complete both ECE 4011 and ECE 4012 in earlier semesters.

Requirements for Computer Engineering Majors
CmpE majors are required to complete three specified junior-level computer engineering courses (ECE 3020, ECE 3030, and ECE 3056) and 22 credit hours of ECE or CS electives. Note that these hours do not include the senior design sequence (ECE 4011/4012), which is part of the ECE Core. At least 9 of these elective hours must be completed at the 4000-level or higher. Additional restrictions also apply.

CmpE students typically select most of their electives from either the Computer Systems & Software or the VLSI Systems & Digital Design specializations within ECE, or from computer science. However, some students opt for a broader background that includes courses from digital signal processing, microelectronics, systems & controls, telecommunications, or other specializations within ECE. In such cases, it is important to check prerequisites and the projected schedule of classes in order to plan properly for your remaining courses.

ECE 4011 and ECE 4012 is the two-semester culminating design sequence required of all EE and CmpE majors graduating under the 2013-2014 catalog. These two courses, which must be taken sequentially, consist of a team-based design project, with significant presentations and written reports. ECE 4012 is not taught during the summer term, so students graduating in the summer must have completed both courses (ECE 4011/4012 in earlier semesters.

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Technical Interest Areas within Electrical and Computer Engineering

The School of Electrical and Computer Engineering is organized into 11 technical interest areas spanning various subfields within ECE. Most elective courses are associated with one of these areas. Each of the areas is briefly described below, along with a list of the related breadth and elective courses. Course outlines are available on the ECE website. For more information about courses and job opportunities in a specific area, contact the faculty members in the area.

Note: Prerequisites indicated with an asterisk may be taken concurrently with the relevant course.

**BIOENGINEERING** is concerned with the application of engineering principles to the study and control of biological processes. In this area, mathematical and physical concepts are developed which are applied to medicine and biology. Specific applications include feature extraction in cardiac imagery, MEMS devices for direct interfacing with biological systems, modeling of biological sensory and motor systems, and the development of sensors for the detection of cancer cells. Because of the continued advancement of medical technology and the many unsolved problems in the understanding and treatment of disease, bioengineers play an essential role in the improvement of the understanding of biological systems, and in the development and evaluation of healthcare technologies. Relevant ECE courses include the following:

- ECE 1750 – Introduction to Bioengineering
- ECE 4781 – Biomedical Instrumentation (prereq: ECE 3040 or ECE 3710)
- ECE 4782 – Biosystems Analysis (prereq: ECE 2040)
- ECE 4783 – Introduction to Medical Image Processing (prereq: ECE 2025/2026 and probability/statistics*)
- ECE 4784 – Engineering Electrophysiology (prereq: ECE 3040 or BME 3510)

**COMPUTER SYSTEMS & SOFTWARE** spans applications from high performance microarchitecture to integrated hardware/software systems to large-scale distributed software and internetworks. Computer systems and software activities focus on the optimization of cross cutting characteristics, such as power/energy consumption and security, within application domains such as health, high performance computing, and embedded real-time systems. Relevant courses include the following:

- ECE 3056 – Architecture, Concurrency, and Energy in Computation (prereq: ECE 2035/3035 and ECE 2031)
- ECE 4100 – Advanced Computer Architecture (prereq: ECE 3055/3056)
- ECE 4110 – Internetwork Programming (prereq: ECE 3076/3600 or probability/statistics)
- ECE 4112 – Internetwork Security (prereq: ECE 3076/3600 or ECE 4110 or CS 3251)
- ECE 4180 – Embedded Systems Design (prereq: ECE 2031 and ECE 2035/3035 and (ECE 3040 or ECE 3055/3056))
- ECE 4185 – Embedded Microcontroller Design (prereq: ECE 2031 and (ECE 3040 or ECE 3055/3056))

**DIGITAL SIGNAL PROCESSING** (DSP) is concerned with the representation of signals in digital form, and with the transformation of such signal representations using digital computation. DSP is at the core of virtually all of today’s information technology, and its impact is felt everywhere – in telecommunications, medical technology, radar and sonar, and in seismic data analysis. ECE offers the largest undergraduate and graduate DSP academic programs in the country, providing a strong foundation in all aspects of digital signal processing. Relevant courses include the following:

- ECE 3084 – Signals and Systems (prereq: ECE 2025/2026 and ECE 2040)
- ECE 4260 – Random Signals and Applications (prereq: ECE 3084)
- ECE 4270 – Fundamentals of Digital Signal Processing (prereq: ECE 3075/4260* or ECE 3084*)
- ECE 4271 – Applications of Digital Signal Processing (prereq: ECE 4270*)
- ECE 4273 – Design Synthesis of Application-Specific Signal Processors (prereq: ECE 4270)

**ELECTRICAL ENERGY** is primarily concerned with meeting the future demand for electric energy while satisfying environmental constraints. Instruction and research is conducted in power systems, electric energy conversion, alternative energy systems, power electronics, high-voltage engineering, electric power materials and semiconductors. Relevant courses include the following:

- ECE 3300 – Electromechanical and Electromagnetic Energy Conversion (prereq: ECE 3025 and ECE 3040)
- ECE 3072 – Electrical Energy Systems (prereq: ECE 2040)
ECE 4320 – Power System Analysis and Control (prereq: ECE 3300/3070)
ECE 4321 – Power System Engineering (prereq: ECE 3300/3070)
ECE 4325 – Electric Power Quality (prereq: 3300/3070)
ECE 4330 – Power Electronics (prereq: ECE 3040 and (ECE 3042* or ECE 3043))
ECE 4335 – Electric Machinery Analysis (prereq: ECE 3300/3070)

**ELECTROMAGNETICS** involves the study of basic principles of electricity and magnetism and their application to the analysis and design of devices and systems. Applications of electromagnetics encompass such far-reaching areas as microwave communications, antenna design, microwave millimeter engineering, and remote sensing. These cutting edge technologies are applied to national defense and security, the space program, and every form of commercial communications. Relevant courses include the following:

ECE 4350 – Electromagnetic and Microwave Applications (prereq: ECE 3025)
ECE 4360 – RF-Microwave Measurement Laboratory (prereq: ECE4350/3065 and ECE 4415*)
ECE 4370 – Antenna Engineering (prereq: ECE 3025)
ECE 4390 – Introduction to Radar and Electromagnetic Sensing (prereq: ECE 4350/3065)
ECE 4391 – Electromagnetic Compatibility (prereq: ECE 3025 and ECE 3040)

**ELECTRONIC DESIGN AND APPLICATIONS** involves device and integrated circuit fabrication, circuit and system design and simulation, and instrumentation and testing techniques. Areas of emphasis include the design, fabrication, testing and application of analog and digital integrated circuits and systems and high frequency circuits and systems. Relevant courses include the following:

ECE 3400 – Analog Electronics (prereq: ECE 3040)
ECE 4043 – Analog Electronics Lab (prereq: ECE 3040 and (ECE 3043 or ECE 3042))
ECE 4360 – RF-Microwave Measurement Laboratory (prereq: ECE 4350/3065 and ECE 4415*)
ECE 4410 – Analog Filters (prereq: ECE 3040)
ECE 4415 – RF Engineering I (prereq: ECE 3025 and ECE 3400/3050)
ECE 4418 – RF Engineering II (prereq: ECE 4415)
ECE 4420 – Digital Integrated Circuits (prereq: ECE 3040)
ECE 4430 – Analog Integrated Circuits (prereq: ECE 3400/3050)
ECE 4435 – Operational Amplifier Design (prereq: ECE 3041/3043)
ECE 4445 – Audio Engineering (prereq: ECE 3040)

**MICROSYSTEMS** is concerned with the design, analysis, growth, and fabrication of micron/sub-micron feature length devices. These devices are the key enabling technology for the integrated circuits and systems that form the basis of most contemporary electronic products. Areas of emphasis include semiconductor devices, packaging technology, and materials growth and characterization. Relevant courses include the following:

ECE 3450 – Semiconductor Devices for Computer Engineering and Telecomm Systems (prereq: ECE 3040)
ECE 4451 – Semiconductor Devices for Wireless and Fiber Communication (prereq: ECE 3450/3080)
ECE 4460 – Introduction to Electronic Systems Packaging (prereq: ECE 3040)
ECE 4752 – Integrated Circuit Fabrication (prereq: ECE 3040)
ECE 4754 – Electronics Packaging Assembly, Reliability, Thermal Management, and Test (prereq: ECE 3040)
ECE 4755 – Electronic Packaging Substrate Fabrication (prereq: CHEM 1310 and PHYS 2212)

**OPTICS AND PHOTONICS** involves the study of lasers, optical data processing, nonlinear optics, optical communications, optical computing, optical data storage, optical system design and holography. Areas of emphasis include volume holography studies, hybrid optical digital data processing, image processing and the study of optic properties of materials. Relevant courses include the following:

ECE 4500 – Optical Engineering (prereq: ECE 3025)
ECE 4501 – Fiber Optics (prereq: ECE 3025)
ECE 4751 – Laser Theory and Applications (prereq: PHYS 2212)

**SYSTEMS AND CONTROLS** is concerned with mathematical and computational techniques for modeling, estimation, realization, identification and design of feedback control of physical systems and processes. Applications include missile tracking and guidance, robotic control, stabilization and model reduction of power systems. Relevant courses include the following:

ECE 3084 – Signals and Systems (prereq: ECE 2025/2026 and ECE 2040)
ECE 3550 – Feedback Control Systems (ECE 2040)
ECE 4550 – Control System Design (ECE 2031 and ECE 3550/3085)
ECE 4555 – Embedded and Hybrid Control Systems (prereq: ECE 3550/3085)
ECE 4560 – Introduction to Automation and Robotics (prereq: ECE 3550/3085)
ECE 4562 – Neural Networks and Fuzzy Logic in Control (prereq: ECE 3550/3085)
ECE 4570 – System Theory for Communication and Control (prereq: ECE 3550/3085)
ECE 4580 – Computational Computer Vision (prereq: ECE 2025/2026)
ECE 4761 – Industrial Controls and Manufacturing (prereq: ECE 3550/3085)

**TELECOMMUNICATIONS** is concerned with the characterization, representation, transmission, storage, and networking of information over various media including space, optical fiber, and cable. Harnessing technologies from areas such as digital signal processing, computer engineering, controls, and optics, telecommunications plays a defining role in information technology applications such as mobile communications, wireless local area networks, television, and telephony. Relevant courses include the following:

- ECE 3600 – Computer Communications (prereq: ECE 2025/2026 and ECE 2020/2030)
- ECE 3084 – Signals and Systems (prereq: ECE 2025/2026 and ECE 2040)
- ECE 4110 – Internetwork Programming (prereq: ECE 3600/3076 or probability/statistics)
- ECE 4112 – Internetwork Security (prereq: ECE 3600/3076 or ECE 4110 or CS 3251)
- ECE 4260 – Random Signals and Applications (prereq: ECE 3084)
- ECE 4601 – Communication Systems (prereq: probability/statistics and ECE 3040*)
- ECE 4602 – Communication Systems Laboratory (prereq: ECE 4601)
- ECE 4604 – Network Design and Simulation (prereq: ECE 3600/3076)
- ECE 4605 – Advanced Internetworking (prereq: ECE 3600/3076*)
- ECE 4606 – Wireless Communications (prereq: ECE 2025/2026 and probability/statistics and ECE 3040*)
- ECE 4607 – Mobile and Wireless Networks (prereq: ECE 3600/3076*)

**VLSI SYSTEMS & DIGITAL DESIGN** forms the core of the hardware component of our undergraduate computer engineering program. Topics in this area include circuits and devices, hardware design, and microelectronics technology. Relevant courses include the following:

- ECE 3060 – VLSI and Advanced Digital Design (prereq: ECE 2031 and ECE 3040)
- ECE 3056 – Architecture, Concurrency, and Energy in Computation (prereq: ECE 2035/3035 and ECE 2031)
- ECE 4100 – Advanced Computer Architecture (prereq: ECE 3055/3056)
- ECE 4130 – Advanced VLSI Systems (prereq: ECE 3400/3050 or ECE 3060)
Specific existing courses.

More courses may be added. Ask if you are unsure about plans to include

- ECE 4752, Integrated Circuit Fabrication
- ECE 4891, Antenna Engineering Lab (companion lab for ECE 4370)
- ECE 4881, Audio Engineering Lab (companion lab for ECE 4445)
- ECE 4884B, Optical Fiber Communications (formerly ECE 4501)
- ECE 4602, Communication System Lab
- ECE 4550, Control System Design (prior Special Topics course ECE 4840A)
- ECE 4185, Embedded Microcontroller Design (slightly revised ECE 4175)
- ECE 4180, Embedded Systems Design
- ECE 4043, Senior Analog Electronics Laboratory

Approved Senior EE Lab Electives