Electronics (ETRO)

Electronics (ETRO) Classes

ETRO 101 : Introduction to Electronics Technology

Credits: 3
Class Hours: 6 lecture/lab
Recommended:
Completed ETRO 18.
Description:
This course introduces the fundamentals of electronics, computer technology, and electrical components. It also develops applications of basic arithmetic and mathematics to electronic and computer technology, engineering notation, electrical units, and schematic diagrams. Finally, it provides the theory and applications of electronic measuring instruments and the construction of circuits.
Semester Offered: Fall

Course Student Learning Outcomes (CSLOs):
1. Present projects using various forms of electronics media.
2. Document and communicate project designs using manual drafting, CAD, and electronic design software tools.
3. Working independently or as a member of a team; diagnose, troubleshoot, and repair basic electronic hardware problems.
4. Using accepted industry procedures and standards, perform electronics fabrication and assembly tasks, applying concepts of design, construction, and process and quality control.
5. Observe all appropriate OSHA safety rules and hazmat regulations when performing electronics fabrication and assembly tasks.

ETRO 105 : Circuit Analysis I

Credits: 4
Class Hours: 3 lecture and 3 lab
Prerequisites:
Qualified for MATH 103.
Description:
This course covers fundamental topics including resistance, and networks, with DC voltage sources and circuit analysis. It also demonstrates Ohm's law, Kirchoff's laws, Thevenin's theorem, and maximum power theorems. Students will develop step-by-step problem solving methods and hands-on laboratory applications and utilize electronics measurement instrumentation and software for data analysis.
Semester Offered: Fall

Course Student Learning Outcomes (CSLOs):
1. Demonstrate effective use of multimeters, power supplies, circuit software, and hand tools used in electronics.
2. Demonstrate via calculations and practical hardware the theoretical and measured performance of DC circuits.
3. Function effectively on teams in an electronics lab environment, interacting with all levels of personnel.

ETRO 106 : Circuit Analysis II

Credits: 4
Class Hours: 3 lecture and 3 lab
Prerequisites:
"C" or higher in ETRO 105.
Description:

The course teaches practical and theoretical principles of AC circuits and waveforms and reinforces trouble shooting and circuit analysis skills. In addition, magnitude, phase, rectangular and polar forms for sinusoids, impedance, and power vectors will be introduced. Time domain and frequency domain solutions for capacitive and inductive circuits will be studied and filter circuits will be demonstrated.
Semester Offered: Spring

Course Student Learning Outcomes (CSLOs):
1. Demonstrate an understanding of the functions of contemporary tools of the electronics technology, such as multimeters, oscilloscopes, function generators, power supplies, and spectrum analyzers.
2. Design and analyze circuits by applying theoretical and technical knowledge of DC and AC components and circuit principals and by verifying designs with computer simulations. and lab experiments.

ETRO 118 : General Electronics

Credits: 3
Class Hours: 3 lecture
Prerequisites:
Qualified for ENG 75.
Description:
This introduction to DC, AC, semi-conductor, and digital electronics includes characteristics, applications, power supplies, and amplifiers. The course also includes the use of the oscilloscope and meters.
Semester Offered: Fall, Spring

Course Student Learning Outcomes (CSLOs):
1. Apply safety regulations and practices common to the electricity and electronics fields.
2. Describe the physical nature of matter and electron flow in conductors, semiconductors, and insulators.
3. Analyze basic DC and AC analog and digital circuits by calculating and measuring electrical parameters using multimeters and oscilloscopes.
4. Describe the relationship between magnetism, electrical currents and voltages, and how is it used in the generation of power.
5. Assemble, test, and electronically document electronic and electrical circuits, using both breadboards and PCBS, complying with the program's quality soldering standards.
6. Communicate effectively using digital documentation methods and presentation technology.
7. Demonstrate appropriate personal, professional, and social ethics and responsibility by fully participating and adding to the dynamics of the group.
8. Demonstrate awareness of the contemporary professional, societal, and global issues relevant to the fields of electricity and electronics technologies.

ETRO 140B : Cisco Networking 1

Credits: 3
Class Hours: 6 lecture/lab
Recommended:
Basic computer and internet usage skills.
Description:
This course introduces the architecture, structure, functions, components, and models of the internet and other computer networks. The principles and structure of IPv4 and IPv6 addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum. By the end of the course, students will be able to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes.
Semester Offered: Fall, Spring

Course Student Learning Outcomes (CSLOs):
1. Identify and describe the devices and services used to support communications in data networks and the internet.
2. Identify and explain the role of protocol layers in data networks.

3. Explain and implement addressing and naming schemes at various layers of data networks in IPv4 and IPv6 environments.
4. Explain fundamental Ethernet concepts such as media, services, and operations.
5. Build a simple Ethernet network using routers, switches, and appropriate cabling.
6. Use Cisco command-line interface (CLI) commands to perform basic router and switch configurations.
7. Utilize common network utilities to verify small network operations and analyze data traffic.

ETRO 140C : Cisco Networking 2

Credits: 3
Class Hours: 6 lecture/lab
Prerequisites:
"C" or higher in ETRO 140B.
Recommended:
Basic computer and internet usage skills.
Description:
This course introduces the architecture, components, and operations of routers and switches in a small network. Students learn how to configure a router and a switch for basic functionality. By the end of this course, students will be able to configure and troubleshoot routers and switches; implement and troubleshoot common issues with static, RIPv2, single-area OSPFv2, and single-area OSPFv3 routing protocols; implement inter-VLAN routing in both IPv4 and IPv6 networks; secure the network with Access Control Lists (ACLs); and apply essential network services such as Dynamic Host Configuration Protocol (DHCP) for IPv4 and IPv6, and Network Address Translation (NAT).
Semester Offered: Spring

Course Student Learning Outcomes (CSLOs):
1. Describe, configure, and troubleshoot basic and enhanced switching technologies, such as Virtual Local Area Networks (VLANs), VLAN Trunking Protocol (VTP), and 802.1q.
2. Explain the purpose, nature, and operations of a router, routing tables, and the route lookup process.
3. Describe basic and enhanced routing technologies, including static routing, dynamic routing protocols, distance vector routing protocols, link-state routing protocols, and how they work with the route lookup process.
4. Configure, verify, and troubleshoot basic operations of routers in a small routed network utilizing static and default routing, Routing Information Protocol (RIPv1 and RIPv2), and Open Shortest Path First (OSPF) single-area for IPv4 and IPv6.
5. Explain, configure, and troubleshoot VLANs and inter-VLAN routing in an enhanced network.
6. Design, configure, monitor, and troubleshoot access control lists (ACLs) for IPv4 and IPv6.
7. Describe and demonstrate the operations and benefits of Dynamic Host Configuration Protocol (DHCP) for IPv4 and IPv6.
8. Describe and demonstrate the operations and benefits of Network Address Translation (NAT) including implementation and troubleshooting in an enhanced network.

ETRO 143 : Digital Electronics

Credits: 3
Class Hours: 3 lecture
Prerequisites:
Qualified for MATH 103.
Corequisite Courses: ETRO 143L
Description:
This course is an introduction to number systems, codes, logic gates, Boolean algebra, and ICs used in digital circuits. Digital design using both logic gates and the VHDL programming language are studied. Analog-to-digital/digital-to-analog and microprocessor interfacing are introduced.
Semester Offered: Fall

Course Student Learning Outcomes (CSLOs):
1. Explain the differences between analog and digital signals and systems.
2. Utilize binary, octal, decimal, and hexadecimal numbering systems and digital codes, convert from one number system to another, and perform mathematical operations using these number systems.

3. Demonstrate and verify circuits with truth tables and timing diagrams.
4. Design and analyze various digital integrated circuits.
5. Analyze digital circuits using circuit design and simulation software.
6. Demonstrate how electronics hardware can be used to interface to an analog world.
7. Demonstrate an understanding of digital memory technologies.

ETRO 143L : Digital Electronics Laboratory

Credits: 1
Class Hours: 3 lab
Prerequisites:
Admission into the Electronics Technology program.
Corequisite Courses: ETRO 143
Description:
This course demonstrates the principles studied in ETRO 143 by means of laboratory experiments. Digital electronics concepts presented in ETRO 143 lectures are verified and reinforced by simulating, building, and testing digital electronics and computer circuits.
Semester Offered: Fall

Course Student Learning Outcomes (CSLOs):
1. Utilize binary, octal, decimal, and hexadecimal numbering systems and digital codes, convert from one number system to another, perform mathematical operations using these number systems, and then relate the results to various digital circuit constructs.
2. Build various digital integrated circuits that demonstrate and verify truth tables and timing diagrams.
3. Demonstrate interfacing to an analog world using electronics hardware.
4. Demonstrate an understanding of semi-conductor memory functions using hardware.

ETRO 161 : Introduction to Optics and Photonics

Credits: 3
Class Hours: 6 lecture/lab
Prerequisites:
Qualified for ENG 100 and MATH 103.
Description:
This introductory photonics course covers the physics of light, laser safety, geometric optics, lenses, mirrors, polarizing lenses, interference/diffraction waves, laser physics, optical imaging, and bio-photonics. Lab experiments and projects are embedded to reinforce the theory and provide practical experience for those interested in pursuing a career in this field.
Semester Offered: Spring

Course Student Learning Outcomes (CSLOs):
1. Set up and use laser and optics equipment and instruments in conformance to industry laser safety regulations.
2. Explain the concepts underlying the electromagnetic spectrum and the nature of photons, waves, refraction, interference, and diffraction.
3. Design, analyze, and use optical systems comprised of geometric optics, lenses, mirrors, polarizers, and other optical instruments.
4. Describe the types of lasers available, how laser beams are generated, and how they are used.
5. Function effectively as a member of a team to solve problems, produce documentation, and present information, demonstrating appropriate personal, professional, and social ethics and responsibility.

ETRO 199V : Projects in Electronics

Credits: 1-4
3 hours (1 credit), 5 hours (2 credits), 7 hours (3 credits), 9 hours (4 credits)
Prerequisites:
Approval of instructor.

Recommended:
ICS 100 or ETRO 18.
Comments:
May be repeated any number of times for credit.
Description:
Students in this independent studies course are expected to write a project proposal which states the objectives or scope of the project, materials cost, expected outcomes, and implementation plan. A schedule of lab use time and instructor consultation time should also be included. The project must be documented and a final report is expected.
Semester Offered: Fall, Spring

Course Student Learning Outcomes (CSLOs):
1. Prepare a proposal for the project to be undertaken.
2. Prepare and execute a work study schedule to accomplish the proposal objectives within the prescribed time.
3. Demonstrate that the proposal objectives have been successfully attained.
4. Create a final report that documents the results of a project.

ETRO 210 : Electronic Technology 1

Credits: 3
Class Hours: 6 lecture/lab
Prerequisites:
"C" or higher in ETRO 106.
Description:
This course introduces basic theory as well as operations of solid-state devices and applies to diodes, bipolar transistors, field effect transistors, Zener diodes, photonic devices, and other semiconductor devices. Students will study electronic circuits performing rectifying and amplification. They will also investigate common amplifier devices and usages, and instrumentation applications.
Semester Offered: Fall

Course Student Learning Outcomes (CSLOs):
1. List common amplifier devices and describe the purpose of each component in an amplifier circuit.
2. Explain the uses of operational amplifiers and how they differ from other amplifiers.
3. Identify semiconductor devices and list common usages.

ETRO 240B : Cisco Networking 3

Credits: 3
Class Hours: 6 lecture/lab
Prerequisites:
"C" or higher in ETRO 140B and ETRO 140C.
Recommended:
Basic computer and internet usage skills.
Description:
This course describes the architecture, components, and operations of routers and switches in larger and more complex networks. Students learn how to configure routers and switches for advanced functionality. By the end of this course, students will be able to configure and troubleshoot routers and switches and resolve common issues with Open Shortest Path First (OSPF), Enhanced Interior Gateway Routing Protocol (EIGRP), and Spanning-Tree Protocol (STP) in both IPv4 and IPv6 networks. Students will also develop the knowledge and skills needed to implement a Wireless Local Area Network (WLAN) in a small-to-medium network.
Semester Offered: Fall, Spring

Course Student Learning Outcomes (CSLOs):
1. Compare hierarchical and scalable network designs that are recommended for small-medium size businesses.
2. Describe, configure, and troubleshoot enhanced switching technologies such as Virtual Local Area Networks (VLANs), Rapid Spanning Tree Protocol (RSTP), Per VLAN Spanning Tree Plus protocol (PVST+), and EtherChannel.

3. Explain, configure, and troubleshoot first hop redundancy protocols including Hot Standby Redundancy Protocol (HSRP) and Gateway Load Balancing Protocol (GLBP) in a switched network.
4. Explain, configure, and troubleshoot wireless routers and wireless clients.
5. Configure and troubleshoot routers in a complex routed IPv4 or IPv6 network using the following advanced routing protocols: single-area Open Shortest Path First (OSPF), Multiarea OSPF, and Enhanced Interior Gateway Routing Protocol (EIGRP).
6. Identify and manage Cisco IOSÂ® (Internetwork Operating System) Software licensing and configuration files.

ETRO 240C : Cisco Networking 4

Credits: 3
Class Hours: 6 lecture/lab
Prerequisites:
"C" or higher in ETRO 240B or approval of instructor.
Recommended:
Basic computer and internet usage skills.
Description:
This course discusses the WAN technologies and network services required by converged applications in a complex network. The course enables students to understand the selection criteria of network devices and WAN technologies to meet network requirements. Students learn how to configure and troubleshoot network devices and resolve common issues with data link protocols. Students will also develop the knowledge and skills needed to implement virtual private network (VPN) operations in a complex network.
Semester Offered: Fall, Spring

Course Student Learning Outcomes (CSLOs):
1. Describe and differentiate network architectures to support borderless networks, data centers, virtualization, and collaboration technology solutions.
2. Describe the benefits of Wide Area Networks (WAN) and explain the differences between WAN technologies.
3. Describe the benefits of Virtual Private Networks (VPNs) and tunneling.
4. Compare, configure, and implement Virtual Private Networks (VPNs).
5. Explain, configure, and troubleshoot tunneling operations.
6. Explain, configure, and troubleshoot Network Address Translation (NAT) operations.
7. Monitor and troubleshoot network operations using industry accepted software based tools.

ETRO 244 : Cisco CCNA Security

Credits: 4
Class Hours: 8 lecture/lab
Prerequisites:
“C” or higher in ETRO 140C or approval of instructor.
Recommended:
ETRO 240B and ETRO 240C.
Description:
CCNA Security is a hands-on career-oriented course preparing students with the associate-level knowledge and skills required to secure Cisco networks. Emphasis is placed on the development of a security infrastructure; identification of threats and vulnerabilities to networks; mitigation of security threats; and core security technologies. Students will experience hands-on installation, troubleshooting and monitoring of network devices to maintain integrity, confidentiality, and availability of data and devices.
Semester Offered: Fall, Spring

Course Student Learning Outcomes (CSLOs):
1. Describe the security threats facing modern network infrastructures and the role security policies play in security threat prevention.
2. Demonstrate how to secure network device access.
3. Implement Authentication, Authorization and Accounting (AAA) on network devices.
4. Describe and demonstrate mitigation of threats to networks using Access Control Lists (ACLs).
5. Explain and implement secure network management and reporting.

6. Demonstrate the mitigation of common Layer 2 attacks.
7. Implement both the software based Cisco Internetwork Operating System (IOS) firewall and the hardware based Adaptive Security Appliance (ASA).
8. Implement the Cisco IOS Intrusion Prevention System (IPS) feature set.
9. Explain and implement a site-to-site Internet Protocol Security (IPSec) Virtual Private Network (VPN).

ETRO 257 : RF Communications

Credits: 4
Class Hours: 8 lecture/lab
Prerequisites:
"C" or higher in ETRO 106.
Description:
This course studies the general principles and characteristics of a variety of Radio Frequency (RF) Communications Systems. The coverage includes the analysis of digital and analog communications systems, subsystems, modulation techniques, and circuits. RF communication theory will be reinforced in lab with practical hands- on experience.
Semester Offered: Fall, Spring

Course Student Learning Outcomes (CSLOs):
1. Work as a member of a diverse team to solve problems, produce documentation, and do oral presentations.
2. Configure, measure, and demonstrate RF circuits and systems.
3. Demonstrate appropriate personal, professional, and social ethics and responsibility, respecting human diversity and considering ethics of engineering and technician practices.
4. Describe characteristics of communication systems and components using various modulation techniques such as AM and FM and various forms of multiplexing such as TDM and PCM.
5. Explain and analyze transmission lines, antennas, and propagation.

ETRO 275 : Fundamentals of Linux

Credits: 3
Class Hours: 6 lecture/lab
Prerequisites:
"C" or higher in ICS 101 or approval of instructor.
Description:
This course introduces the student to fundamentals of the Linux-based system that provides essential services for a local area network. Upon completion of this course, the student will have a basic understanding of the Linux operating system and have hands-on experience installing, managing, and troubleshooting the Linux operating system.
Semester Offered: Fall, Spring

Course Student Learning Outcomes (CSLOs):
1. Describe the history and nature of Open Source software.
2. Differentiate between X Window system and Linux system architectures.
3. Install and evaluate a variety of Linux distributions.
4. Complete basic Linux tasks using the command-line and graphical user interface.
5. Use network-based applications in a Linux environment.
6. Install applications using the appropriate tools and compression utilities.
7. Compare and contrast Linux-based desktop environments and supported applications.
8. Troubleshoot problems related to installation and configuration of a variety of operating systems.

ETRO 280 : Microprocessor Architecture, Programming, and Interfacing

Credits: 3
Class Hours: 3 lecture
Prerequisites:

Acceptance into Electronics Technology program. Qualified for ENG. Qualified for MATH 103.
Recommended:
ETRO 143/ETRO 143L.
Description:
Microprocessor trainers will be used to introduce microprocessor architecture, interfacing, and machine language programming. Memory, interfaces, I/O devices, and interrupt processed I/O will also be covered.
Semester Offered: Fall, Spring

Course Student Learning Outcomes (CSLOs):
1. Differentiate between binary, octal, decimal, and hexadecimal number systems, codes, and mathematics, and convert from one system to another.
2. Describe the architecture of a microprocessor, microcontroller, and the computer circuits that allow the computer to interface to the analog world.
3. Create flowcharts, develop algorithms, and program a microprocessor using a machine language command set.
4. Design and assemble an interface that inputs and outputs information to and from the microprocessor.
5. Communicate effectively using electronic documentation methods and present a design project using current multi-media technology.
6. Function effectively on teams with all levels of personnel, demonstrating appropriate personal, professional, and social ethics and responsibility, fully participating and adding to the dynamics of the group.

ETRO 287 : Computer Systems and Networking

Credits: 4
Class Hours: 3 lecture and 3 lab
Prerequisites:
"C" or higher in ETRO 105 or ETRO 280.
Description:
This course prepares students for work in maintaining, servicing, troubleshooting, and repairing PCs, peripheral devices, operating systems, as well as communication systems and networks. Students will build, upgrade, install, maintain, and troubleshoot computer and networking hardware. Topics include cabling of voice and data networks, LANs and WANs architecture and protocols, networking devices, wireless networking, and network security.
Semester Offered: Spring

Course Student Learning Outcomes (CSLOs):
1. Describe the history and nature of the science of computers and the technological advances that led to the evolution of modern computers, software, and network systems.
2. Explain the proper procedures and steps to assemble computers from hardware components and install additional advanced hardware to enhance performance and functionality.
3. Identify and describe how to install and configure system and network operating systems.
4. Describe diagnostic and troubleshooting procedures when assembling, installing, or repairing hardware or software problems.