ENGINEERING TECHNOLOGY AND SURVEYING ENGINEERING

Engineering Technology Courses

E T 101. Introduction to Engineering Technology and Geomatics
1 Credit (1)
An introduction to geomatics and the various engineering technology disciplines, the engineering approach to problem solving, and the design process. Projects emphasize the importance of teamwork, written & oral communication skills, as well as ethical responsibilities.

Learning Outcomes

1. Develop a basic understanding of all programs in the Engineering Technology and Surveying Engineering Department.
2. Create a solid curriculum plan for their degree program.
3. Describe the Engineering Design Process.
4. Define and visit campus support programs and student engineering programs.
5. Describe and discuss communication skills in the engineering profession.

E T 104. Soldering Techniques
1 Credit (3P)
Fundamentals of soldering, desoldering, and quality inspection of printed circuit boards.

E T 109. Computer Drafting Fundamentals
3 Credits (2+2P)
Introduction to principles and fundamentals of drafting using both manual drawing techniques and computer-aided drafting (CAD) applications. Crosslisted with: DRFT 109 and C E 109. May be repeated up to 3 credits.

Learning Outcomes

1. Describe related career options/pathways.
2. Explain and apply common drafting terms, concepts, and conventions.
3. Utilize various AutoCAD commands and Coordinate Entry methods to produce accurate and precise Two-Dimensional drawings.
4. Setup AutoCAD working environment, drawings, styles, and applicable settings.
5. Navigate the AutoCAD user interface efficiently.
6. Apply different drafting methods, strategies, and processes.
7. Utilize AutoCAD to produce basic 2D CAD working drawings.
8. Measure utilizing scales accurately.
9. Create drawings with different scales and units. 1
10. Plot drawings produced in AutoCAD at various scales and on various sheet sizes. 1
11. Utilize the two Drawing Environments: Paper Space and Model Space. 1
12. Manage AutoCAD drawing files.

E T 110. Introduction to 3-D Modeling (Solid Works)
3 Credits (2+3P)
Introduction to SolidWorks, a 3-D modeling software. The foundation for designing mechanical parts and assemblies.

E T 120. Computation Software
2-3 Credits (2-3)
The use of spreadsheet software in the field of engineering technology.

E T 125. Introduction to Renewable Energy
3 Credits (3)
Renewable energy systems, including topics in thermal-solar photovoltaic, wind, geothermal systems, and other current topics. Theory, practical applications, safety considerations and the economics of alternative renewable energy systems compared to conventional systems.

E T 143. Civil Drafting Fundamentals
3 Credits (2+2P)
Introduction to drafting in the field of Civil Engineering. Drawings, projects, and terminologies related to topographic, contour drawings, plan and profiles, and street/highway layout. Restricted to Community Colleges only. Taught with DRFT 143 and SUR 143.
Prerequisite: DRFT 109.

Learning Outcomes

1. Use appropriate drafting/technical terminology.
2. Identify of the different types of Civil Engineering work drawing plan sets.
3. Understanding and the use of the terminologies used in the industry.
4. Use AutoCAD Civil 3D.
5. Enter appropriate data into AutoCAD software in order to retrieve necessary outcomes.
6. Plot/Print different types of civil engineering working plans.
7. Read, interpret and understand engineering drawings.
8. Define and understand the different types of engineering drawings.

E T 153. Fundamentals of Networking Communications
3 Credits (3)
Introduction to networking basics, including computer hardware and software, electricity, networking terminology, protocols, LANs, WANs, OSI model, IP addressing, and design and documentation of basic network and structure cabling.

Learning Outcomes

1. Students will identify network types/protocols utilizing the OSI reference model and compute numbering system network problems.
2. Students will explain issues related to managing and documenting network environments.
3. Students will list, compare, and discuss industry standards for addressing computers on a network.
4. Students will list and distinguish between computer networking historical milestones.
5. Students will identify, compare, and evaluate networking data transport techniques.
6. Students will identify and compare network transmission media and build/evaluate network cabling.
7. Students will discuss IT industry certifications and summarize current technology trends.

E T 154. Construction Methods and Communications
3 Credits (3)
Blueprint reading, specifications, and introduction to materials used in construction. May be repeated up to 3 credits.

Learning Outcomes

1. Students will develop a basic knowledge of AutoCad Civil Three-Dimensional software as they relate to the civil drafting process.

2. Students will become familiar with a basic understanding of computers, drafting, and trigonometry as required.
3. Use of long-term projects will be utilized to simulate real-world work environments to aid the understanding and applying vocabulary on surveying drafting plans.
4. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering, and technology.

E T 155. Network Operating Systems I
3 Credits (3+1P)
Introduction to a computer network operating system. May not be used as part of an E T degree program on main campus. Restricted to: Community Colleges only.
Prerequisite(s): E T 120 or E T 122.

E T 156. Introduction to Information Security
2 Credits (2)
This course introduces information security terminology, historical evolution of digital security, types of PC and network system vulnerabilities and types of information loss. In addition, methods of information protection and integrity, intrusion detection, and recovery of data are introduced.
Prerequisite(s)/Corequisite(s): E T 120. Restricted to Community Colleges campuses only.

E T 160. Windows Fundamentals for IET
3 Credits (3)
Fundamental review of the Windows operating system including installation and upgrades as well as managing applications, files, folders, devices and maintenance.
Learning Outcomes
1. Properly deploy the Windows OS.
2. Manage Windows OS data and devices.
3. Apply network and connection configurations.
4. Provide Windows OS maintenance.

E T 182. Introduction to Digital Logic
2 Credits (1.5+1.5P)
An introduction to logic design and the basic building blocks of digital systems. Topics include numbering systems, Boolean algebra, digital logic theory, combinational logic, and applications such as adders. Includes hands-on laboratory
Prerequisite: A grade of C- or better in MATH 1220G or higher.
Learning Outcomes
1. Demonstrate ability to convert numerical values to commonly-used digital representations and their use for arithmetic and logical functions.
2. Demonstrate understanding of Boolean logic functions and truth tables.
3. Demonstrate ability to simplify logic expressions.
4. Demonstrate understanding of combinational logic functions, and the ability to build digital circuits using breadboards.

E T 183. Applied DC Circuits
3 Credits (2+2P)
Application of Ohm's law, Kirchhoff's laws, Thevenin's, and Norton's theorems to the analysis of DC passive circuits. Embedded Lab.
Prerequisite(s)/Corequisite(s): MATH 1220G.

E T 183 L. Applied DC Circuits Lab
1 Credit (2P)
DC applied circuits lab.
Corequisite(s): E T 183.

E T 184. Applied AC Circuits
2-3 Credits (1-2+2P)
Application of circuit laws and theorems to analysis of AC passive circuits. Resonant circuit, polyphase circuit and magnetic circuit topics are introduced. Embedded Lab.
Prerequisite: A grade of C- or better in ENGR 120.
Learning Outcomes
1. Analyze and design AC circuits, including ideal op-amps, using concepts of voltage, current, power, Kirchhoff's laws, and network theorems.
2. Design simple systems involving AC circuits.

E T 190. Applied Circuits
4 Credits (3+2P)
Application of Ohm's law, Kirchhoff's laws, and Thevenin's theorems to the analysis of AC and DC passive circuits. Electronic circuit topics are introduced. Embedded lab. May be repeated up to 4 credits.
Prerequisite/Corequisite: MATH 1250G or higher.
Learning Outcomes
1. Analyze and design DC and AC circuits, including ideal op-amps, using concepts of voltage, current, power, Kirchhoff's laws, and network theorems.
2. Design simple systems involving DC and AC circuits.

E T 191. Applied Circuits Laboratory
1 Credit (2P)
Applied Circuits Lab

E T 200. Special Topics
1-3 Credits
Directed study or project. May be repeated for a maximum of 6 credits.
Prerequisite: consent of department head.

E T 210. Advanced 3-D Modeling (Solid Works)
3 Credits (3)
Advanced 3-D modeling techniques to prepare for the Certification of SolidWorks Associate (CSWA) exam.
Prerequisite: A grade of C- or better in ENGR 110.
Learning Outcomes
1. Properly operate a CAD system in the most efficient manner.
2. Generate and easily update Part models.
3. Ability to create complex assembly models.
4. Create usable production drawings from Three-Dimensional CAD models.
5. Understand the basic fundamentals of available add-in software compatible with SolidWorks (FEA, CAM, PDM).
6. Work in a group and operate effectively on a team.
7. Use creative and technical thinking skills in design.

E T 217. Manufacturing Processes
3 Credits (2+3P)
Introduction to manufacturing and processing, including: casting, forming, and machining. Emphasis on creating products with the appropriate techniques. Crosslisted with: I E 217.
Prerequisite(s): A grade of C- or better in either E T 110 or ENGR 110 and C- or better in MATH 1220G.
Learning Outcomes
1. Identify the different manufacturing processes and their applications.
2. Use, set up, and calibrate measuring tools.
3. Apply geometric tolerances to engineering drawings.

4. Demonstrate basic knowledge of materials and material properties.
5. Demonstrate basic knowledge of GM codes and their application.
6. Proficiently use CAM packages such as SolidWorks CAM.
7. Identify different tooling, their use, and manufacturing application.

E T 217 L. Manufacturing Processes Lab
1 Credit (3P)
Hands-on laboratory in machine shop to apply topics from E T 217, including: casting, forming, and machining.
Corequisite: E T 217.
Learning Outcomes
1. Various

E T 220. Internship
1-6 Credits
Internship requiring an approved number of hours of varied and progressive experience in the field of study. The scope and other requirements of the internship are stated in an individualized syllabus and through a memorandum of understanding between the faculty mentor and the industry partner. May be repeated up to 6 credits. Consent of Instructor required.
Prerequisite(s): E T 283.

E T 240. Applied Statics
3 Credits (3)
Fundamental topics of applied statics, including force system analysis, equilibrium, free body diagrams, methods of joints and sections, distributed loads, friction, centroids, area moments, and shear and moment diagrams.
Prerequisite(s)/Corequisite(s): MATH 1430G or MATH 1511G. Prerequisite(s): PHYS 1230G or PHYS 1310G.

E T 241. Applied Dynamics
3 Credits (3)
The foundation for understanding particles and bodies in motion and the forces involved, including: projectile motion, Newton's Laws of Motion, conservation of energy, and impulse and momentum.
Prerequisite: A grade of C- or better in either E T 240 or ENGR 233.
Prerequisite/Corequisite: (MATH 1440 or MATH 1521G or MATH 1521H).
Learning Outcomes
1. Various

E T 246. Electronic Devices I
4 Credits (3+3P)
Solid-state devices including diodes, bipolar-transistors, and field effect transistors. Use of these devices in rectifier circuits, small signal and power amplifiers.
Prerequisite: A grade of C- or better in one of the following: E T 190 or E T 183 or ENGR 120.
Prerequisite/Corequisite: E T 184 or ENGR 230.
Learning Outcomes
1. Describe semiconductor devices and their properties.
2. Apply the characteristics of diodes to analyze diode rectifier and regulator circuits.
3. Apply the characteristics of bipolar junction transistors (BJTs) to analyze BJT amplifier circuits.
4. Apply the characteristics of metal-oxide-semiconductor field-effect transistors (MOSFETs) to analyze MOSFET amplifier circuits.
5. Describe and analyze complementary MOS (CMOS) digital circuits.
6. Learn to solder and layout printed-circuit boards (PCBs).
7. Design, simulate, and test diode and transistor-amplifier circuits.

E T 253. Networking Operating Systems II
3 Credits (3+1P)
Introduction to a computer network operating system. May not be used as part of an E T degree program on main campus. Restricted to Community Colleges campuses only.
Prerequisite: E T 120 and E T 153.
Learning Outcomes
1. Identify Linux utilities and terminology.
2. Use the Linux filesystem.
3. Install, administer, and manage a Linux system.
4. Utilize Linux user/group management.
5. Install software packages.
6. Apply data management skills.

E T 254. Concrete Technology
3 Credits (2+2P)
Fundamentals of aggregates, Portland cement, and asphalt used in design and construction. May be repeated up to 3 credits.
Learning Outcomes
1. Define the fundamentals of aggregates and their use in construction including concrete and asphalt.
2. Define the types of concrete and their uses.
3. Prepare and test concrete mix designs.
4. Executing tests for AASHTO Certification.

E T 255. Linux System Administration
3 Credits (3)
Operating systems applications and interfacing with an introduction to systems administration. Topics include Shell Programming, Programming Tools, Database Management, System Backups, Security, Setup and Maintenance of Linux Servers.
Learning Outcomes
1. Describe the key features of the Linux operating system.
2. Plan the Linux Filesystem to match system requirements.
3. Design BASH scripts to optimize common Linux operations.
4. Interpret Linux performance data to solve hardware and software issues.
5. Students will demonstrate the Core Linux System Administration.
6. Students will be able to link the use of shell commands to managing Linux server daemons and software.
7. Students will apply these concepts to build application servers running Linux, Apache, MySQL, and PHP (LAMP); Tomcat, CUPS print servers; and create backup solutions.
8. Students will apply problem analysis, object-oriented structured logic, and development concepts.
9. Students will demonstrate an understanding of theory and hands-on experience administrating a Linux Based server.

E T 256. Networking Operating Systems III
3 Credits (3+1P)
Introduction to a computer network operating system. May not be used as part of an E T degree program on main campus. Restricted to Community Colleges campuses only.
Prerequisite(s): E T 253.

E T 262. Software Technology I
3 Credits (2+2P)
An introduction to computer programming concepts as applied to engineering technology. Includes basic logic design, algorithm

development, debugging and documentation. History and use of computers and their impact on society.
Prerequisite/Corequisite: (E T 182 or ENGR 130) or (MATH 1250G or MATH 1430G).

Learning Outcomes

1. Set up and use a rich programming environment for programming with C
2. Analyze existing code
3. Employ effective use of basic programming and basic troubleshooting
4. Write, debug and test code given software requirements
5. Apply testing and documentation best practices
6. Transfer programming knowledge and apply coding knowledge

E T 272. Electronic Devices II
4 Credits (3+3P)
Operational amplifiers, positive and negative feedback, computer aided circuit analysis. In addition circuits include integrator, differentiators and phase shift networks.
Prerequisite: A grade of C- or better in E T 246.

Learning Outcomes

1. Design ideal operational amplifier (opamp) circuits.
2. Determine the frequency response of BJT and MOSFET amplifier circuits.
3. Predict the impact of non-ideal properties of opamps on opamp circuits.
4. Design opamp integrator and differentiator circuits.
5. Implement electronic wave-generating and wave-shaping circuits.
6. Solder and layout surface-mount printed-circuit boards (PCBs).
7. Simulate and test opamp and transistor-amplifier circuits.

E T 273. Advanced Networking Communications
4 Credits (2+4P)
Explores advanced networking communications to include Wireless Networking, Virtualization and Cloud Computing, Subnets and VLANs, Network Risk Management, Network Security Design, Network Performance, and WANS. The course covers the examination objectives and detailed preparation for students to take the CompTIA Network+ exam.
Prerequisite: E T 153.

Learning Outcomes

1. Identify, describe, and apply wireless transmission characteristics and standards.
2. Explain the benefits of cloud virtualization and cloud computing.
3. Explain the purpose of network segmentation and describe how VLANs work and how they are used.
4. Identify basic concepts of network risk management and configure devices for increased security.
5. Identify network design security features and discuss options in network access control.
6. Use tools to evaluate network performance and discuss best practices for incident response and disaster recovery.
7. Explain characteristics of WAN technology and troubleshoot connection methods.

E T 276. Electronic Communications
3 Credits (2+2P)
Antennas, transmission devices, A-M and F-M transmission and detection, pulse systems, microwave systems.
Prerequisite(s): E T 246.

E T 280. Web Design and Multimedia
3 Credits (3)
Introduction to front-end web development including webpage design, structure, layout, positioning, responsiveness, and foundational layers of how the web works. Video, audio, and other digital presentation tools are covered.

Learning Outcomes

1. Create multiple frontend development micro-components.
2. Create single and multi-page websites.
3. Use flexbox, grid, and media queries and different design patterns.
4. Employ effective use of web development and basic troubleshooting.
5. Build small web site projects.

E T 282. Digital Electronics
4 Credits (3+3P)
Applications of digital integrated circuits, multiplexers, counters, arithmetic circuits, and microprocessors.
Prerequisite(s)/Corequisite(s): (E T 190 or E T 184). Prerequisite(s): E T 182.

E T 283. Hardware PC Maintenance
3 Credits (3+1P)
Installing, configuring, troubleshooting, and maintaining personal computer hardware components.
Prerequisite(s): E T 120 or E T 122.

E T 284. Software PC Maintenance
3 Credits (3+1P)
Installing, configuring, troubleshooting, and maintaining personal computer operating systems.
Prerequisite(s): E T 120 or E T 122.

E T 285. Advanced Information Security
3 Credits (3)
The course covers detailed analysis of network security, including security operations and policy adherence; internal and external vulnerabilities; methods of identifying, controlling and managing system access, and the protection of system information.
Prerequisite(s)/Corequisite(s): E T 283. Prerequisite(s): E T 156.

E T 286. Information Security Certification Preparation
4 Credits (4)
The course covers the examination objectives and detailed preparation for a certification in information security.
Prerequisite(s): E T 285.

E T 291. PC Forensics and Investigation
3 Credits (3)
Introduction to computer forensics and investigative fundamentals. Topics include understanding computer forensic and investigation law and requirements, processing crime and incident scenes, and the extraction, preservation, analysis and presentation of computer-related evidence.
Prerequisite(s): E T 120 or E T 122.

E T 300. Special Topics
1-3 Credits
Directed study or project. May be repeated for a maximum of 6 credits.
Prerequisite: consent of department head.

E T 305. Introduction to Product Design
3 Credits (2+3P)

The process of designing an innovative product for a real customer. Working through ideas, prototypes, 3-D models, concept validation, and entrepreneurship.
Prerequisite: A grade of C- or better in (COMM 1115G or COMM 1130G or AXED 2120G or HNRS 2175G) or consent of instructor for non-MET majors.
Prerequisite/Corequisite: E T 210 and E T 217.
Learning Outcomes

1. Learn and follow design process.
2. Develop experience working in a team to solve a design problem.
3. Develop experience presenting ideas and concepts orally.
4. Learn and apply creative problem-solving techniques.
5. Perform interviews with customer.
6. Translate customer needs into product specifications.
7. Design novel product for customer.
8. Build low-resolution prototype of product.
9. Develop a recognition of the importance of innovation and entrepreneurship.

E T 306. Thermodynamics and Laboratory Applications
4 Credits (3+3P)
Fundamentals of thermodynamics, including the first and second laws, properties of substances, and thermodynamic cycles, with a focus on power generation and refrigeration, application of thermodynamic principles to laboratory-scale systems, testing, instrumentation, and data collection, energy conversion assessment and system performance.
Prerequisite: A grade of C- or better in the following: CHEM 1120G and ENGR 233 and (PHYS 1240G or PHYS 1320G) and (PHYS 1240L or PHYS 1320L).
Prerequisite/Corequisite: ENGR 140 and (ENGR 190 or MATH 1521G or MATH 1521H).
Learning Outcomes

1. Explain and apply fundamental and applied thermodynamics (including laws, substance properties, and cycles in power generation and refrigeration).
2. Solve real-world problems using thermodynamic theory in energy systems.
3. Utilize tools and methods to analyze and solve applied thermodynamics problems, including instrumentation and data analysis.
4. Collect, analyze, and interpret experimental data to determine thermodynamic properties.
5. Communicate results effectively through written reports and presentations.
6. Assess the performance of thermodynamic systems, including refrigeration cycles, heat engines, and power plants.

E T 306 L. Thermodynamics Lab
1 Credit (3P)
Applications of thermodynamic theory to lab devices. Practice in testing, instrumentation, and data collection.
Prerequisite: A grade of C- or better in the following: CHEM 1120G and ENGR 233 and (PHYS 1240G or PHYS 1320G) and (PHYS 1240L or PHYS 1320L).
Prerequisite/Corequisite: (E T 306 or pre-approved equivalent) and ENGR 140 and (ENGR 190 or MATH 1521G or MATH 1521H).
Learning Outcomes

1. Effectively communicate results of laboratory work and in-class studies in written formal technical reports.
2. Present one lab experiment through a PowerPoint presentation.
3. Find thermodynamic properties through lab experiments.
4. Describe performance indicators of a laboratory refrigeration cycle and a heat engine.
5. Describe power plant operation.

E T 308. Fluid Technology
3 Credits (3)
Application of basic principles of fluid mechanics to practical applied problems.
Prerequisite: A grade of C- or better in both, (ENGR 190 or MATH 1511G or MATH 1511H) and (E T 240 or ENGR 233).
Corequisite: E T 308 L.
Learning Outcomes

1. Solve hydrostatic problems.
2. Describe and measure physical properties of a fluid.
3. Describe the motion of fluids.
4. Apply conservation equations.
5. Design pipeline and pump systems.

E T 308 L. Fluid Technology Lab
1 Credit (3P)
Measurements in fluid statics, dynamics, and hydraulic systems.
Corequisite: E T 308.
Learning Outcomes

1. Effectively communicate results of laboratory work and in-class studies in written formal memoranda.
2. Experimentally find properties of fluids.
3. Experiment head losses in pipe flows.
4. Analyze pipeline systems and open channel flows.
5. Analyze flow regimes and equipment selection.

E T 309V. Manufacturing: History and Technology
3 Credits (3)
The history of manufacturing, the technology on which it is based, and its impact on society.

E T 310. Applied Strength of Materials
3 Credits (3)
Application of principles of strength of materials to practical design and analysis problems.
Prerequisite: A grade of C- or better in E T 240 or ENGR 233.
Corequisite: E T 310 L.
Prerequisite/Corequisite: ENGR 190 or MATH 1521G or MATH 1521H.
Learning Outcomes

1. To obtain knowledge of basic engineering materials and their use in civil and mechanical construction.
2. To perform basic structural analysis, stress, strain and deformation calculations as they apply to current engineering practices.
3. To conduct appropriate experiments in the laboratory as they apply to straight of materials and be able to interpret the results.
4. To effectively communicate results of laboratory work and in-class studies in written memoranda, business letters, and formal technical reports.
5. To recognize that the field of engineering materials is constantly changing and therefore, needs to be studied throughout one's career.

E T 310 L. Applied Strength of Materials Lab
1 Credit (3P)

Testing and analyzing the physical properties of materials. Cursory review of Excel, PowerPoint, FEA, Instron machine, and testing standards.
Corequisite: E T 310.

Learning Outcomes

1. Effectively communicate results of laboratory work and in-class studies in written formal memoranda.
2. Demonstrate an understanding of the tensile, compressive, shear, torsional and buckling properties of basic materials through hands-on testing per ASTM Standards.
3. Evaluate the results of the hands-on laboratory testing through modeling exercises using SOLIDWORKS simulations.
4. Effectively communicate industry practices through oral presentations of ASTM standards.

E T 314. Communications Systems I
3 Credits (3)
Circuits and devices used for transmission, reception, and processing of RF signals. May be repeated up to 3 credits.
Prerequisite: A grade of C- or better in both, E T 246 and (MATH 1250G or higher).

Learning Outcomes

1. Analyze analog and digital communication systems.
2. Apply the fundamental communication concepts of AM and FM techniques.
3. Build an AM/FM communication system.
4. Apply basic antenna theory and satellite communication theory.

E T 317. Advanced Manufacturing and Design
3 Credits (3)
Advanced 3-D modeling with current engineering design practices. Students will use SolidWorks add-ins such as CAMWorks, Product Data Mangement (PDM), and Model-Based Definition in congunction with Geometric Dimensioning and Tolerancing (GD&T) practices. Students will have the opportunity to take the Certification SolidWorks Profesional Exam (CSWP).
Prerequisite: A grade of C- or better in both, E T 210 and E T 217 or ENGR 217.

Learning Outcomes

1. Create manufacturing drawing packages in accordance with ANSI.
2. Relate design data using proper geometric dimensioning and tolerancing practices.
3. Knowledge of advanced manufacturing processes.
4. Knowledge of requirements design for manufacturability (DFM).
5. Write and understand G-Code toolpaths.
6. Use CAD/CAM systems to create toolpaths.
7. Operate and setup CNC machining center.
8. Work in a group and operate effectively on a team.
9. Use creative and technical thinking skills in design.

E T 324. Signal Processing and Filtering
4 Credits (3+3P)
Application of digital and analog signal conversion models. Discrete time signals and systems. Time and frequency domain concepts. Presentation of Fourier and Z transforms. Application of analog and digital signal filtering with and without feedback.
Prerequisite: A grade of C- or better in E T 272, and ENGR 140, and (ENGR 190 or (MATH 1521G or MATH 1521H, or higher)).
Prerequisite/Corequisite: (PHYS 1240G or PHYS 1320G) and (PHYS 1240L or PHYS 1320L).

Learning Outcomes

1. Analyze signals and systems and differentiate between discrete and continuous-time signals and systems.
2. Determine the impulse response of a differential or difference equation.
3. Apply the convolution theorem for continuous-time signals to determine the response of linear systems.
4. Evaluate the Fourier series of periodic signals.
5. Apply bilateral Laplace transforms for continuous signals and Z transforms for discrete signals.
6. Apply the Sampling theorem, reconstruction, aliasing, and Nyquist's theorem to represent continuous-time signals in discrete time.
7. Design and analyze signals and systems using the programming language MATLAB and /or Simulink.

E T 328. Kinematics of Machines
3 Credits (2+3P)
Kinematic analysis of machine elements using linkages, cams, and gears. Applied design of mechanical systems using SolidWorks simulation and Excel modeling.
Prerequisite: A grade of C- or better in both, E T 210 and (E T 241 or ENGR 234).
Prerequisite/Corequisite: E T 305.

Learning Outcomes

1. Design mechanical device with specific points of motion to solve engineering problem.
2. Develop experience working in a team to solve a design problem.
3. Develop experience presenting technical concepts in writing and orally.
4. Develop understanding of classic four bar mechanisms, including crank-rocker, crank-crank, double-rocker, and crank-slider.
5. Using algebra and trigonometry, analyze points of motion for displacement, velocity, and acceleration.
6. Using SolidWorks Motion Analysis, analyze points of motion for displacement, velocity, and acceleration.
7. Reverse-engineer a Franz Rouleaux mechanism.

E T 332. Applied Design of Structures I
4 Credits (3+3P)
An introduction to structural analysis and design. Use of various building codes for development of allowable and factored loads on structures. Allowable stress and strength design concepts for structural components using concrete and steel. Required use of computer software such as spreadsheets, databases, and self-developed programs and design aids.
Prerequisite: A grade of C- or better in both, E T 310 and (ENGR 190 or MATH 1521G or higher).

Learning Outcomes

1. Demonstrate mastery of the knowledge, techniques, skills and use of modern tools of their disciplines.
2. Design structural components of a system, component, or process to meet desired needs.
3. Identify, formulate, and solve structural analysis problems.
4. Describe professional and ethical responsibility.
5. Communicate effectively with peers and faculty.

E T 339. Introduction to Digital Forensics and Incident Response
3 Credits (2+3P)
Introduction to the skills required to perform digital forensics and incident response on Windows operating systems. Topics include: live

response, evidence acquisition, Windows operating system artifacts, documentation and reporting.
Prerequisite: A grade of C- or better in both, E T 255 and E T 160.
Learning Outcomes

1. To understand Digital Forensics terms and definitions and why digital forensics is needed.
2. To study what is required and how to perform digital forensics.
3. To become familiar and aware of the hindrances/obstacles that affects effective digital/computer forensic operations.
4. To learn about the tools and procedures for how deleted data is recovered during digital forensic operations.
5. To use forensic tools and procedures to perform digital forensic operations on Windows operating systems, Emails, Mobile devices, and Communication networks (Computer, wireless, cellular networks).
6. To learn about incident response and procedures.

E T 344. Microprocessor Systems
3 Credits (2+3P)
Microcomputer and/or microcontroller systems, applications and architectures with an emphasis on software using high-level and assembly programming languages. May be repeated up to 3 credits.
Prerequisite: A grade of C- or better in both, (E T 182 or ENGR 130) and (MATH 1250G or higher).
Prerequisite/Corequisite: E T 362.
Learning Outcomes

1. Compare and contrast microprocessor architectures and their characteristics.
2. Configure a Nios II microprocessor architecture core on an FPGA.
3. Write programs in assembly language targeting the Nios II microprocessor.
4. Write programs in C targeting the Nios II microprocessor.
5. Present, demonstrate and document a team project.

E T 354. Soil and Foundation Technology
4 Credits (3+3P)
Fundamentals of investigation of soil properties and their importance in design, construction, and testing as related to buildings, roads, dams, and other structures. Design of foundations considering slope stability, bearing capacity and settlement.
Prerequisite: A grade of C- or better in E T 254.
Prerequisite/Corequisite: E T 310.
Learning Outcomes

1. Demonstrate an understanding of the basic soil types and the accepted soil classification systems: USCS, AASHTO, USDA.
2. Demonstrate an understanding of the various engineering properties of soils and how they apply to the built environment: compaction, permeability, consolidation, shear strength and stress distribution.
3. Perform advance calculations on lateral earth pressure, retaining structures and slope stability.
4. Perform basic designs of shallow foundations and pile structures.
5. Demonstrate an ability to perform laboratory tests: soil classification, Atterburg Limits, compaction (proctors), permeability, shear strength, and compression. Confirm these abilities through completion of the NMDOT soil testing certification program.

E T 355. Site/Land Development and Layout
3 Credits (3)
Techniques, methods, and takeoffs for infrastructure layout, site plan design, grading, earthwork, utilities, road construction. Students must be in Junior or Senior standing to enroll.
Prerequisite: A grade of C- or better in E T 143 or DRFT 143 or DRFT 153.
Learning Outcomes

1. Describe the purpose of Land Development and its process.
2. Define Feasibility and Programming (Environmental policy, Environmental Site Feasibility, Engineering Feasibility) for land development.
3. Base Map Preparation (Control Surveys, Boundary Surveys Topographic Surveys).
4. Examine Flood Plain Studies (FEMA) and Preliminary Hydrological Analysis.
5. Compute the TOC/Intensity of rainfall on a property, runoff for pre/post-development, and peak flow.
6. Implement types of Grading - Earthwork (end section method)/ production estimations/Preliminary layout/Grading work Grid Method).
7. Analyze asphalt designs for different types of cross-sections.

E T 356. Applied Power Technologies
4 Credits (3+3P)
Basic elements of modern power systems, energy sources, substation configuration, load cycles, and three-phase circuits. Students will gain experience in power factor correction, transmission line configurations and impedance, voltage regulation of transformers, and the per-unit system. Study of load flow, fault analysis, and economic operations is included. Students must be in junior or senior standing in order to enroll.
Prerequisite: A grade of C- or better in the following: (ENGR 190 or MATH 1511G or MATH 1511H) and E T 272 and ((PHYS 1240G and PHYS 1240L) or (PHYS 1320 and PHYS 1320L)).
Learning Outcomes

1. To apply concepts of electronics, magnetism and induction.
2. To solve single and three phase transformers circuits.
3. To understand different operations of DC machines and generators.
4. To analyze single phase and three phase power circuits in per-unit analysis.
5. To analyze transmission lines for power loss and power efficiency.
6. To understand power flow, fault analysis and economic operations of the power system generation and transmission.
7. To describe modern power systems, energy sources and substation configurations.

E T 360V. Technology in Business and Society
3 Credits (3)
Examination of how technology affects business and society with specific attention to understanding the role of technical personnel and their interaction with nontechnical personnel. May be repeated up to 3 credits.
Learning Outcomes

1. Understand the impact of technology on business and society.
2. Understand the importance of technical personnel in implementing technology within businesses.

E T 362. Applied Software Development with Python
3 Credits (3)
This course explores various real-world applications of Python in modern software development. Students will engage in hands-on projects, including web applications, database-driven solutions, selected hardware-based applications, and other emerging technologies, while applying object-oriented programming (OOP) principles. The curriculum is designed to adapt to evolving industry needs.
Prerequisite: A grade of C- or better in ENGR 140.

Prerequisite/Corequisite: MATH 1250G or Higher.

Learning Outcomes

1. Configure and utilize various programming environments to meet real-world application needs.
2. Analyze and modify existing codebases.
3. Develop and troubleshoot Python applications.
4. Implement Object-Oriented Programming (OOP) principles.
5. Apply testing, debugging, and documentation best practices.

E T 377. Computer Networking I
3 Credits (2+2P)

Topics include the principles and structure of the OSI model, IP addressing, media, LANs, TCP/IP networks, routing protocols (RIPv2, EIGRP, OSPF) and their advanced functionality, as well as VLANs and inter-VLAN communication. This course focuses on the architecture of networks, the configuration of devices, how to identify and resolve common issues, and troubleshooting (from physical to transport layers).

Prerequisite: A grade of C- or better in both, (E T 182 or ENGR 130) and (MATH 1250G or Higher).

Learning Outcomes

1. Define and distinguish the role of a network administrator (from other roles in the IT world)
2. Identify the OSI model, its layers, and relationship to TCP/IP model
3. Identify different cable media and networking devices and their use
4. Design, configure, and troubleshoot basic networks.
5. Identify MAC, IPv4, and IPv6 addressing
6. Apply different techniques for IP allocation and subnet design (IPv4)
7. Use Cisco IOS software for basic switch and router configurations
8. Configure and troubleshoot basic setup for static and dynamic routing protocols

E T 381. Renewable Energy Technologies
3 Credits (3)

Renewable energy systems, including topics in thermal-solar, photovoltaic, wind, geothermal systems, and other current topics. Theory, practical applications, safety considerations and the economics of alternative renewable energy systems compared to conventional systems.

Prerequisite: A grade of C- or better in MATH 1220G or higher.

Learning Outcomes

1. Define renewable energy sources.
2. Understand the current state of the art of renewable energy technologies and performance improvements. This includes solar, wind, hydro, ocean, biomass, and geothermal energies.
3. Understand the benefits and disadvantages of using renewable resources.
4. Research or design a renewable energy system as a class project.

E T 382. Solar Energy Technologies
3 Credits (2+3P)

Solar energy technologies, including topics in passive, solar thermal, and photovoltaic systems. Theory, practical applications, safety considerations and the economics of solar renewable energy systems compared to conventional systems.

Prerequisite: A grade of C- or better in MATH 1220G.

Learning Outcomes

1. Define renewable energy sources.
2. Understand the current state of the art of photovoltaic and solar thermal energy technologies and performance improvements.
3. Evaluate the economics of implementing a solar system.
4. Design and size a PV or solar thermal energy system as a class project.

E T 384. Wind and Water Energy Technologies
3 Credits (3)

Wind and Water energy technologies, including topics in small and large scale systems. Theory, practical applications, safety considerations and the economics of wind and water renewable energy systems compared to conventional systems.

Prerequisite: A grade of C- or better in MATH 1220G or higher.

Learning Outcomes

1. Define renewable energy sources.
2. Understand the current state of the art of wind and water energy technologies and performance improvements.
3. Evaluate the economics of implementing wind or water systems.
4. Design and size a wind or water energy system as a class project.

E T 386. Sustainable Construction and Green Building Design
3 Credits (3)

Sustainable Building materials, methods, and techniques including green architecture and design, codes, standards and specifications.

Prerequisite: A grade of C- or better in MATH 1220G or higher.

Learning Outcomes

1. Demonstrate an understanding of the basic principles of Green Building: sustainability, life-cycle costing, triple bottom line, return periods and unintended consequences.
2. Interpret the various categories present in the LEED certification process and other green certification systems commonly used.
3. Evaluate different “green” technologies as they apply to the student’s area of interest.
4. Evaluate energy efficiency scenarios and resulting cost analyses using RETScreen and RESCheck softwares.
5. Navigate the various certification opportunities as they apply to the Green Building industry.

E T 396. Heat Transfer and Applications
3 Credits (2+3P)

Fundamentals of conduction, convection, and radiation heat transfer. Application of heat transfer, thermodynamics, and fluid mechanics principles to thermal system analysis and design.

Prerequisite: A grade of C- or better in both E T 306 and E T 308.

Learning Outcomes

1. Understand the concepts and basic principles of fundamental and applied heat transfer.
2. Model and solve engineering problems involving one, two, or three heat transfer modes: conduction, convection, and radiation.
3. Analyze the performance of industrial equipment like heat exchangers.
4. Validate theoretical concepts through heat transfer lab experiments.

E T 398. Digital Systems
4 Credits (3+3P)

Analysis, design, implementation, and testing of digital systems, including microprocessor blocks, using state machine logic, FPGAs, and hardware description language programming. May be repeated up to 4 credits.

Prerequisite: A grade of C- or better in both (E T 282 or ENGR 130) and (MATH 1250G or higher).

Prerequisite/Corequisite: E T 362.

Learning Outcomes

1. Apply design, synthesis, and analysis methods for digital systems that incorporate programmable logic devices (FPGAs).
2. Utilize CAD tools such as Altera Quartus II to design digital systems.
3. Evaluate and apply methods to analyze the timing behavior and to detect timing hazards in digital circuits.
4. Apply methods for analysis and design of sequential digital circuits with feedback.
5. Design complex circuits using VHSIC Hardware Description Language (VHDL) for programming FGPA systems.

E T 400. Special Topics
1-3 Credits
Directed study or project. May be repeated for a maximum of 6 credits.
Prerequisite: consent of department head.

E T 402. Instrumentation
3 Credits (2+3P)
Sensors/transducers, signal conditioning and transmission for measurement and control systems. Student project in an area of instrumentation and/or control is required.
Prerequisite/Corequisite: E T 396 or E T 398.
Learning Outcomes

1. Apply physical concepts, operational principles, and components of basic instrumentation and control in industrial process systems.
2. Learn relevant problem-solving methods and aspects of good practice.
3. Use LabView data acquisition systems, PLC ladder logic, and basic Arduino controllers.
4. Prototype a control system through a class project.

E T 410. Senior Seminar
1 Credit (1)
Transition from academics to business and industry. Students must be senior standing in E T majors to enroll. May be repeated up to 1 credit.
Learning Outcomes

1. Explain the path to professional licensure (CET, ECET, MET).
2. Implement a plan to test and pass the fundamental exam (CET, ECET, MET).
3. Identify and work towards completing different certifications used in industry, and work towards (IET).

E T 412. Highway Technology
3 Credits (3)
Road-vehicle performance, geometric alignment, traffic analysis, highway materials, pavement design, and plan and profile development.
Prerequisite: A grade of C- or better in E T 354.
Learning Outcomes

1. Design of a roadway including geometric design, materials selection, pavement design, and drainage.
2. Develop an understanding of design criteria based on traffic characteristics.
3. Interpret the purpose of course requirements, gather correct resources, present criteria, study alternatives, and finally develop a design.

E T 414. Communications Systems
3 Credits (3)
Circuits and devices used for transmission, reception, and processing of RF signals.
Prerequisite: A grade of C- or better in both, E T 246 and (MATH 1250G or higher).
Learning Outcomes

1. Analyze analog and digital communication systems.
2. Apply the fundamental communication concepts of AM and FM techniques.
3. Build an AM/FM communication system.
4. Apply basic antenna theory and satellite communication theory.

E T 418. Applied Hydraulics
3 Credits (3)
Introduction to hydrology, hydraulic equations, hydraulic cross-sections, control structures, and collection and distribution of water, wastewater, and storm runoff using closed conduit and open channel flow. May be repeated up to 3 credits.
Prerequisite: A grade of C- or better in E T 308.
Learning Outcomes

1. Perform basic rainfall/runoff calculations using the Rational Method, TR-fifty-five and the Unit Hydrograph method.
2. Design hydraulic conveyance structures using Manning's equation and basic culvert equations, both by hand and various software packages.
3. Perform advanced calculations of pipe flow and head loss, both by hand and various software packages.
4. Evaluate pumping scenarios and pumping design, both by hand and various software packages.
5. Demonstrate an understanding of basic groundwater hydraulics.

E T 420. Senior Internship
1-6 Credits
Internship requiring an approved number of hours of varied and progressive experience in the field of study. The scope and other requirements of the internship are stated in an individualized syllabus and through a memorandum of understanding between the faculty mentor and the industry partner. Taken in the senior year of program.
Prerequisites: Senior standing in E T.

E T 421. Senior Project
3 Credits (3)
Project in an area of civil engineering technology conducted under the direction of civil engineering technology faculty member. Project must be one that can be completed within a semester and of sufficient complexity for 3 credits. Taken last semester of program. May be repeated up to 3 credits.
Learning Outcomes

1. Write a transmittal letter in a format consistent with industry practices.
2. Develop a scheduling table delineating the various project stages.
3. Develop a table of contents to organize all work documents.
4. Use the knowledge learned in CET courses to develop/design a project and prepare a professionally written report.
5. Communicate effectively with the faculty advisor and industry mentor.
6. Develop skills to work independently or in teams on a self-paced project.

E T 426. Analysis and Design of Machine Elements
3 Credits (2+3P)
Analysis and design of power transmission components, including: gears, sprockets, belts, chains, bearings, and shafts. Experiential design project using SolidWorks and Excel modeling.

Prerequisite: A grade of C- or better in both ENGR 234 and E T 310.
Prerequisite/Corequisite: E T 305.

Learning Outcomes

1. Design mechanical device with specific machine elements to solve engineering problem.
2. Develop experience working in a team to solve design problems.
3. Develop experience presenting technical concepts in writing and orally.
4. Apply strength of materials concepts to design machine elements.
5. Learn about various types of machine elements, including shafts, sheaves, gears, sprockets, bearings, fasteners, retaining rings, o-rings, and motors.
6. Analyze the performance of various types of machine elements, including shafts, sheaves, gears, sprockets, and bearings.
7. Using SolidWorks Simulation, design and analyze machine elements and mechanical systems.
8. Conduct FEA simulation and validate results mathematically.

E T 432. Applied Design of Structures II
4 Credits (3+3P)

Continuation of E T 332. Design of structural systems and study of their responses. Wood and masonry systems included.
Prerequisite: A grade of C- or better in E T 332.

Learning Outcomes

1. Demonstrate mastery of the knowledge, techniques, skills and use of modern tools of their disciplines.
2. Design a system, component, or process to meet desired needs.
3. To effectively function as a member of a team while designing, constructing and testing structural scale model.
4. To identify, formulate, and solve engineering problems including material selection and cost analysis.
5. Recognize of professional and ethical responsibility.

E T 435. Senior Project
3 Credits (2+3P)

Capstone course. Practical application of student's cumulative knowledge to an assigned design projects. Design principles, teamwork, and project management skills are stressed. Demonstration of written and oral communication skills via project documentation and presentation of results. Must be graduating senior. Consent of Instructor required.

Learning Outcomes

1. Demonstrate an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline.
2. Demonstrate an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline.
3. Demonstrate an ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature.
4. Demonstrate an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes.
5. Demonstrate an ability to function effectively as a member as well as a leader on technical teams.

E T 439. Advanced Digital Forensics and Incident Response
3 Credits (3)

Advanced topics in digital forensics and incident response. Topics include network analysis and advanced cybersecurity concepts.
Prerequisite: A grade of C- or better in both, E T 339 and E T 377.

Learning Outcomes

1. Students will become familiar with tools and processes to analyze and detect memory resident processes that include malware, rootkits, and user recoverable data.
2. Students will also have exposure to methods and processes used by hackers to penetrate and compromise targets.

E T 444. Computer Hardware Senior Design
3 Credits (2+3P)

The design, development, implementation, documentation, and formal demonstration of a computer hardware system. Emphasis on interfacing FPGA to peripheral devices using VHDL. A student project is required. Students must be in senior standing to enroll. May be repeated up to 3 credits.
Prerequisite: A grade of C- or better in both, E T 362 and E T 398.

Learning Outcomes

1. To design, analyze and simplify digital logic circuits for practical problems.
2. To understand basic and complex digital logic circuits, such as memory, registers, and other arithmetic circuits.
3. To design sequential digital circuits using basic digital gates in Moore and Mealy model.
4. To design Finite State Machines and implement them on an FPGA board.
5. To interface different sensors and user inputs in VHDL and implement them on an FPGA board.
6. To complete a design project, working in teams, solving a real-life problem, and demonstrate their practical solution.

E T 452. Advanced Automated Control Systems
3 Credits (2+3P)

This course introduces students to the fundamentals of automated control systems used in industrial, manufacturing, and process environments. Emphasis is placed on control theory, programmable logic controllers (PLCs), human-machine interfaces (HMIs), SCADA systems, panel hardware, and industrial networking. Students will engage in hands-on labs and simulations to design, program, and integrate automated systems that reflect real-world industry standards.
Prerequisite: A grade of C- or better in E T 402.

Learning Outcomes

1. Design and implement automated control systems using foundational principles of control logic and industrial system architecture.
2. Program programmable logic controllers (PLCs) using ladder logic and apply them to real-world automation tasks involving digital and analog inputs and outputs.
3. Develop and configure human-machine interfaces (HMIs) that enable effective operator control, process visualization, and system monitoring.
4. Integrate PLCs and HMIs with supervisory control and data acquisition (SCADA) systems for centralized control, data logging, and alarm management.
5. Apply data acquisition techniques using sensors and signal processing to monitor and analyze process performance.

6. Configure and troubleshoot industrial networking systems, ensuring reliable communication between PLCs, HMIs, SCADA, and robotic systems.
7. Understand and apply robotics principles in automation, including basic programming, simulation, and integration of robotic tasks into larger control systems.
8. Demonstrate safety, documentation, and system organization standards relevant to hardware interfacing, device selection, and industrial protocols.
9. Collaborate in teams to design and present a fully integrated automated system, incorporating PLC logic, HMI screens, SCADA functionality, DAQ elements, and optional robotics.

E T 455. Cost Estimating and Scheduling
3 Credits (3)
Methods and techniques in construction estimating including final bid preparation, construction planning and scheduling using various network methods and other techniques.
Prerequisite: junior or senior standing in E T.

E T 456. Applied Power Technologies II
3 Credits (2+3P)
This course focuses on fault analysis, protective systems, transient stability, and economic operation of power systems. Students apply analytical techniques and simulation tools to assess and optimize power system performance under dynamic conditions.
Prerequisite: A grade of C- or better in E T 356.
Learning Outcomes
1. Perform symmetrical and unsymmetrical fault analyses.
2. Interpret sequence networks and analyze faulted systems.
3. Understand protective relay schemes and coordination.
4. Analyze rotor angle and frequency stability.
5. Apply methods for economic dispatch and system optimization.

E T 458. Web Development and Database Applications
3 Credits (3)
Design, planning, and building of interactive and dynamic web applications which are customizable and contain real-time information. Topics include relational databases, object oriented programming, secure-coding practices and web security, user authentication and personalization, as well as front-end and back-end technology integration.
Prerequisite: A grade of C- or better in both, E T 362 and E T 280.
Learning Outcomes
1. Setting up a development server
2. Read, design, and write code for backend web dev.
3. Design, create, and access databases that support web applications.
4. Implement effective security and authentication on Web applications

E T 459. Construction Technology and Management
3 Credits (3)
This is a Technical Specialty course that builds on topics presented in the construction sequence thus far: E T 154, E T 254, E T 354, and E T 355. The course introduces students to the different civil engineering approach to construction and management, including planning, construction estimating & scheduling, foundations, formwork, concrete work, steel fabrication and erection installation, equipment basics, quality control, and safety. Methods and techniques involved in construction including use of Primavera Project Management® software.
Prerequisite/Corequisite: E T 354 and E T 355.
Learning Outcomes
1. Understand the basic concepts of construction planning, cost estimation, scheduling, and types of project management
2. Obtain basic knowledge on techniques to construct structures based on site condition
3. Develop work breakdown system and quantity take-offs
4. Develop project cost estimation for different construction projects
5. Prepare work schedule for construction project
6. Identify and implement the suitable method and equipment to construct various structures.

E T 463. Enterprise Linux Administration
3 Credits (3)
Advanced Linux Includes an advanced look at the use of Coding repositories, Linux-based containers, virtual machines, and scripting tools including Dockerfiles, Vagrantfiles, and Ansible.
Prerequisite: A grade of C- or better in both, E T 255 and E T 362.
Learning Outcomes
1. Demonstrate the ability to use Software Versioning systems using Windows and Linux.
2. Apply best practices with versioning repositories when creating software.
3. Deploy single and clustered microservice containers to support a web application.
4. Use script-based code to deploy and configure a full stack web server.
5. Use infrustructure management software to deploy defined roles in multiple environments.

E T 464. Windows Enterprise Administration
3 Credits (3)
Installation, configuration, and maintenance of Windows Enterprise services which includes Active Directory, distributed file systems, SQL Server, Web Server, Authentication Procedures, and enterprise elasticity. Topics covered include: Server Maintenance and Troubleshooting Methodologies.
Prerequisite: A grade of C- or better in E T 160 and (E T 262 or ENGR 140 or C S 172).
Learning Outcomes
1. Set up and use a Windows Enterprise environment with Active Directory.
2. Use best practices to design an organizational Structure and define AD DS Objects.
3. Deploy an AD DS embedded DHCP server with IPvfour and IPvsix.
4. Analyze existing cmd shell and PowerShell code for process automation.
5. Deploy security and user settings using Group Policy.
6. Apply version updates and establish an intra-domain trust relationship.
7. Employ effective use of the WDS service to deploy template images.

E T 471. Transportation Engineering and Technology
3 Credits (3)
Learn the principles of transportation engineering and technology with a focus on highway engineering and traffic analysis. Provide a basic skill set that will allow a student to address most of the transportation problems. Provide a foundation for future coursework in transportation should a student wish to pursue further coursework in the field.
Prerequisite: A grade of C- or better in E T 354.

Learning Outcomes

1. To introduce students to techniques for designing a roadway including geometric design, materials selection, pavement design, and drainage.
2. To help students develop an understanding of design criteria based on traffic characteristics.
3. Assess student's ability to: interpret the purpose of course requirements, gather correct resources, present criteria, study alternatives, and finally develop a design.

E T 472. Intelligent Transportation Systems (ITS)
3 Credits (3)

Traffic flow theory, telecommunication and information technology application in transportation, system architecture and standards, transportation management, incident and emergency management, corridor management, dynamic route guidance, in-vehicle systems, and traffic signal timing. Consent of instructor required. May be repeated up to 3 credits.

Learning Outcomes

1. Demonstrate traffic flow theory, telecommunication, and information technology applications in transportation.
2. Discover Intelligent Transportation System (ITS) architecture and standards, transportation management, incident and emergency management, corridor management, dynamic route guidance and in-vehicle systems, and traffic signal timing.
3. Apply knowledge of the ITS to select traffic engineering as a career path or apply the knowledge in their engineering or engineering technology career.

E T 475. Special Topics in Information Technology
3 Credits (3)

Contemporary topics in Information Technology.
Prerequisite: A grade of C- or better in both, ((E T 362 or ICT 362) and (E T 377 or ICT 377)), or Consent of Instructor.

Learning Outcomes

1. Students will learn two way Bluetooth, Wi-Fi, and NFC communication technologies
2. The student will practice building and programming IOT prototype devices
3. The student will develop customer value proposition and perform one round of customer discovery
4. The student will prototype their IOT device
5. The student will demonstrate their IOT device
6. The student will learn to integrate IOT devices into IT architecture

E T 477. Computer Networking II
3 Credits (2+2P)

Advanced concepts in computer network design and applications including managing the campus network infrastructure (LANs and virtual LANs), network services (DNS and DHCP), network security and firewall, network monitoring and forensics, wireless networks, high-speed optical networks and Internet.
Prerequisite: A grade of C- or better in E T 377.

Learning Outcomes

1. Demonstrate an understanding of key fundamental concepts of networking.
2. Apply networking concepts to design networks for real-life application scenarios using applicable software.
3. Configure network hardware such as computers, switches, and routers.
4. Troubleshoot, analyze, and solve network problems with applicable software.

E T 480. Innovation and Product Development
3 Credits (3)

Experiential product design and development. Students will learn about different types of innovation, business models, and methods for developing products. Students will apply the scientific method to develop a product idea of their own. Students will propose ideas, develop hypotheses, test hypotheses, and iterate until they have validated their product idea or identified a need to pivot.

Learning Outcomes

1. The student will be able to apply the scientific method to design a product.
2. The student will be able to develop a plan to learn about the Product-Market-Fit of their innovation.
3. The student will be able to describe the basics of Business Models and Product-Market-Fit.

E T 483. Mobile App Programming and Development
3 Credits (3)

Planning and creation of mobile device applications. Programming tools and technical design considerations. Entrepreneurship and App development.
Prerequisite: A grade of C- or better in both, ICT 152 and (E T 377 or ICT 377)), or Consent of Instructor.

Learning Outcomes

1. The student will learn to create a modern and flexible mobile device User Interface using Java
2. The student will develop a high functioning prototype their mobile app
3. The student will implement a business model canvas including development of a customer value proposition and a minimum of one round of customer discovery
4. The student will implement database and information storage using a mobile device
5. The student will implement the developer's dashboard for their mobile app
6. Student will publish and monetize their mobile app

E T 485. White Hat System Testing
3 Credits (3)

System penetration testing and repair. Review of methods utilized to gain access to unprotected systems. Testing system repairs and fixes for future prevention. Test documentation.
Prerequisite: A grade of C- or better in both, ((E T 362 or ICT 362) and (E T 377 or ICT 377)), or Consent of Instructor.

Learning Outcomes

1. The student will practice modern methods for penetration testing
2. The student will demonstrate advanced ethical hacking methods
3. The student will evaluate in-place security systems
4. The student will run-through simulated attacks and system break-ins
5. The student will learn to prepare detailed reports on system vulnerabilities and weaknesses

E T 490. Selected Topics
1-3 Credits

Selected topics in engineering technology and related areas.
Prerequisite: consent of instructor.

E T 505. Special Topics in Information Technology
3 Credits (3)
Contemporary topics in Information Technology Restricted to: M-IT majors. May be repeated up to 9 credits.
Learning Outcomes
1. Various

E T 513. AI Data Center Designs and Technologies
3 Credits (3)
A study of current Artificial Intelligence Data Center Designs and related Networking Technologies. Data Center Architecture designs for optimization of Artificial Intelligence/Machine Learning clusters and networks. Graduate standing or consent of instructor.
Learning Outcomes
1. Apply AI/ML Workloads and Architecture Designs.
2. Evaluate AI/ML Cluster Design Scalability.
3. Create AI Front-end and Back-end Network Designs.
4. Leverage IP Fabric Designs for Dynamic Data Load Balancing.

E T 515. AI and Cybersecurity Risk in Critical Infrastructure Systems
3 Credits (3)
This course explores the role of artificial intelligence in managing cybersecurity risk within critical infrastructure systems, including energy, transportation, manufacturing, and water systems. Students will study how machine learning models can help identify vulnerabilities, detect anomalies, and forecast failure or attack events across complex, distributed OT environments.
Prerequisite: Graduate standing or consent of instructor.
Learning Outcomes
1. Design AI-based monitoring systems for detecting and managing cyber risk in critical infrastructure.
2. Apply ML models to ICS data to identify anomalies, forecast threats, and guide mitigation.
3. Incorporate AI tools into compliance-driven cyber risk management strategies.
4. Critically assess the use of AI in environments where human safety and system availability are paramount.

E T 520. From IT Tech to IT Manager
3 Credits (3)
This course provides the essential knowledge and skills to move from IT technician role to an IT manager role. This course will provide IT management basics and how tech skills are utilized in an IT administrative role.
Learning Outcomes
1. Understand: Explain the key principles and methodologies of IT Management.
2. Apply: IT Strategies and development roadmaps.
3. Analyze: Operations and capacity management.
4. Create: A corporate design for a comprehensive IT staff management plan.

E T 539. Advanced Enterprise Security
3 Credits (3)
This course provides the student with an overview of enterprise cybersecurity and a foundation for understanding the critical issues of protecting digital and information assets. Restricted to: M-IT majors.
Learning Outcomes
1. Demonstrate an understanding of information security concepts and risk management.
2. Demonstrate an understanding of Intrusion Detection and Prevention Systems and Other Security Tools.
3. Demonstrate an understanding of cryptographic techniques.
4. Demonstrate an understanding of authentication methods.
5. Demonstrate an understanding of access control systems.
6. Demonstrate an understanding of various network security controls.
7. Demonstrate an understanding of the legal, ethical, and professional issues in information security.

E T 540. Risk Management for IT Managers
3 Credits (3)
This course provides a comprehensive framework for designing, developing, and implementing an effective cyber risk management program. Students will explore the key principles and practices necessary to manage cyber risks in today's dynamic and challenging environment.
Learning Outcomes
1. Understand: Explain the key principles and methodologies of cyber risk management.
2. Apply: Implement practical insights and real-world examples to manage and mitigate cyber risks.
3. Analyze: Evaluate modern cyber threats and challenges to develop effective risk management strategies.
4. Create: Design a comprehensive cyber risk management plan to establish trust and ensure organizational compliance.

E T 550. AI: Ethics, Privacy, and Governance
3 Credits (3)
This course explores the ethical and privacy challenges that arise when artificial intelligence is applied in scientific research, engineering systems, and real-world decision-making. As AI technologies are increasingly embedded into tools, platforms, and infrastructures across disciplines—from biomedical research and environmental modeling to manufacturing and social systems—the implications for human autonomy, fairness, data protection, and accountability become critically important.
Prerequisite: Graduate standing or consent of instructor.
Learning Outcomes
1. Critically analyze the ethical and privacy implications of AI use in scientific and engineering contexts.
2. Identify and mitigate algorithmic bias, privacy risks, and governance gaps in AI-driven systems.
3. Apply ethical reasoning and privacy-aware design principles to their own research or professional work.
4. Interpret and operationalize regulatory requirements for data use in AI-enabled projects.

E T 551. Enterprise Architecture I
3 Credits (3)
A study of current enterprise architecture methodologies, tools, and techniques. Restricted to: M-IT majors.
Learning Outcomes
1. Demonstrate the ability to utilize and develop architectural enterprise artifacts.
2. Assess multiple enterprise architecture methodologies.
3. Demonstrate IT architecture landscaping capability.
4. Assess integrating IT initiatives utilizing the enterprise architecture processes.

E T 552. Enterprise Architecture II
3 Credits (3)

Advanced topics in enterprise architecture including availability, access, and architecture map development. Restricted to: M-IT majors.
Prerequisite: A grade of C- or better in E T 551.

Learning Outcomes

1. Demonstrate the differences and similarities in multiple enterprise architectures.
2. Demonstrate the ability for independent research on enterprise architectures.
3. Assess architectural artifacts for impact on IT planning and implementation.

E T 555. Virtualization
3 Credits (3)
An analysis and review of system and IT virtualization techniques. Restricted to: M-IT majors.

Learning Outcomes

1. Demonstrate a basic knowledge of the use of Virtual Environments in Information Technology.
2. Demonstrate knowledge in current software used to manage virtual environments.
3. Demonstrate the ability to architect virtual system networks and topology.
4. Students will be exposed to emerging technologies used in complex virtual network design.
5. Students will have the tools to select and deploy need based virtual environments.

E T 560. Strategic Leadership for IT Managers
3 Credits (3)
This course explores the role of IT leaders in shaping and executing business strategy.

Learning Outcomes

1. Analyze the roles and responsibilities of IT leaders to understand their impact on organizational success.
2. Evaluate Strategic IT Governance frameworks and integrate IT initiatives with strategic planning to align with organizational goals.
3. Critically assess case studies and real-world projects to develop practical skills in leading IT departments and managing projects effectively.
4. Design strategies that leverage IT to optimize systems and processes, and manage business relationships to enhance organizational efficiency.

E T 562. Development and Operations
3 Credits (3)
Software development including Python scripting. Operations programming. Restricted to: M-IT majors.

Learning Outcomes

1. Demonstrate a basic knowledge of Operations Management and it's relationship to DevOps.
2. Demonstrate knowledge in current software used in DevOps.
3. Apply DevOps practices to a software deployment workflow.
4. Demonstrate the ability to define a Continuous Integration pipeline with automated testing.
5. Students will apply the continuous feedback principles to project monitoring.
6. Apply best practices to build security into DevOp projects.

E T 577. Advanced Computer Networking
3 Credits (3)
Advanced networking design and analysis. Modernization of infrastructures. Restricted to: M-IT majors.

Learning Outcomes

1. Identify and classify communication network problems.
2. Devise and propose solutions to real-life problems that require communication network technology.
3. Capture network traffic with Wireshark protocol Analyzer.
4. Analyze network traffic with Wireshark protocol Analyzer.
5. Troubleshoot basic network issues.
6. Identify, differentiate, and use IPv4 and IPv6 schemes for address allocation in network design.
7. Apply different techniques to mitigate Quality of Service (QoS) issues in Communication networks.
8. Describe and discuss the evolution of communication network concepts and state of the art in modern communication networks such as Network Virtualization, Software Defined Networks, Cloud computing, Internet of Things, and 5G.

E T 580. IT Innovation and Product Development
3 Credits (3)
Experiential product design and development in information technology. Students will learn about different types of innovation, business models, and methods for developing products. Students will apply the scientific method to develop a product idea of their own related to their field of study. Students will propose ideas, develop hypotheses, test hypotheses, and iterate until they have validated their product idea or identified a need to pivot. Experience in industry and student perspectives are discussed to support the development of their innovations.

Learning Outcomes

1. The student will be able to apply the scientific method to design a product, software, or service.
2. The student will be able to develop a plan to learn about the Product-Market-Fit of their innovation.
3. The student will be able to describe the basics of Business Models and Product-Market-Fit.
4. The student will be able to explain how course concepts relate to the field of information technology.

E T 583. Mobile App Programming and Development
3 Credits (3)
Planning and creation of mobile device applications. Programming tools and technical design considerations. Entrepreneurship and App development. Restricted to: M-IT majors.

Learning Outcomes

1. Demonstrate a basic knowledge of Mobile App development architecture and planning.
2. Demonstrate knowledge in current software used in the creation and maintenance of Mobile Apps.
3. Apply Mobile App software deployment workflow best practices.
4. Demonstrate the ability to create automated multi-form factor user interfaces.
5. Apply best practices to mobile device UI design interfaces.

E T 584. Cyber Threat Intelligence
3 Credits (3)
This course explores the identification, analysis, and application of cyber threat intelligence to enhance security operations. Students will examine threat actors, attack techniques, and intelligence frameworks while learning to collect, assess, and communicate actionable threat data. Through hands-on exercises and case studies, students will develop

proactive defense strategies and integrate intelligence into cybersecurity decision-making.

Learning Outcomes

1. Analyze cyber threats, threat actors, and attack techniques to assess risk and potential impact.
2. Utilize cyber threat intelligence frameworks and methodologies to collect, process, and analyze threat data.
3. Develop intelligence reports that provide actionable insights for security operations and decision-making.
4. Evaluate the effectiveness of various threat intelligence sources, tools, and platforms in real-world security applications.
5. Design proactive defense strategies that integrate cyber threat intelligence to enhance an organization's security posture.

E T 585. White Hat System Testing
3 Credits (3)

System penetration testing and repair. Review of methods utilized to gain access to unprotected systems. Testing system repairs and fixes for future prevention. Test documentation. Restricted to: M-IT majors.

Learning Outcomes

1. Describe cryptology.
2. Identify common information-gathering tools and techniques.
3. Perform system hacking, and web and database attacks.
4. Analyze vulnerabilities exploited by hackers.
5. Identify common types of malware and the threats they pose.
6. Perform network traffic analysis and sniffing by using appropriate tools.
7. Identify security controls and defensive technologies.

E T 595. Capstone Projects in Information Technology
3 Credits (3)

Capstone course. Practical application of student's cumulative Information Technology knowledge to an assigned design projects. Project management skills.

Learning Outcomes

1. Demonstrate ability to manage complex work-related IT technical projects.
2. Demonstrate the ability to create an IT engineering project timeline.
3. Demonstrate the ability to self-motivate and organize project timeline.
4. Demonstrate the ability to work in teams and execute project.
5. Demonstrate advanced project goal setting, skills assessment, and weekly updates.

Information and Communication Technology Courses

ICT 141. IT Essentials I: A+ Certification Training Focused on the Hardware Exam
3 Credits (3)

Installing, configuring, troubleshooting, and maintaining personal computer hardware components and will assist in preparation for the CompTIA A+ Hardware certification.

Learning Outcomes

1. Configure and support PC, mobile, and IoT device hardware.
2. Perform basic computer diagnostic and maintenance operations.
3. Implement basic data backup and recovery methods.
4. Apply basic hardware maintenance best practices.
5. Demonstrate baseline security practices for hardware.

ICT 145. Network Essentials: N+ Certification Training
3 Credits (3)

Focuses on the installation and administration of network communication systems and will assist in preparation for the CompTIA N + Network certification.

Learning Outcomes

1. Explain basic networking concepts including network services, physical connections, topologies, and architecture.
2. Explain security concepts and network attacks in order to harden networks against threats.
3. Explain routing technologies and networking devices; deploy Ethernet solutions and configure wireless technologies.
4. Troubleshoot common cable, connectivity, and software issues related to networking.
5. Monitor and optimize networks to ensure business continuity.

ICT 152. Java Programming
3 Credits (3)

Programming in the Java language.

Learning Outcomes

1. Set up a rich programming environment.
2. Analyze existing code.
3. Create/modify/debug/test programs.
4. Employ software documentation and programming best practices.

ICT 161. IT Essentials II: A+ Certification Training focused on the Software exam
3 Credits (3)

Installing, configuring, troubleshooting, and maintaining personal computer operating systems and will assist in preparation for the CompTIA A+ Software certification.

Prerequisite: A grade of C- or better in ICT 141.

Learning Outcomes

1. Configure device operating systems, including Windows, Mac, Linux, Chrome OS, Android, and iOS.
2. Administer client-based and cloud-based software.
3. Troubleshoot and problem-solve core service and support challenges.
4. Apply best practices for documentation, change management, and scripting.
5. Support basic IT infrastructure and networking.

ICT 220. Discrete Math and Its Relationship to Information Technology
3 Credits (3)

Focuses on developing software coding skills using a programming language and its application to discrete mathematics, the use discrete structures in computer science. Topics included are logic, sets, relations, functions, methods of proof, recursion, combinatorics, graph theory, and algorithms

Prerequisite: A grade of C- or better in MATH 1220G or higher.

Corequisite: ICT 152.

Learning Outcomes

1. Explain the relationship between discrete math sets and coded arrays, finite and infinite, subsets, intersection, unions, and other set operations.
2. Explain binary Trees and know how to use demonstrate them using code.
3. Demonstrate the use of code applied to group and subgroup theory.
4. Demonstrate the use of code to create functions and algorithms.
5. Identify and explain logical operations and their application in coding.

6. Demonstrate the use of Probability Theory in code to predict random outcomes.

ICT 267. Information Security+ Certification Preparation
3 Credits (3)
The course covers the Sec+ exam objectives and detailed preparation for certification in information security.
Prerequisite: A grade of C- or better in both, ICT 141 and ICT 145.
Learning Outcomes
1. The student will select appropriate mitigation and deterrent techniques to address network attacks and vulnerabilities.
2. The student will examine how access control, identity management, and cryptography can secure a network and manage risk.
3. The student will identify privacy and policy issues.
4. The student will apply activities that an Information Systems Security specialist would normally carry out in the performance of his/her duties.

ICT 280. Introduction to Web Development
3 Credits (3)
Introduction to front-end web development including webpage design, structure, layout, positioning, responsiveness, and foundational layers of how the web works.
Learning Outcomes
1. Explain the Document Object Model of HTML5 web pages.
2. Organize web page contents with Lists, figures, and organizational elements.
3. Develop web page layout templates.
4. Implement style application inline, via style blocks, and using external resources.
5. Develop and apply javascript event-driven programming to web pages.
6. Explain the difference between client and server-side scripting and data processing.

ICT 300. Special Topics
3 Credits (3)
Directed study or project. Students must be in Junior standing and have the consent of department head to enroll. May be repeated up to 3 credits.
Learning Outcomes
1. Various.

ICT 320. Introduction to Internet Protocols
3 Credits (3)
Present a overview of Internet Protocols Applications. Students must be in Junior or Senior standing only.
Learning Outcomes
1. Students will apply an understanding of basic Networking.
2. Students will employ effective use of Packet analysis software to troubleshoot network issues.
3. Explain the RFC process for developing network protocols.
4. Explain network protocol security implications.

ICT 339. Introduction to Digital Forensics and Incident Response
3 Credits (3)
Introduction to the skills required to perform digital forensics and incident response on Windows operating systems. Topics include: live response, evidence acquisition, Windows operating system artifacts, documentation and reporting.
Prerequisite: A grade of C- or better in ICT 141 or ICT 161.
Learning Outcomes
1. To understand Digital Forensics terms and definitions and why digital forensics is needed.
2. To study what is required and how to perform digital forensics.
3. To become familiar and aware of the hindrances/obstacles that affects effective digital/computer forensic operations.
4. To learn about the tools and procedures for how deleted data is recovered during digital forensic operations.
5. To use forensic tools and procedures to perform digital forensic operations on Windows operating systems, Emails, Mobile devices, and Communication networks (Computer, wireless, cellular networks).
6. To learn about incident response and procedures.

ICT 350V. Introduction to Personal Computer Security and Privacy
3 Credits (3)
Introduction to Information Security and Privacy – Have you ever wondered what happens to all of your browsing history or data you fill out on websites go? Who has this data? What do they do with this data? How do you stop sharing your private information? This class will answer those questions and provide steps to make your online presence more secure.
Learning Outcomes
1. Classify security issues
2. Classify Privacy protections
3. Evaluate threats and countermeasures based on personal security breaches.
4. Formulate a real-time privacy response
5. Assess international privacy protections through a multicultural focus.

ICT 352. Software Technology I
3 Credits (3)
This course focuses on reading, writing, debugging, testing, and documenting computer programs. May be repeated up to 3 credits.
Learning Outcomes
1. Set up a rich programming environment
2. Analyze existing code
3. Create/modify/debug/test programs
4. Employ software documentation and programming best practices

ICT 355. Linux System Administration
3 Credits (3)
Operating systems applications and interfacing with an introduction to systems administration. Topics include Shell Programming, Programming Tools, Database Management, System Backups, Security, Setup, and Maintenance of Linux Servers.
Learning Outcomes
1. Create a virtual environment on a host system using VirtualBox.
2. Develop single and multiple Linux Operating Systems within The VirtualBox Virtual Environment.
3. Select applications on production Linux Operating systems.
4. Support the operation of the Linux Operating system using System Administration Techniques.

ICT 360. Operating Systems for ICT
3 Credits (3)
Fundamentals of operating systems with Windows and Linux including installation and configuration using the GUI as well as the command line, text editors, file systems, scripting and operating system management.

Learning Outcomes

1. Create a virtual environment on a host system using VirtualBox.
2. Create multiple Operating Systems in a Virtual Environment.
3. Manage error codes in Virtual Machines.
4. Support the operation of the CentOS GUI and Windows Operating Systems.

ICT 362. Software Technology II
3 Credits (3)
Topics include problem analysis, object-oriented programming (OOP), structured logic, and development concepts. May be repeated up to 3 credits.
Prerequisite: A grade of C- or better in ICT 152 or ICT 352 or E T 262 or OECS 195 or C S 152 or C S 172.
Learning Outcomes

1. Set up and use a rich programming environment for programming with Python.
2. Analyze existing code.
3. Employ effective use of basic programming and basic troubleshooting.
4. Employ effective use of Object-Oriented Programming (OOP) and troubleshooting.
5. Apply testing and documentation best practices.

ICT 364. Windows Enterprise Administration
3 Credits (3)
Installation, configuration, and maintenance of Windows Enterprise services which includes Active Directory, distributed file systems, SQL Server, Web Server, Authentication Procedures, and enterprise elasticity. Topics covered include: Server Maintenance and Troubleshooting Methodologies.
Prerequisite: A grade of C- or better in ICT 152.
Learning Outcomes

1. Set up and use a Windows Enterprise environment with Active Directory.
2. Use best practices to design an organizational structure and define AD DS Objects.
3. Deploy an AD DS embedded DHCP server with IPv4, IPv6, and Failover.
4. Analyze and use PowerShell code for process automation.
5. Deploy security and user settings using Group Policy.
6. Apply version updates and establish an intra-forest trust relationship.

ICT 372. Software Engineering and Design
3 Credits (3)
Topics include the software development lifecycle, problem analysis, and implementing software testing routines to improve the quality, integrity, and security of code.
Prerequisite: A grade of C- or better in ICT 362.
Learning Outcomes

1. Identify, explain, and apply the phases of the SDLC.
2. Identify different Agile methodologies and practices for software project management.
3. Use different development tools and apply best practices.
4. Apply best practices in the creation of business objects, data storage and access, testing, and debugging.
5. Configuring, handling, testing, and deploying services.

ICT 377. Computer Networking I
3 Credits (3)
Computer network design and applications for LAN, TCP/IP networks, routing and switching technologies, VLANs, and the OSI layers from physical to transport.
Prerequisite/Corequisite: A grade of C- or better MATH 1220G or higher.
Learning Outcomes

1. Define and distinguish the role of a network administrator (from other roles in the IT world).
2. Identify the OSI model, its layers, and the relationship to the TCP/IP model.
3. Identify different cable media and networking devices and their use.
4. Design, configure and troubleshoot basic networks.
5. Identify MAC, IPvfour, and IPvsix addressing.
6. Apply different techniques for IP allocation and subnet design (IPvfour).
7. Use the Cisco IOS software for basic switch and router configurations.
8. Configure and troubleshoot basic setup for static and dynamic routing protocols.

ICT 380. Web Design and Multimedia
3 Credits (3)
Introduction to front-end web development including webpage design, structure, layout, positioning, responsiveness, and foundational layers of how the web works. Video, audio, and other digital presentation tools are covered.
Learning Outcomes

1. Create multiple front-end development micro-components.
2. Create single and multi-page websites.
3. Use flexbox, grid, and media queries and different design patterns.
4. Employ effective use of web development and basic troubleshooting.
5. Build small web site projects.

ICT 400. Special Topics
1-3 Credits (1-3)
Directed study or project. Students must be in Senior standing and have the consent of department head to enroll. May be repeated up to 6 credits.
Learning Outcomes

1. Various.

ICT 435. Senior Project
3 Credits (3)
Capstone course. Practical application of student's cumulative knowledge to an assigned design project. Design principles, teamwork, and project management skills are stressed. Demonstration of written and oral communication skills via project documentation and presentation of results. Must be graduating senior. Consent of Instructor required. Restricted to ICT Majors.
Prerequisite: A grade of C- or better in the following: ICT 364 and ICT 377 and (ICT 462 or ICT 355).
Learning Outcomes

1. Demonstrate ability to manage a complex technical project.
2. Demonstrate the ability to create an engineering project timeline.
3. Demonstrate the ability to self-motivate and organize project.
4. Demonstrate the ability to work in teams and execute project.
5. Goal setting, skills assessment and portfolio development included.

ICT 439. Advanced Digital Forensics and Incident Response
3 Credits (3)

Advanced topics in digital forensics and incident response. Topics include network analysis and advanced cybersecurity concepts.
Prerequisite: A grade of C- or better in both, (E T 339 or ICT 339 or ICT 450) and (E T 377 or ICT 377).

Learning Outcomes

1. Demonstrate the use of forensic tools and procedures to perform digital forensic operations on Windows operating systems, Emails, Mobile devices, and Communication networks (Computer, wireless, cellular networks).
2. Demonstrate proper incident response procedures and proper chain of custody when handling digital evidence.
3. Students will become familiar with tools and processes to analyze and detect memory resident processes that include malware, rootkits, and user recoverable data.
4. Students will also have exposure to methods and processes used by hackers to penetrate and compromise targets.

ICT 450. Ethical Hacking
3 Credits (3)
Ethical Hacking and Penetration testing techniques. Students must be in senior standing to enroll.
Prerequisite: A grade of C- or better in ICT 350V.

Learning Outcomes

1. Analyze networking concepts as they relate to hacking vulnerabilities.
2. Define contract requirements necessary to avoid legal liability during Ethical Hacking.
3. Employ tools and techniques to scan and do reconnaissance on potential targets.
4. Demonstrate use of vulnerability testing tools to identify vulnerabilities and exploits.
5. Identify the role of sniffers and session Hijacking in Ethical Hacking.
6. Demonstrate the use of Social Engineering tools and techniques used in Ethical Hacking.

ICT 457. Information Security Principles
3 Credits (3)
This course provides an overview of security challenges and strategies of countermeasure in the information systems environment. Topics include definition of terms, concepts, elements, and goals incorporating industry standards and practices with a focus on availability, vulnerability, integrity and confidentiality aspects of information systems.
Prerequisite: A grade of C- or better in ICT 350V.

Learning Outcomes

1. Demonstrate an understanding of the information security concepts.
2. Demonstrate an understanding of the diversity of potential attacks against an organization.
3. Demonstrate an understanding of cryptographic techniques.
4. Demonstrate an understanding of authentication methods.
5. Demonstrate an understanding of access control systems.
6. Demonstrate an understanding of various network security controls.
7. Demonstrate an understanding of the legal, ethical, and professional issues in information security.

ICT 458. Web Development and Database Applications
3 Credits (3)
Design, plan, and build interactive and dynamic web applications. Topics include relational databases, object-oriented programming, and the application of backend frameworks.
Prerequisite/Corequisite: A grade of C- or better in ICT 362.

Learning Outcomes

1. Build knowledge of Web Servers.
2. Plan, design, and create code for backend web development.
3. Design, create, and access databases that support web applications.
4. Implement adequate security and authentication for the deployment of Web applications.

ICT 460. Advanced Software Development Concepts
3 Credits (3)
This course focuses on advanced software development concepts to help embed security into code, protecting software applications.
Prerequisite: A grade of C- or better in ICT 362.

Learning Outcomes

1. Application of best practices against software vulnerabilities.
2. Identification of code defects, bugs, and logic flaws.
3. Assessment and testing of code.
4. Utilization of secure code alternatives.
5. Code refactoring to improve design and structure and prevent vulnerabilities.

ICT 462. Linux System Administration
3 Credits (3)
Operating system applications and interfacing with an introduction to systems administration. Topics include Shell Programming, Programming Tools, Database Management, System Backups, Security, Setup and Maintenance of Linux Servers.

Learning Outcomes

1. Create a virtual environment on a host system using VirtualBox.
2. Develop single and multiple Linux Operating Systems within The VirtualBox Virtual Environment.
3. Select applications on production Linux Operating systems.
4. Support the operation of the Linux Operating system using System Administration Techniques.

ICT 463. Enterprise Linux Network Administration Tools
3 Credits (3)
Advanced methods and tools used to deploy, manage, and administer networked devices.
Prerequisite: A grade of C- or better in ICT 377.

Learning Outcomes

1. Demonstrate the ability to use Software Versioning systems using Windows and Linux.
2. Apply best practices with versioning repositories when creating software.
3. Deploy single and clustered microservice containers to support a web application.
4. Use script-based code to deploy and configure a full stack web server.
5. Use infrastructure management software to deploy defined roles in multiple environments.

ICT 467. Communication Network Security
3 Credits (3)
The course provides a technical perspective on maintaining the security of communication network systems. It covers a wide range of technical issues, including wired, wireless and Internet communication fundamentals, communication network security mechanisms and configuration, standards and protocols, vulnerabilities, attacks and countermeasures.
Prerequisite: A grade of C- or better in both, ICT 320 and ICT 377.

Learning Outcomes

1. Demonstrate an understanding of key and basic communication network security concepts, terminologies, standards, issues, and policies.
2. Apply the principles of network security techniques such as Cryptography, Cryptanalysis, Biometrics, Watermarking, and Stenography.
3. Implement security techniques with commonly available network security software.
4. Examine the fundamentals of Wired and Wireless communication network systems including Cellular, Bluetooth, Wi-Fi, Internet, Cloud Networking, and the Internet of Things.
5. Explain the TCP/IP security protocols that pertain to communication network systems.
6. Explain the security attacks, threats, risks, mechanisms, and tools associated with and used for securing network devices especially mobile devices.
7. Demonstrate an understanding of the operation and countermeasures against Malwares in network systems and the implementation of intrusion detection and prevention, and firewall technologies.

ICT 477. Computer Networking II
3 Credits (3)
Advanced concepts in computer network design and applications including managing the campus network infrastructure (LANs and virtual LANs), network services (DNS and DHCP), network security as well as network monitoring.
Prerequisite: A grade of C- or better in either ICT 377 or E T 377 or CTEC 285.
Learning Outcomes

1. VLSM, Summarization, and the TCP/IP model.
2. Understanding of IPvsix basics
3. Configuration of routing protocols using IPvsix
4. Configuration of advanced router configurations
5. Configuration of route redistribution, DHCP, DNS, NAT and PAT
6. Configure network security and Access Control Lists (ACLs)
7. Perform basic analysis of network data traffic
8. Create, test and troubleshoot software simulations (Cisco Packet Tracer)

ICT 487. Data Security
3 Credits (3)
Delving into the realm of advanced data security is the essence of this senior-level undergraduate course. Students will immerse themselves in the intricacies of safeguarding digital information by covering an array of topics, from encryption to secure data transmission, and extending to secure data storage and data security in use. The course takes a comprehensive approach, encompassing three key domains of data security: data in motion, data at rest, and data in use. Throughout the journey, students will grasp the technical and theoretical underpinnings of data security and cultivate practical, hands-on expertise in fortifying data against vulnerabilities.
Prerequisite: A grade of C- or better in both, ICT 320 and ICT 360.
Learning Outcomes

1. Understand the fundamental concepts of data security, including data in motion, data at rest, and data in use.
2. Explore encryption algorithms and their applications in data security.
3. Evaluate the importance of secure communication protocols in data transmission.
4. Develop skills in secure data storage and backup techniques.
5. Analyze various security architectures, such as network security, cloud security, and mobile security.

Surveying Engineering (Geomatics) Courses

SUR 143. Civil Drafting Fundamentals
3 Credits (2+2P)
Introduction to drafting in the field of Civil Engineering. Drawings, projects, and terminologies related to topographic, contour drawings, plan and profiles, and street/highway layout. Restricted to Community Colleges only. Taught with E T 143 and DRFT 143.
Prerequisite: DRFT 109.
Learning Outcomes

1. Use appropriate drafting/technical terminology.
2. Identify of the different types of Civil Engineering work drawing plan sets.
3. Understanding and the use of the terminologies used in the industry.
4. Use AutoCAD Civil 3D.
5. Enter appropriate data into AutoCAD software in order to retrieve necessary outcomes.
6. Plot/Print different types of civil engineering working plans.
7. Read, interpret and understand engineering drawings.
8. Define and understand the different types of engineering drawings.

SUR 222. Introduction to Geomatics
3 Credits (2+3P)
Theory and practice of geomatics as applied to plane surveying in the areas of linear measurements, angle measurements, area determination, differential and trigonometric leveling, and topographic mapping.
Prerequisite: A grade of C- or better in both, E T 109 and (MATH 1250G or higher).
Learning Outcomes

1. Perform basic distance and angular measurements.
2. Evaluate the quality of collected measurements.
3. Utilize a measuring tape.
4. Determine a plumb line.
5. Set up a level line.
6. Set up a tripod and total station.
7. Utilize a plumb rod.
8. Understand the role of surveying in civil engineering and construction-related fields.
9. Understand new technologies is surveying.

SUR 285. Precise Digital Mapping
3 Credits (3)
Photogrammetric Mapping Principles, digital sensor including optical cameras, terrestrial, surveying control, IMU & GPS integration, stereo photography, analytical triangulation, orthorectification, precision and accuracy of measurement systems, sUAS (Small Unmanned Aerial Vehicles) data collection project fight/pre planning, introduction to laser scanning systems.
Learning Outcomes

1. Understand the basic principles of photogrammetry.
2. Perform photo measurements and computation.

3. Be able to design aerial surveying projects.
4. Define the basic principles of analytical photogrammetry.
5. Explain the different steps in aerial triangulation.

SUR 292. Legal Principles and Boundary Law I
3 Credits (3)
Fundamentals of real property law; principles of land description; survey evidence and procedure in boundary determination, order of importance of conflicting elements; liability, ethical and professional principles in boundary surveying; NM professional practice act; NM Minimum Standards, contemporary issues in boundary determination.
Prerequisite: C- or better in SUR 222.
Learning Outcomes
1. Demonstrate an understanding of surveying boundary laws.
2. Describe procedures for locating real property boundaries.
3. Read, interpret, and write legal descriptions of real property.
4. Perform legal research of case and statutory law.
5. Communicate research findings through written and oral presentations.

SUR 312. Public Land Survey System Boundaries
3 Credits (3)
Fundamentals of the U.S. Public Land Survey System; rules for the survey of the public lands, field surveys; the rectangular system, corners, monuments, evidence; dependent and independent resurveys, corner restoration; plats and field notes, patents.
Prerequisite: A grade of C- or better in SUR 222.
Learning Outcomes
1. Understand how the USPLSS was developed and used.
2. Develop the ability to locate and identify USPLSS survey monuments.
3. Recognize the need for restoring lost corners and apply proportionate methods.
4. Perform computations for simple PLSS section subdivisions.
5. Demonstrate an ability to read, write and interpret USPLSS legal descriptions.

SUR 315. Advanced Mapping Technologies
2 Credits (2)
Advanced applications of airborne sUAS (Small Unmanned Aerial Vehicles) in 3D data acquisition, sensor specifications, selection, and platform compatibility. Principles of lidar data collection, airborne and terrestrial. LiDAR data processing including registration, modeling, and analysis. Point cloud principles, processing, and applications. DEMs principles, processing and analysis. Principles and applications of GPR in surveying.
Prerequisite: SUR 285 and Junior Standing.
Corequisite: SUR 315L.
Learning Outcomes
1. Identify the basic principles and applications of advanced mapping technologies.
2. Compare and contrast different UAS-based aerial surveying techniques for 3D data acquisition principles and applications of Ground Penetrating Radar (GPR).
3. Process, analyze, and interpret point clouds and DEMs.
4. Recognize the principles of terrestrial LiDAR data collection.
5. Explain the principles and applications of Ground Penetrating Radar (GPR).

SUR 315L. Advanced Mapping Technologies Lab
1 Credit (1P)
Hands-on application of using optical and LiDAR UASs in surveying and mapping. Design and conduct UAV surveys, including flight planning and pre-planning with an understanding of sensor limitations, control point configuration, and FAA regulations and restrictions. Applications of terrestrial scanners in collecting accurate 3D models. Process, analyze, and visualize different types of point clouds.
Prerequisite: SUR 285.
Corequisite: SUR 315.
Learning Outcomes
1. Identify lab safety, workflow overview, and liability considerations.
2. Apply UAS technologies in surveying and mapping projects through hands-on flight operations.
3. Develop 3D point clouds for surveying, engineering, and mapping applications.

SUR 328. Construction Surveying & Automation Technologies
3 Credits (2+3P)
Construction Surveying Principles: conventional and machine controlled. Layout alignments, grades, various infrastructure, buildings. Understand error identification, common quality control checks and blunder identification. Alignments and station/off set, types of construction layout of infrastructure: roads, bridges, utilities (including subsurface), buildings, industrial; reading and interpreting construction plans, data management, horizontal, vertical and spiral curves, slope staking, machine control basics, applications and data managements. Use of electronic files and liability issues. Layout alignments, grades, various infrastructure, buildings. Ability to understand data integration in automated machine control, work flow processes.
Prerequisite: A grade of C- or better in both, (SUR 222 or DRFT 222) and (ENGR 190 or MATH 1511G or MATH 1511H).
Learning Outcomes
1. Acquire the ability to answer test questions on professional surveying exams.
2. Develop the ability to appropriately collect, analyze, interpret and apply surveying and surveying-related data.
3. Develop the ability to recognize, analyze, and solve surveying and surveying-related problems.
4. Develop the ability to work on teams.

SUR 328L. Construction Surveying & Automation Technologies Lab
1 Credit (1P)
Hands-on application of surveying equipment such as GNSS and total stations to perform construction stakeout for different types of construction layouts, including buildings, horizontal and vertical alignments. Reading and interpreting construction plans. Integrating machine-controlled surveys in different applications.
Prerequisite: A grade of C- or better in both, (SUR 222 or DRFT 222) and (ENGR 190 or MATH 1511G or MATH 1511H).
Corequisite: SUR 328.
Learning Outcomes
1. Identify lab safety, workflow overview, and liability considerations.
2. Apply surveying technologies in construction stakeout.
3. Recognize different forms of construction plans.

SUR 351. Spatial Data Adjustment I
3 Credits (3)
Theory of random error in observations/measurements. Use of statistics in spatial data analysis, statistical testing, advanced data structures. Emphasis on computer based problem solving and programming to solve spatial data problems.

Prerequisite: A grade of C- or better in the following: (SUR 222 or DRFT 222) and (A ST 311G or MATH 1350G) and (ENGR 190 or MATH 1511G or MATH 1511H).

Learning Outcomes

1. Acquire the ability to answer questions on professional surveying exams.
2. Acquire a sound and fundamental understanding of the mathematical principles underlying surveying measurements and computations.
3. Develop the ability to appropriately analyze, interpret, and apply survey and survey-related data.
4. Develop the ability to recognize, analyze, and solve survey and survey-related problems.

SUR 361. Geodesy/Geodetic Control Surveying
3 Credits (3)

Horizontal and vertical control network design and consideration. Understand ellipsoid, geoid, horizontal and vertical datum, coordinates, precise leveling, astronomic, establishment of state plane zones, understanding reporting. Transform data between geodetic Latitude/Longitude, state plane, ground data, perform geodetic computations, ability to design GPS networks utilizing CORS stations, network adjustments. Perform a control survey, process data, adjust network, and prepare control report with Meta-data.

Prerequisite: A grade of C- or better in the following: (SUR 222 or DRFT 222) and (ENGR 190 or MATH 1511G or MATH 1511H).

Learning Outcomes

1. Define the different coordinate systems and geometric models used to represent the shape of the Earth.
2. Be able to perform surveying computations on the sphere and ellipsoid.
3. Distinguish between the different map projections systems.
4. Explain the effects of gravity in survey measurements, especially in precise leveling.
5. Outline how earth motions affect surveying measurements and the different time systems.
6. Explicitly indicate which of the student outcomes listed in Criterion III or any other outcomes are addressed by the course.

SUR 401. Ethics and Professionalism in Surveying and Mapping
3 Credits (3)

Ethics as applied to the surveying profession. Includes case studies and problems. May be repeated up to 3 credits.

Learning Outcomes

1. An ability to communicate effectively with a range of audiences.
2. An ability to understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts.

SUR 412. Advanced Topics in Boundary Surveying
3 Credits (2+3P)

Advanced land boundary topics including water boundaries, mineral claims, Spanish and Mexican land grants, state and national boundaries. May be repeated up to 3 credits.

Prerequisite: A grade of C- or better in SUR 312.

Learning Outcomes

1. Identify land boundary topics

SUR 440. Geomatics Laboratories
2 Credits (6P)

Layout alignments, grades, various infrastructure, buildings. Performing GNSS surveys including RTK, rapid-static, static data collection and processing. Laser scanning and photogrammetric data collection and processing. Surveying applications in the U.S. Public Land Survey System (PLSS).

Prerequisite: A grade of C- or better in, SUR361, (SUR 222 or DRFT 222) and (MATH 1435 or MATH 1511G).

Prerequisite/Corequisite: SUR 328 and SUR 461.

Learning Outcomes

1. An ability to develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions.
2. An ability to communicate effectively with a range of audiences.
3. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.

SUR 450. Senior Project
3 Credits (3)

Research project prepared by student. Includes class presentation. Students will learn how to research after the end of their formal education. Students must be in Senior Standing to enroll.

Learning Outcomes

1. An ability to identify, formulate, and solve broadly defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the discipline.
2. An ability to formulate or design a system, process, procedure or program to meet desired needs.
3. An ability to develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions.
4. An ability to communicate effectively with a range of audiences.

SUR 451. Spatial Data Adjustment II
3 Credits (3)

Rigorous analysis of the theory of observations as applied to spatial data, application of least squares adjustments, ability to perform statistical analysis to determine accuracy of final product, constrained/free geospatial data integration, error ellipses, and pre-analysis of spatial data acquisition procedures.

Prerequisite: A grade of C- or better in SUR 351.

Learning Outcomes

1. Understand the theory of least squares as applied to survey measurements
2. Understand the relevance of weighting survey observations
3. Be able to adjust vertical, horizontal and 3D networks by least squares
4. Be able to transform coordinates between similar coordinate systems
5. Be able to analyze survey errors and detect survey blunders

SUR 452. Surveying Practicum
3 Credits (3)

Surveying practice under the direction of a licensed, professional land surveyor requiring an approved number of hours. Planned work between the student and the surveyor should be designed to be part of a project that integrates spatial data. An individualized syllabus should be developed collaboratively with the industrial partner and approved by the geomatics faculty. The final deliverable must be certified by the licensed professional land surveyor. A written report by the student is required. Credit is given to past work experience in cases where students can demonstrate that requirements for the practicum are met and should be approved by geomatics faculty.

Learning Outcomes

1. Demonstrate a level of technical competency, based upon completing the requirements of a geomatics technology curriculum.
2. Students are expected to successfully and professional complete a "real" project. Additionally, student work is employed to assess most of the program's outcomes for program assess.

SUR 461. GNSS Positioning
2 Credits (2)
Logistics of GNSS data collection, the GPS signal, codes and biases, error sources, differences between relative and autonomous GNSS positioning, code phase carrier phase, DGPS static and RTK surveys. Geodetic and GPS standards and specifications GNSS data processing, network adjustments, and evaluation of spatial data accuracy practical applications of GNSS.
Prerequisite: A grade of C- or better in SUR 361.
Corequisite: SUR 461L.
Learning Outcomes

1. Outline the relationship of geodesy to satellite positioning systems.
2. Describe the procedure of GNSS surveys.
3. Differentiate between different GNSS surveying techniques.
4. Identify GPS standards and specifications.

SUR 461L. GNSS Positioning Lab
1 Credit (1P)
Hands-on experience using different types of surveying-grade GNSS equipment in collected geospatial data for surveying and engineering applications. Mastering field procedures, understanding equipment functionality, and learning to process and evaluate real-world GNSS data. May be repeated up to 3 credits.
Prerequisite: A grade of C- or better in SUR 361.
Corequisite: SUR 461.
Learning Outcomes

1. Identify lab safety, workflow overview, and liability considerations.
2. Conduct different types of GNSS surveys for mapping and engineering applications.
3. Assess the quality and reliability of spatial data collected by different GNSS surveying techniques.

SUR 464. Legal Principles and Boundary Law II
3 Credits (3)
Advanced boundary determination, evaluation of written and field evidence. Advanced application of PLSS subdivision, special surveys (water, mineral, and reservations), NM Standards, and laws. Preparation of boundary survey plats and reports. ALTA/NSPS Surveys and Standards.
Prerequisite: A grade of C- or better in both, SUR 292 and SUR 312.
Learning Outcomes

1. Application of the rules of evidence as concerning to boundary surveys.
2. Demonstrate understanding between original, resurveys, and retracements.
3. Acquire the ability to perform advanced section subdivisions.
4. Understand the issues of professional liability and ethical practice.

SUR 485. Emerging Techniques in Geospatial Technologies
3 Credits (3)
Hydrographic, Altimetry, Space borne Imaging Systems, Mobile Mapping Systems, Mining and Agriculture Surveying Principles, Ranging technologies and applications such as LiDAR, SAR, and Bathymetry. Principles of terrestrial & airborne laser scanning, point cloud data management & extraction, scan registration and processing, and advanced ranging data acquisition systems. Consent of Instructor required.
Prerequisite(s): Senior standing.
Learning Outcomes

1. Outline the different techniques in mapping seabed.
2. Describe the procedure of LIDAR mapping.
3. Outline the remote sensing technologies used in mapping.
4. Recognize the UAV mapping technologies.
5. Produce surveying products from new technologies in geomatics.