ENGINEERING TECHNOLOGY AND SURVEYING ENGINEERING

Undergraduate Program Information

Educational opportunities offered by the Department of Engineering Technology and Survey Engineering (ETSE) in the College of Engineering place an emphasis on the theory and practical hands-on application of engineering principles and methods, under the motto of “linking theory and application”. Many ETSE graduates go on to earn advanced degrees but most typically begin their careers upon graduation and can select from public or private employment opportunities in a wide variety of fields.

Four ABET www.abet.org accredited four-year Bachelor of Science (BS) degrees in Engineering Technology are offered by the department with majors in:

- Civil Engineering Technology (CET) - Visit the CET webpage. Want to learn more?
- Electronics and Computer Engineering Technology (ECET) - Visit the ECET webpage;
- Information Engineering Technology (IET) - Visit the IET webpage;
- Mechanical Engineering Technology (MET) - Visit the MET webpage;

An ABET accredited four-year Bachelor of Science (BS) degree in Geomatics is offered by the department.

Two Bachelor’s degrees are also offered via a two-year degree completion programs for transfer students or for students interested in starting the degree at NMSU. The Geomatics and the Information and Communications Technology completion programs are offered completely online via a distance education format:

- Geomatics - Visit the webpage - offered online since Fall 2018.
- Information and Communication Technology (ICT) - Visit the ICT webpage.

NMSU is accredited under the Higher Learning Commission.

Opportunities are available for students to concentrate in a particular area within their major or earn a minor to complement their degree. Please visit the ETSE Majors, Minors, and Concentrations website to find more details.

Mission Statement

The Mission of the ETSE Department is to provide students with a quality engineering technology or surveying/geomatics education that links theory and application provides a rigorous fundamental education and gives students enhanced career opportunities.

The department’s goals supporting this mission are:

- to provide educational and social environments that promote and facilitate student learning
- to have a highly respected and visible department
- to foster the development of the department and
- to graduate students who are competent and sought after by industry

View the Educational Objectives of our Engineering Technology Programs page to see detailed information of what our students will gain upon graduating from an Engineering Technology and Surveying Engineering degree program.

Requirements Related to Transfer of Academic Credit

Students transferring to NMSU may receive transfer credit depending on completed courses and source institutions. Articulation agreements exist for many New Mexico Community Colleges and represent a framework for the transfer of academic credit. General degree requirements of the College of Engineering and NMSU also apply to ETSE department majors. The Engineering Transfer Policy applies to any course in an ABET-accredited major that is not to be completed on the NMSU main campus by a student already having official degree-seeking status within the department.

- The department head must approve the course prior to enrollment and the course must be offered by an ABET-accredited program (exceptions may be made when existing articulation agreements with NMSU are relevant). In all cases, a corresponding course syllabus and any other supporting documentation are to be submitted, together with the student’s completed online request, before the course will be considered for transfer credit approval.
- To qualify for approval, the technical content and rigor must also be substantially the same as the equivalent NMSU course and the student must have satisfied all relevant university prerequisite requirements. If program co- and prerequisite requirements are not met, transfer credit will not be approved.
- No credit for on-line courses of another institution may be substituted to meet departmental core curriculum requirements.

To formally request approval to transfer a core course from another institution, you must complete the Engineering Transfer Course Request Form.

Academic Performance Requirements

In addition to University and College of Engineering’s specific requirements, as outlined in the NMSU General Information and College of Engineering catalog sections, departmental majors are expected to maintain a status of academic good standing and to complete degree requirements in a timely manner.

Courses in engineering, technology, math and science (and their respective pre- and co-requisites) must be completed with a minimum grade of C- to be counted toward the fulfillment of degree requirements. This also includes all courses in the NM General Education Common Core Areas I, II, and III. If a grade lower than C- is earned in one of the above-noted courses, the student will be required to retake that course during the first subsequent semester in which it is offered.

An ETSE student may attempt to complete core curriculum courses no more than three times for outcomes involving D or F letter grades. After this specified number of attempts without a passing grade of C- or better, the student will be prohibited from enrolling in any course offered within the college of engineering for a minimum period of one year, after which they may appeal to the college and department for re-admission into the program. Any credit earned outside the college during a period of academic suspension will not qualify for subsequent transfer credit toward core course degree requirements. Refer to the section of the catalog for university academic probation policies.
Requirements for Graduation
The completion of ETSE undergraduate degrees are contingent upon fulfillment of

1. University requirements as outlined in relevant sections of this catalog,
2. policy expectations as outlined under College General Requirements, and
3. departmental requirements, as outlined above and within the individual program descriptions of this catalog.

Degrees for the Department
Engineering Technology - Civil Degrees
Engineering Technology - Civil - Bachelor of Science in Engineering Technology
Engineering Technology - Civil (Construction Technology) - Bachelor of Science in Engineering Technology
Engineering Technology - Civil (Geomatics) - Bachelor of Science in Engineering Technology
Engineering Technology - Civil (Renewable Energy Technologies) - Bachelor of Science in Engineering Technology
Engineering Technology - Civil (Transportation Technology) - Bachelor of Science in Engineering Technology
Engineering Technology - Civil (Water/Wastewater Technology) - Bachelor of Science in Engineering Technology

Engineering Technology - Electronics and Computer Degrees
Engineering Technology - Electronics and Computer - Bachelor of Science in Engineering Technology
Engineering Technology - Electronics and Computer (Digital Forensics) - Bachelor of Science in Engineering Technology
Engineering Technology - Electronics and Computer (Information Security Technology) - Bachelor of Science in Engineering Technology
Engineering Technology - Electronics and Computer (Renewable Energy Technologies) - Bachelor of Science in Engineering Technology

Engineering Technology - Information Degrees
Engineering Technology - Information - Bachelor of Science in Engineering Technology
Engineering Technology - Information (Information Security Technology) - Bachelor of Science in Engineering Technology

Engineering Technology - Mechanical Degrees
Engineering Technology - Mechanical - Bachelor of Science in Engineering Technology
Engineering Technology - Mechanical (Renewable Energy Technologies) - Bachelor of Science in Engineering Technology

Geomatics Degree
Geomatics - Bachelor of Science (BS)

Information and Communication Technology Degree
Information and Communication Technology - Bachelor of Information and Communication Technology

Minors for the Department
Digital Electronic Applications - Undergraduate Minor
Digital Forensics - Undergraduate Minor
Geomatics - Undergraduate Minor
Information Security Technology - Undergraduate Minor
Manufacturing - Undergraduate Minor
Renewable Energy Technologies - Undergraduate Minor

Professor Ruinian Jiang, Ph. D., P.E., Department Head
Assistant Professor Philip Braker, Associate Department Head
Assistant Professor Barbara Gamillo, Associate Department Head

Professors Cooper¹, Jiang¹, Stevens¹; Associate Professors Elaksher², Furth, Nogales, Sassenfeld, Wurm²; Assistant Professors Ben Ayed, Braker, Elshinawy, B. Gamillo, E. Gamillo, Tapia; Emeritus Faculty Alexander, Burkholder¹,², Cameron, Hyde, Kelly, Reilly², Ricketts, Rico.

Staff: Administrative Assistant Carol Serna
¹ Registered Professional Engineer (NM).
² Licensed Professional Surveyor (NM).

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

E T 106. Drafting Concepts/Computer Drafting Fundamentals I
4 Credits (2+4P)
Basic drafting skills, terminology, and visualization. Introduction to principles and fundamentals of computer-aided drafting. Community Colleges only. Same as DRFT 112.
Prerequisite: OECS 125, OECS 207, or consent of instructor.

E T 109. Computer Drafting Fundamentals
3 Credits (3+2P)
Crosslisted with: DRFT 109, C E 109 and SUR 109

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 153. Introduction to Computer Networks  
3 Credits (3)  
Introduction to basic computer network fundamentals including International Open Systems Interconnect (OSI), the seven-layer model, and various networking hardware devices. Community Colleges only.

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

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.

E T 182. Digital Logic  
3 Credits (3)  
The use of truth tables, Boolean equations, and diagrams to define, simplify, and implement logic-valued functions.

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  
3 Credits (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(s)/Corequisite(s): MATH 1250G. Prerequisite(s): E T 183.

E T 184 L. Applied AC Circuits Lab  
1 Credit (2P)  
AC applied circuits lab  
Corequisite(s): E T 184.

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.  
Prerequisite(s)/Corequisite(s): MATH 1250G.

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 203. Computational Foundations  
3 Credits (3)  
Fundamental concepts of various proof techniques. These concepts will be applied to the use of computer algorithms, programming languages and other engineering and technology applications.  
Prerequisite(s): MATH 1250G and E T 262.

E T 210. Intermediate 3-D Modeling (Solid Works)  
3 Credits (3)  
Intermediate 3-D modeling. Applied modeling of techniques to prepare for SolidWorks certification (CSWA).  
Prerequisite(s): E T 110.

E T 217. Manufacturing Processes  
3 Credits (3)  
Introduction to manufactuing and processing, including: casting, forming, and machining. Emphasis on creating products with the appropriate techniques. Crosslisted with: I E 217.  
Prerequisite(s)/Corequisite(s): E T 217 L. Prerequisite(s): E T 110 and MATH 1220G.

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.  
Prerequisite(s)/Corequisite(s): E T 217.

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 230. Introduction to Servo Systems  
1 Credit (2P)  
Introduction to Servo Systems. Topics include uses of servos in the industry, servo types, lop gains and frequency response, software control systems, damping, feedback, encoders, synchros and resolvers. Restricted to Community Colleges campuses only.  
Prerequisite(s): E T 246.
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(s)/Corequisite(s): (MATH 1140 or MATH 1521G or MATH 1521H). Prerequisite(s): E T 240.

E T 245. Computer Hardware Fundamentals
3 Credits (2+2P)
Computer hardware fundamentals including architecture, interfacing, peripherals, troubleshooting, system upgrades, and maintenance.
Restricted to Las Cruces campus only.

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(s): E T 190 or E T 184.

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(s): E T 155.

E T 254. Concrete Technology
3 Credits (2+2P)
Fundamentals of aggregates, Portland cement, and asphalt used in design and construction.

E T 255. Linux System Administration
3 Credits (3)
A system administration view of the Linux operating system covering various distributions with a focus on managing the operating system and enterprise applications that run on Linux.

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 252. 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(s)/Corequisite(s): E T 182 or MATH 1250G.

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(s)/Corequisite(s): MATH 1430G or MATH 1511G.
Prerequisite(s): E T 246.

E T 273. Fundamentals of Networking Communications I
4 Credits (2+4P)
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. Community Colleges only. May be repeated up to 4 credits. Restricted to Community Colleges campuses only.
Prerequisite(s): E T 153.

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 277. Computer Networking I for IET
3 Credits (2+2P)
Computer network design and applications for LAN, TCP/IP networks, routing and switching technologies, VLANs, and the OSI layers from physical to transport.
Prerequisite(s): E T 182.

E T 280. Multimedia Tools and Support
3 Credits (3)
Introduction to video, audio and other digital presentation methods. Addresses the latest multimedia technology advances and how they apply to the information and communication technology fields. Sample tools like ffmpeg, and Audacity are covered.

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.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>E T 286</td>
<td>Information Security Certification Preparation</td>
<td>4</td>
<td>The course covers the examination objectives and detailed preparation for a certification in information security.</td>
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<tr>
<td>E T 290</td>
<td>Networking Wireless Communication</td>
<td>3</td>
<td>This course provides an introduction to wireless networking and communications. Some of the topics covered are protocols, transmission methods, and IEEE 802.11 standards. Wireless LAN (WLAN) fundamentals, devices, and security, cellular telephony, broadband, and satellite communications.</td>
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<tr>
<td>E T 291</td>
<td>PC Forensics and Investigation</td>
<td>3</td>
<td>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.</td>
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<tr>
<td>E T 300</td>
<td>Special Topics</td>
<td>1-3</td>
<td>Directed study or project. May be repeated for a maximum of 6 credits.</td>
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<tr>
<td>E T 305</td>
<td>Introduction to Product Design</td>
<td>3</td>
<td>The process of designing an innovative product for a real customer. Working through ideas, prototypes, 3-D models, concept validation, and entrepreneurship.</td>
</tr>
<tr>
<td>E T 306</td>
<td>Fundamental and Applied Thermodynamics</td>
<td>3</td>
<td>First and second laws, properties of substances, thermodynamic cycles including power generation and refrigeration.</td>
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<tr>
<td>E T 306 L</td>
<td>Thermodynamics Lab</td>
<td>1</td>
<td>Applications of thermodynamic theory to lab devices. Practice in testing, instrumentation, and data collection.</td>
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<tr>
<td>E T 308</td>
<td>Fluid Technology</td>
<td>3</td>
<td>Application of basic principles of fluid mechanics to practical applied problems.</td>
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<tr>
<td>E T 308 L</td>
<td>Fluid Technology Lab</td>
<td>1</td>
<td>Measurements in fluid statics, dynamics, and hydraulic systems.</td>
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<tr>
<td>E T 309V</td>
<td>Manufacturing: History and Technology</td>
<td>3</td>
<td>The history of manufacturing, the technology on which it is based, and its impact on society.</td>
</tr>
<tr>
<td>E T 310</td>
<td>Applied Strength of Materials</td>
<td>3</td>
<td>Application of principles of strength of materials to practical design and analysis problems.</td>
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<tr>
<td>E T 310 L</td>
<td>Applied Strength of Materials Lab</td>
<td>1</td>
<td>Testing and analyzing the physical properties of materials. Cursory review of Excel, PowerPoint, FEA, Instron machine, and testing standards.</td>
</tr>
<tr>
<td>E T 314</td>
<td>Communications Systems I</td>
<td>3</td>
<td>Circuits and devices used for transmission, reception, and processing of RF signals.</td>
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<tr>
<td>E T 317</td>
<td>Advanced Manufacturing and Design</td>
<td>3</td>
<td>Advanced 3-D modeling with current engineering design practices. Students will use SolidWorks add-ins such as CAMWorks, Product Data Management (PDM), and Model-Based Definition in conjunction with Geometric Dimensioning and Tolerancing (GD&amp;T) practices. Students will have the opportunity to take the Certification SolidWorks Professional Exam (CSWP).</td>
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<tr>
<td>E T 332</td>
<td>Applied Design of Structures I</td>
<td>4</td>
<td>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.</td>
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</tbody>
</table>
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(s):** E T 255 and E T 160.

E T 344. Microcomputer Systems  
3 Credits (2+3P)  
Microcomputer and/or microcontroller systems applications and architectures with a software emphasis using programming languages.  
**Prerequisite(s)/Corequisite(s):** E T 362. **Prerequisite(s):** E T 182 and MATH 1250G.

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(s)/Corequisite(s):** E T 310. **Prerequisite(s):** E T 254.  
Restricted to: ET U, ET E, ET M, CE, ET C majors.

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.  
**Prerequisite(s)/Corequisite(s):** DRFT 143 or DRFT 153.

E T 360V. Technology in Business and Society  
3 Credits (2+2P)  
Examining of how technology affects business and society with specific attention to understanding the role of technical personnel and their interaction with nontechnical personnel.

E T 362. Software Technology II  
3 Credits (3)  
A continuation of topics from E T 262 that are directed toward more advanced software development. Topics include problem analysis, object oriented, structured logic, and development concepts.  
**Prerequisite(s):** E T 262 and MATH 1250G.

E T 377. Computer Networking I  
3 Credits (2+2P)  
Computer network design and applications for LAN, TCP/IP networks, routing and switching technologies, VLANs, and the OSI layers from physical to transport.  
**Prerequisite(s):** E T 182 and MATH 1250G.

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(s):** MATH 1220G.

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(s):** MATH 1220G.

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(s):** MATH 1220G.

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(s):** MATH 1220G.

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(s):** E T 306 and E T 308 and PHYS 1240G.

E T 398. Digital Systems  
3 Credits (2+3P)  
Advanced analysis and design of digital systems using state machine logic, programming of logic devices, implementation and testing.  
**Prerequisite(s):** E T 282 and MATH 1250G.  
**Prerequisite(s)/Corequisite(s):** E T 362.

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 401. Heating and Air-Conditioning Systems  
3 Credits (3)  
HVAC system design including heating and cooling load calculations, psychometrics, piping, duct layout, and system control. Same as M E 401.  
**Prerequisite(s):** E T 306.  
**Corequisite(s):** E T 396.

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(s)/Corequisite(s):** E T 396 or E T 398.

E T 410. Senior Seminar  
1 Credit (1)  
Transition from academics to business and industry. Graded S/U.  
**Prerequisite:** senior standing in E T.

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(s):** E T 354.

E T 415. Manufacturing Management and Productivity  
3 Credits (3)  
Projects incorporating concurrent engineering, total quality management, design for manufacturability/assembly, and other contemporary topics in manufacturing.  
**Prerequisites:** senior standing in E T.
ET 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.  
Prerequisite(s): E T 308.

ET 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.  
Prerequisite: Senior standing in E T.

ET 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.

ET 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(s)/Corequisite(s): E T 305. Prerequisite(s): E T 210, E T 241, and E T 310.

ET 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(s): E T 332.

ET 435. Senior Project  
3 Credits (2+3P)  
Capstone course. Practical application of student's cumulative knowledge to 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.

ET 439. Advanced Digital Forensics and Incident Response  
3 Credits (3)  
Advanced topics in digital forensics and incident response on Windows, Linux and Mac OS X and mobile devices. Topics include: Memory analysis, registry analysis, timeline analysis, malware analysis, Linux artifacts, network analysis and advanced cyber security concepts.  
Prerequisite(s): E T 339 and E T 377.

ET 444. Hardware and Software Senior Design  
3 Credits (2+3P)  
The design, development, implementation, documentation and formal demonstration of a microprocessor-based application to solve an engineering problem. Emphasis on microprocessor architectural concepts and software interfacing. A student project is required.  
Prerequisite(s): E T 344 and E T 398.

ET 454. Advanced Construction Technology  
3 Credits (3)  
Contractor design and construction methods concerning formwork, special foundations, shoring, excavations, pilings, steel erection, and various material handling components.  
Prerequisite: E T 354 and E T 355.

ET 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.

ET 456. 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.  
Prerequisite(s): (MATH 1430G or MATH 1511G) and E T 272 and ((PHYS 1240G or PHYS 1320G) and (PHYS 1240L or PHYS 1320L)).

ET 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(s): E T 362 and E T 160.

ET 460. Web Technologies and Multimedia  
3 Credits (3)  
Introduction to web technologies and multimedia.  
Prerequisite(s): E T 160.

ET 463. Advanced Linux and Python Scripting  
3 Credits (3)  
Advanced Linux includes installation and maintenance of Unix/Linux/Windows versions of Python. Use of Python to solve numerous engineering problems using Python scripting as infrastructure.  
Prerequisite(s): E T 255 and E T 362.

ET 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(s)/Corequisite(s): E T 339. Prerequisite(s): E T 362.

ET 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.
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(s): E T 277 or E T 377.

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.  
Prerequisite(s)/Corequisite(s): (COMM 1115G or COMM 1130G or AXED 2120G or HNRS 2175G).

E T 481. Engineering Principles for Elementary Teachers  
3 Credits (3)  
Introduction to hands-on engineering principles and projects useful for application in the Elementary classroom. Restricted to: Masters of Arts in Education in Elementary Mathematics and Science majors.

E T 482. Manufacturing Technology  
3 Credits (2+2P)  
Fundamentals of computer aided manufacturing (CAM) and computer numerical control (CNC) machining. Students will learn how to program several variants of CNC machines, using both G/M code programming and computer aided manufacturing software. Emphasis will be on the effective design of parts to be made on CNC machines along with a hands on lab to give students experience on CNC machines. Students will individually design, manufacture, and keep items such as keychains, bottle openers, LED clocks, ergonomic handles, and license plates.  
Prerequisite(s): E T 210 and E T 217.

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.

E T 539. Advanced Enterprise Security  
3 Credits (3)  
Advanced enterprise security design and analysis. Identification and minimization of cyber threats. Restricted to: M-IT majors.

E T 551. Enterprise Architecture I  
3 Credits (3)  
A study of current enterprise architecture methodologies, tools, and techniques. Restricted to: M-IT majors.

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(s): E T 551.

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

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

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

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.

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.

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. May be repeated up to 6 credits. Consent of Instructor required. Restricted to: M-IT majors.

Information and Communication Technologies Courses

ICT 320. Introduction to Internet Protocols  
3 Credits (3)  
Present a overview of Internet Protocols Applications.

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(s): ICT 360.

ICT 352. Software Programming for Information and Communication Technology  
3 Credits (3)  
Computer programming techniques for information and communication technology topics.

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.
ICT 360. Software Technology II
3 Credits (3)
A continuation of topics from ICT 352 that are directed toward more advanced software development. Topics include problem analysis, object oriented, structured logic, and development concepts using JAVA. May be repeated up to 3 credits.
Prerequisite(s)/Corequisite(s): ICT 352 or E T 262 or OECS 195 or C S 152 or C S 172.

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(s)/Corequisite(s): ICT 339. Prerequisite(s): ICT 352.

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(s)/Corequisite(s): MATH 1220G or above.

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(s): ICT 364, ICT 377, and ICT 462.

ICT 450. Ethical Hacking
3 Credits (3)
Ethical Hacking and Penetration testing techniques.
Prerequisite(s): ICT 339.

ICT 457. Introduction to Information Security Technology
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.

ICT 458. Web Development and Database Applications
3 Credits (3)
Design, planning, and building of interactive and dynamic web applications. Topics include relational databases, object oriented programming, and web security.
Prerequisite(s)/Corequisite(s): ICT 362.

ICT 460. Multimedia Tools and Support
3 Credits (3)
Introduction to video, audio and other digital presentation methods. Addresses the latest multimedia technology advances and how they apply to the information and communication technology fields. Sample tools like ffmpeg, and Audacity are covered.
Prerequisite(s): ICT 360.

ICT 462. Linux System Administration
3 Credits (3)
Operating systems applications and interfacing with an introduction to systems administration. C Programming, System Backups, Setup and Maintenance Linux Servers. Webserver with virtual domains, CGI programming and interface with MySQL databases.

ICT 463. Advanced Linux and Python Scripting
3 Credits (3)
Advanced Linux includes installation and maintenance of Unix/Linux/Windows versions of Python. Use of Python to solve numerous engineering problems using Python scripting as infrastructure.
Prerequisite(s): ICT 362 and ICT 462.

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 and forensics.
Prerequisite(s): ICT 377 or E T 377.

Surveying Courses
SUR 222. Plane Surveying
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. Crosslisted with: DRFT 222.
Prerequisite(s): MATH 1250G.

SUR 264. Introduction to LIS
3 Credits (2+3P)
Introduction to land information systems. Land tenure systems, coordinate systems, computer methods.
Prerequisite(s)/Corequisite(s): DRFT 109.

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) applications to geospatial data collection and practical applications project fight/pre planning, sensor platform, FAA regulations and restrictions, introduction to laser scanning systems. Restricted to Las Cruces campus only.

SUR 292. 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. Restricted to Las Cruces campus only.

SUR 312. 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; and liability, ethical and professional principles in boundary surveying; contemporary issues in boundary determination.
Prerequisite(s): SUR 222 or DRFT 222.
SUR 328. **Construction Surveying & Automation Technologies**
3 Credits (2+3P)
**Prerequisite(s):** (SUR 222 or DRFT 222) and (MATH 1511G or MATH 1430G).

SUR 330. **Computer Applications of Surveying**
3 Credits (2+3P)
Advanced application of concepts and tools used in the manipulation of geospatial data in a computer environment. Topics include the use of surveying-specific software applications for problem solving, analysis and generation of spatial data products. Advanced programming skills in a high level language are presented and applied.
**Prerequisite(s):** DRFT 109 AND SUR 222, and (MATH 1511G or MATH 1430G) and (C S 187 or E T 262 or E E 161).

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(s):** (SUR 222 or DRFT 222) and (MATH 1511G or MATH 1435) and (A ST 311G or MATH 1350G).

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, astrographic, 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(s):** (SUR 222 or DRFT 222) and (MATH 1511G or MATH 1435).

SUR 370. **Control Surveying**
3 Credits (2+3P)
**Prerequisite(s):** SUR 222 and (MATH 1511G or MATH 1430G).

SUR 401. **Ethics and Professionalism in Surveying and Mapping**
3 Credits (3)
Ethics as applied to the surveying profession. Includes case studies and problems.
**Prerequisites:** SUR 312, SUR 328, and senior standing.

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.
**Prerequisite:** SUR 312.

SUR 450. **Senior Project**
1 Credit (1)
Research project prepared by student. Includes class presentation. Students will learn how to research after the end of their formal education.
**Prerequisite(s):** Senior Standing.

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(s):** SUR 351, (MATH 2415 or MATH 480).

SUR 452. **Spatial Data Integration and Analysis**
3 Credits (3)
Methodologies of geospatial data acquisition and integration, knowledge of applications the source data is intended for, accuracies of acquired spatial data, types and analysis of coordinate transformation models, Integrating datasets for routing analysis, location study analysis, land management and long range plans as well as existing needs related to connectivity and safety. Consent of Instructor required.

SUR 461. **GNSS Positioning**
3 Credits (2+3P)
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 May be repeated up to 3 credits.
**Prerequisite(s):** SUR 361.

SUR 464. **Legal Principles and Boundary Law II**
3 Credits (3)
ALTA Surveys and Standards, boundary evidence, order of evidence, Subdivision and Platting Law, Mexican and Spanish land grants, water boundaries, sequential and simultaneous conveyances. Consent of Instructor required.
**Prerequisite(s):** SUR 312.

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):** SUR 312.

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