

# ENGINEERING TECHNOLOGY AND SURVEYING ENGINEERING

## Undergraduate Program Information

Educational opportunities offered by the Department of Engineering Technology and Survey Engineering (<https://et.nmsu.edu>) (ETSE) in the College of Engineering (<https://enr.nmsu.edu>) 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](http://www.abet.org) (<http://www.abet.org>) accredited four-year Bachelor of Science (BS) degrees in Engineering Technology are offered by the department with majors in:

- **Electronics and Computer Engineering Technology** (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/engineering-technology-electronics-computer-bachelor-science-engineering-technology>) (ECET) - **Visit the ECET** (<https://et.nmsu.edu/academics/electronics-and-computer-engineering-technology-ecet>) **web page**,
- **Information Engineering Technology** (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/engineering-technology-information-bachelor-science-engineering-technology>) (IET) - **Visit the (IET)** (<https://et.nmsu.edu/academics/information-engineering-technology-iet>) **web site**
- **Mechanical Engineering Technology** (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/engineering-technology-mechanical-bachelor-science-engineering-technology>) (MET) - **Visit the (MET)** (<https://et.nmsu.edu/academics/mechanical-engineering-technology-met>) **web site or; Want to know more?** (<https://et.nmsu.edu/files/2016/10/MET-Intro.mp4>)
- **Civil Engineering Technology** (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/engineering-technology-civil-bachelor-science-engineering-technology>) (CET) - **Visit the (CET)** (<https://et.nmsu.edu/academics/civil-engineering-technology-cet>) **web site or;** (<https://et.nmsu.edu/academics/civil-engineering-technology-cet>) **Want to learn more?** (<https://et.nmsu.edu/files/2016/10/CET-Intro.pdf>)

An ABET accredited four-year Bachelor of Science (BS) degree in Surveying Engineering is offered by the department:

- **Geomatics or Surveying Engineering** (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/surveying-engineering-bachelor-science-surveying-engineering>) (SE) - **Visit the (SE)** (<https://et.nmsu.edu/academics/surveying-engineering>) **web site** - offered online beginning Fall 2018

A Bachelor's degree is also offered via a two-year degree completion program for students having an Associate's degree:

- **Information and Communication Technology** (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/information-and-communication-technology-bachelor-information-communication-technology>) (ICT) (<https://et.nmsu.edu/>

[academics/information-and-communication-technology-ict](https://et.nmsu.edu/academics/information-and-communication-technology-ict)) Bachelor degree completely **on-line** via a distance education format. See the **ICT Course Listing** (<http://catalogs.nmsu.edu/nmsu/course-listings/ict>) for a complete list of available courses

NMSU is accredited under the Higher Learning Commission (<http://www.hlcommission.org>).

Opportunities are available for students to **Concentrate** in a particular area within their major or earn a Minor (<https://et.nmsu.edu/academics/degree-programs-overview>) to complement their degree.

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 our Educational Objectives of our Engineering Technology Programs (<https://et.nmsu.edu/accreditation-and-assessment/outcomes>) 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 (<https://enr.nmsu.edu/course-transfer-credit>) depending on completed courses and source institutions. Articulation agreements (<https://et.nmsu.edu/academics/transfer-student-information>) exist for many New Mexico Community Colleges and represent a framework for transfer of academic credit. General degree requirements of the College of Engineering and NMSU also apply to ETSE department majors. The Engineering Transfer Policy (<https://enr.nmsu.edu/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. (<https://enr.nmsu.edu/15466-2>)

## Academic Performance Requirements

In addition to University (<http://catalogs.nmsu.edu/nmsu/regulations-policies>) and College of Engineering specific requirements (<http://catalogs.nmsu.edu/nmsu/engineering>), 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 corequisites) 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** (<http://catalogs.nmsu.edu/nmsu/regulations-policies>).

## Requirements for Graduation

The completion of ETSE undergraduate degrees are contingent upon fulfillment of

1. **University requirements** (<http://catalogs.nmsu.edu/nmsu/regulations-policies/#graduationrequirements>) as outlined in relevant sections of this catalog,
2. policy expectations as outlined under **College General Requirements** (<http://catalogs.nmsu.edu/nmsu/engineering>), and
3. departmental requirements, as outlined above and within the individual program descriptions of this catalog.

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## Degrees for the Department

Information and Communication Technology (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/information-and-communication-technology-bachelor-information-communication-technology>) - Bachelor of Information and Communication Technology

Engineering Technology - Civil (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/engineering-technology-civil-bachelor-science-engineering-technology>) - Bachelor of Science (BS) in Engineering Technology

Engineering Technology - Electronics and Computer - (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/engineering-technology-electronics-computer-bachelor-science-engineering-technology>) Bachelor of Science (BS) in Engineering Technology

Engineering Technology - Information (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/engineering-technology->

[information-bachelor-science-engineering-technology](http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/information-bachelor-science-engineering-technology)) - Bachelor of Science (BS) in Engineering Technology

Engineering Technology - Mechanical (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/engineering-technology-mechanical-bachelor-science-engineering-technology>) - Bachelor of Science (BS) in Engineering Technology

Geomatics (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/surveying-engineering-bachelor-science-surveying-engineering>) - Bachelor of Science (BS)

## Minors for the Department

Digital Electronic Applications (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/digital-electronic-applications-undergraduate-minor>) - Undergraduate Minor

Digital Forensics (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/information-technologies-undergraduate-minor>) - Undergraduate Minor

Manufacturing (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/manufacturing-undergraduate-minor>) - Undergraduate Minor

Renewable Energy Technologies (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/renewable-energy-technologies-undergraduate-minor>) - Undergraduate Minor

Information Security Technology (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/information-security-technology-undergraduate-minor>) - Undergraduate Minor

Geomatics (Surveying Engineering) (<http://catalogs.nmsu.edu/nmsu/engineering/engineering-technology-surveying/surveying-engineering-undergraduate-minor>) - Undergraduate Minor

**Professor Thomas Jenkins, Department Head**

**Assistant Professor Barbara Gamillo**

([https://myaccount.nmsu.edu/phonebook?](https://myaccount.nmsu.edu/phonebook?txtFirstName=barbara&txtLastName=Gamillo&txtEmail=&chkEmployees=Employees)

[txtFirstName=barbara&txtLastName=Gamillo&txtEmail=&chkEmployees=Employees](https://myaccount.nmsu.edu/phonebook?txtFirstName=barbara&txtLastName=Gamillo&txtEmail=&chkEmployees=Employees))

**Associate Department Head**

**Professors** Cooper<sup>1</sup>, Jenkins, Jiang<sup>1</sup>, Stevens<sup>1</sup>; **Associate Professors** Sassenfeld, Nogales, Wurm<sup>2</sup>; **Assistant Professors** S. Ben Ayed, Braker, B. Gamillo, E. Gamillo, Morrell, Tapia; **Emeritus Faculty** Alexander, Burkholder<sup>1,2</sup>, Cameron, Hyde, Reilly<sup>2</sup>, Ricketts, Rico,

**Staff** Administrative Assistant Carol Serna

([https://myaccount.nmsu.edu/phonebook?](https://myaccount.nmsu.edu/phonebook?txtFirstName=carol&txtLastName=serna&txtEmail=&chkEmployees=Employees)

[txtFirstName=carol&txtLastName=serna&txtEmail=&chkEmployees=Employees](https://myaccount.nmsu.edu/phonebook?txtFirstName=carol&txtLastName=serna&txtEmail=&chkEmployees=Employees))

<sup>1</sup> Registered Professional Engineer (NM).

<sup>2</sup> Licensed Professional Surveyor (NM).

## Engineering Technology Courses

**ET 101. Introduction to Engineering Technology**

**1 Credit**

The development of engineering technology, with an introduction to engineering technology, education, and practice. Graded S/U.

**E T 104. Soldering Techniques****1 Credit**

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**

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**

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**

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**

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. Introduction to Information Engineering Technology****3 Credits**

An information engineering technology approach to the basics of computer systems and data, computer architecture, hardware and software operation, networks, and data communications. May be repeated up to 3 credits.

**E T 182. Digital Logic****3 Credits**

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. May be repeated up to 3 credits.

**Prerequisite(s)/Corequisite(s):** MATH 121G.

**E T 183 L. Applied DC Circuits Lab****1 Credit**

DC applied circuits lab. May be repeated up to 1 credits.

**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. May be repeated up to 3 credits.

**Prerequisite(s)/Corequisite(s):** MATH 190G. Prerequisite(s): E T 183.

**E T 184 L. Applied AC Circuits Lab****1 Credit**

AC applied circuits lab May be repeated up to 1 credits.

**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 190G.

**E T 191. Applied Circuits Laboratory****1 Credit**

Applied Circuits Lab May be repeated up to 1 credits.

**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**

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. May be repeated up to 3 credits.

**Prerequisite(s):** MATH 190G and E T 262.

**E T 210. Intermediate 3-D Modeling (Solid Works)****3 Credits (2+2P)**

Intermediate 3-D modeling. Applied modeling of techniques to prepare for SolidWorks certification (CSWA). May be repeated up to 3 credits.

**Prerequisite(s):** E T 110.

**E T 217. Manufacturing Processes****3 Credits**

Introduction to manufacturing and processing, including: casting, forming, and machining. Emphasis on creating products with the appropriate techniques. May be repeated up to 3 credits. Crosslisted with: I E 217.

**Prerequisite(s)/Corequisite(s):** E T 217L. Prerequisite(s): E T 110 and MATH 121G.

**E T 217 L. Manufacturing Processes Lab****1 Credit**

Hands-on laboratory in machine shop to apply topics from E T 217, including: casting, forming, and machining. May be repeated up to 1 credits.

**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**

Introduction to Servo Systems. Topics include uses of servos in the industry, servo types, loop 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**

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. May be repeated up to 3 credits.

**Prerequisite(s)/Corequisite(s):** MATH 235G or MATH191G.

**Prerequisite(s):** PHYS 211G or PHYS 215G.

**E T 241. Applied Dynamics****3 Credits**

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. May be repeated up to 3 credits.

**Prerequisite(s):** E T 240, (MATH 235 or MATH 191G).

**E T 245. Computer Hardware Fundamentals****3 Credits (2+2P)**

Computer hardware fundamentals including architecture, interfacing, peripherals, troubleshooting, system upgrades, and maintenance. May be repeated up to 3 credits. 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. May be repeated up to 4 credits.

**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**

Introduction to Linux system administration.

**Prerequisite(s)/Corequisite(s):** E T 160.

**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. May be repeated up to 3 credits.

**Prerequisite(s)/Corequisite(s):** E T 182 or MATH 190G.

**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. May be repeated up to 4 credits.

**Prerequisite(s)/Corequisite(s):** MATH 235G or MATH 191G.

**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 to WAN, protocols, switches, bridges, routers, NT server, TCP/IP networks, network diagnostics, voice over IP, wireless networks, and the OSI layers from physical to transport. May be repeated up to 3 credits.

**Prerequisite(s):** E T 182.

**E T 280. Introduction to Multimedia****3 Credits**

Introduction to video, audio and other digital presentation methods.

**Prerequisite(s):** E T 255.

**E T 282. Digital Electronics****4 Credits (3+3P)**

Applications of digital integrated circuits, multiplexers, counters, arithmetic circuits, and microprocessors. May be repeated up to 4 credits.

**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**

Examines the field of information security within a real-world context of issues faced by today's IT professionals. May be repeated up to 3 credits.

**Prerequisite(s)/Corequisite(s):** E T 283. Prerequisite(s): E T 156.

**E T 286. Information Security Certification Preparation****4 Credits (3+1P)**

An overview of general security concepts for information technology systems.

**Prerequisite(s):** E T 285.

**E T 287. PC Disaster and Data Recovery****3 Credits**

This course provides an overview of the various causes of personal computer data failure and methods to mitigate the loss of your personal computer data. The focus is on restoring your personal computer to full PC functionality and recovering lost and damaged files after one of these unforeseen problems. In addition, the course provides a means to lessen the impact of these inevitable events with the preparation of a disaster recovery plan.

**Prerequisite(s):** E T 120 or E T 122.

**E T 290. Networking Wireless Communication****3 Credits (3+1P)**

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.

**Prerequisite:** E T 273.

**E T 291. PC Forensics and Investigation****3 Credits**

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 302. Manufacturing Data Analysis****3 Credits**

Methods for analyzing data collected during manufacturing processes. Emphasis placed on production control utilizing results of statistical methods and design of experiments.

**Prerequisite(s):** MATH 235.

**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. May be repeated up to 3 credits.

**Prerequisite(s)/Corequisite(s):** E T 210, E T 217, and (COMM 265G or COMM 253G or AXED 201G or HON 265G). Restricted to: ET U,ET M,ET C,ET E majors.

**E T 306. Fundamental and Applied Thermodynamics****3 Credits**

First and second laws, properties of substances, thermodynamic cycles including power generation and refrigeration. May be repeated up to 3 credits.

**Prerequisite(s):** CHEM 110G and E T 240 and (MATH 235G or MATH 191G) and (( PHYS 212G or PHYS 216G)and (PHYS 212GL or PHYS 216GL)).

**E T 306 L. Thermodynamics Lab****1 Credit**

Applications of thermodynamic theory to lab devices. Practice in testing, instrumentation, and data collection. May be repeated up to 1 credits.

**Prerequisite(s)/Corequisite(s):** E T 306 and ((E T 184 201440) or (E T 190 201640)).

**E T 308. Fluid Technology****3 Credits**

Application of basic principles of fluid mechanics to practical applied problems. May be repeated up to 3 credits.

**Prerequisite(s):** (MATH 235 or MATH 191G) and E T 240.

**E T 308 L. Fluid Technology Lab****1 Credit**

Measurements in fluid statics, dynamics, and hydraulic systems. May be repeated up to 1 credits.

**Prerequisite(s)/Corequisite(s):** E T 308. Prerequisite(s): (MATH 235 or MATH 191G), E T 240.

**E T 309V. Manufacturing: History and Technology****3 Credits**

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**

Application of principles of strength of materials to practical design and analysis problems. May be repeated up to 3 credits.

**Prerequisite(s)/Corequisite(s):** MATH 236 or MATH 192G. Prerequisite(s): (MATH 235G or MATH 191G) and E T 240.

**E T 310 L. Applied Strength of Materials Lab****1 Credit**

Testing and analyzing the physical properties of materials. cursory review of Excel, PowerPoint, FEA, Instron machine, and testing standards. May be repeated up to 1 credits.

**Prerequisite(s)/Corequisite(s):** E T 310.

**E T 312. Emergency Response to Hazardous Material Incidents****2 Credits**

Same as E S 312, WERC 312.

**E T 314. Communications Systems I****3 Credits (3+2P)**

Circuits and devices used for transmission, reception, and processing of RF signals.

**Prerequisite(s):** E T 246 & MATH 190G.

**E T 317. Advanced 3-D Modeling and Design****3 Credits**

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&T) practices. Students will have the opportunity to take the Certification SolidWorks Professional Exam (CSWP). May be repeated up to 3 credits. Consent of Instructor required. Restricted to: exclude ET U,ET M,ET C,ET E majors.

**Prerequisite(s):** E T 210.

**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. May be repeated up to 4 credits.

**Prerequisite(s)/Corequisite(s):** (MATH 236 or MATH 191G) and ((PHYS 212G or PHYS 216G) and (PHYS 212GL or PHYS 216GL)).

**Prerequisite(s):** E T 272.

**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. May be repeated up to 3 credits.

**Prerequisite(s):** E T 210 and E T 241.

**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. May be repeated up to 4 credits.

**Prerequisite(s):** E T 310 and (MATH 236 or MATH 192G).

**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. May be repeated up to 3 credits.

**Prerequisite(s):** E T 255.

**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 190.

**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. May be repeated up to 4 credits.

**Prerequisite(s)/Corequisite(s):** E T 310. **Prerequisite(s):** E T 254.

Restricted to: ET U,ET E,ET M,C,E,ET C majors.

**E T 355. Site/Land Development and Layout****3 Credits**

Techniques, methods, and takeoffs for infrastructure layout, site plan design, grading, earthwork, utilities, road construction. May be repeated up to 3 credits.

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

**E T 360V. Technology in Business and Society****3 Credits (2+2P)**

Examination 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**

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. May be repeated up to 3 credits.

**Prerequisite(s):** E T 262 and MATH 190G.

**E T 365. Building Utilities****3 Credits (2+3P)**

Basic design and code applications in plumbing and electrical systems for buildings.

**Prerequisites:** junior standing in E T.

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

Computer network design and applications for LAN to WAN, protocols, switches, bridges, routers, TCP/IP networks, network diagnostics, voice over IP, wireless networks, and the OSI layers from physical to transport. May be repeated up to 3 credits.

**Prerequisite(s):** E T 182 and MATH 190G.

**E T 381. Renewable Energy Technologies****3 Credits**

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. May be repeated up to 3 credits.

**Prerequisite(s):** MATH 121.

**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. May be repeated up to 3 credits.

**Prerequisite(s):** MATH 121.

**E T 384. Wind and Water Energy Technologies****3 Credits**

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. May be repeated up to 3 credits.

**Prerequisite(s):** MATH 121.

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

Sustainable Building materials, methods, and techniques including green architecture and design, codes, standards and specifications. May be repeated up to 3 credits.

**Prerequisite(s):** MATH 121.

**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. May be repeated up to 3 credits.

**Prerequisite(s):** E T 306 and E T 308 and PHYS 212G.

**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. Pre/

**Prerequisite(s):** E T 282 and MATH 190G.

**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**

HVAC system design including heating and cooling load calculations, psychometrics, piping, duct layout, and system control. Same as M E 401.

**Prerequisite:** E T 306.

**Corequisite:** 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. May be repeated up to 3 credits.

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

**E T 410. Senior Seminar****1 Credit**

Transition from academics to business and industry. Graded S/U.

**Prerequisite:** senior standing in E T.

**E T 412. Highway Technology****3 Credits**

Road-vehicle performance, geometric alignment, traffic analysis, highway materials, pavement design, and plan and profile development. May be repeated up to 3 credits.

**Prerequisite(s):** E T 354.

**E T 415. Manufacturing Management and Productivity****3 Credits**

Projects incorporating concurrent engineering, total quality management, design for manufacturability/assembly, and other contemporary topics in manufacturing.

**Prerequisites:** senior standing in E T.

**E T 418. Applied Hydraulics****3 Credits**

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.

**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**

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.

**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. May be repeated up to 3 credits.

**Prerequisite(s)/Corequisite(s):** E T 241. Prerequisite(s): E T 210 and E T 310.

**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. May be repeated up to 4 credits.

**Prerequisite(s):** E T 332.

**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. May be repeated up to 3 credits. Consent of Instructor required.

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

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 and Mac artifacts, mobile device forensics. May be repeated up to 3 credits.

**Prerequisite(s):** E T 339 and E T 377.

**E T 440. Senior Design****2 Credits (1+2P)**

Team design of a system, mechanism, or model that will be fabricated or simulated during the following semester in E T 441. Pre/

**Prerequisite(s)/Corequisite(s):** E T 444 and E T 402. Restricted to: ET C,ET E,ET M,ET U majors.

**E T 441. Senior Project****2 Credits (1+2P)**

Team fabrication or simulation, testing, and debugging of a system, mechanism or model designed in E T 440.

**Prerequisite(s):** E T 440.

**E T 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.

**E T 454. Advanced Construction Technology****3 Credits**

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.

**E T 455. Cost Estimating and Scheduling****3 Credits**

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****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. May be repeated up to 4 credits.

**Prerequisite(s):** (MATH 235 or MATH 191G) and E T 272 and ((PHYS 212G or PHYS 216G) and (PHYS 212GL or PHYS 216GL)).

**E T 458. Database Technology for Engineering****3 Credits**

MySQL and PHP. Data conversion using PHP, mysql and Python. Methods of transferring data from electronic boards and data feeds, into databases. Use of SQL in java programming. Remote programming of computers for running database systems in a mixed OS environment. Generation of web pages directly from Database queries.

**Prerequisite(s):** E T 362 and E T 160.

**E T 460. Web Technologies and Multimedia****3 Credits**

Introduction to web technologies and multimedia. May be repeated up to 3 credits.

**Prerequisite(s):** E T 160.

**E T 463. Advanced Linux and Python Scripting****3 Credits**

Advanced Linux Includes installation and maintenance of Unix/Linux/Windows versions of Python. Use of Python to solve numerous engineering problems including video and audio. Image manipulation. Using PostScript for image and typesetting development. Integration of C programming with Python.

**Prerequisite(s):** E T 255 and E T 362.

**E T 464. Advanced Windows Server Administration****3 Credits**

Learn about configuration and maintenance of Microsoft Windows Server and related services such as DHCP, DNS, Failover Clusters, Active Directory, Group Policy, File Sharing, Microsoft SQL server, Microsoft Exchange Server, IIS, Network Load Balancing, Backups, Remote Administration, PowerShell scripting and more. May be repeated up to 3 credits.

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

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

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**

Advanced concepts in computer network design and applications including managing the campus network, virtual LANs (VLAN), network security, wireless networks, high-speed optical networks, and voice over IP. May be repeated up to 3 credits.

**Prerequisite(s):** E T 277 or E T 377.

**E T 480. Innovation and Product Development****3 Credits**

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. May be repeated up to 6 credits. Consent of Instructor required.

**Prerequisite(s)/Corequisite(s):** (COMM 265G or COMM 253G or AXED 201G or HON 265G).

**E T 482. Advanced Manufacturing****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. May be repeated up to 3 credits. Consent of Instructor required.

**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.

## Surveying Courses

**SUR 101. Introduction to Surveying Engineering****1 Credit**

Review and discussion of career paths open to surveying engineers. Restricted to: Main campus only.

**SUR 201. GPS and Spatial Data Applications****3 Credits**

Overview of spatial data applications based on GPS observations. Emphasis on positioning and navigation using code-phase techniques with handheld receivers. Use of coordinate systems. Students encouraged to have their own GPS handheld unit.



**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. May be repeated up to 3 credits. Crosslisted with: DRFT 222.

**Prerequisite(s):** MATH 190G.

**SUR 264. Introduction to LIS****3 Credits (2+3P)**

Introduction to land information systems. Land tenure systems, coordinate systems, computer methods. Pre/

**Corequisite(s):** DRFT 109.

**SUR 285. Precise Digital Mapping****3 Credits**

Perform basic photogrammetric mapping, and create digital terrain models. May be repeated up to 3 credits.

**Prerequisite(s)/Corequisite(s):** SUR 222 or DRFT 222.

**SUR 292. Public Land Survey System Boundaries****3 Credits (2+3P)**

Detailed study of the U.S. Public Land Survey System Instructions with special emphasis on New Mexico. Sectionalized land subdivision, corner restoration, and field surveys. Field trips required.

**Prerequisite:** SUR 222.

**SUR 312. Legal Principles and Boundary Law I****3 Credits**

Legal principles of property boundary retracement, and rights-of-way. Systems of law and legal research. Principles of the U.S. Public Land Survey System and manual of Instructions May be repeated up to 3 credits.

**Prerequisite(s):** SUR 222 or DRFT 222.

**SUR 322. Laser Scanning Mapping Technologies****3 Credits (2+2P)**

Perform basic terrestrial & airborne LiDAR scan, LiDAR Technologies and Applications will include ranging technologies such as LiDAR, SAR, and Bathymetry, point cloud data management & extraction, scan registration and processing

**Prerequisite(s):** SUR 285.

**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. May be repeated up to 3 credits.

**Prerequisite(s):** (SUR 222 or DRFT 222) and (MATH 191G or MATH 235).

**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 191G or MATH 235) and (C S 187 or E T 262 or E E 161).

**SUR 351. Introductory Spatial Data Adjustment I****3 Credits**

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. May be repeated up to 3 credits.

**Prerequisite(s):** (SUR 222 or DRFT 222) and (MATH 191G or MATH 235) and (A ST 311G or STAT 251G) and (C S 151 or C S 152 or E T 262 or E E 161).

**SUR 361. Introduction to Geodesy/Geodetic Control Surveying****3 Credits (2+2P)**

Horizontal and vertical control network design and consideration. May be repeated up to 3 credits.

**Prerequisite(s):** (SUR 222 or DRFT 222) and (MATH 191G or MATH 235).

**SUR 370. Control Surveying****3 Credits (2+3P)**

Design and use of survey control networks. Includes Horizontal, Vertical and 3D networks. Use of standards in control surveying. History of control surveying.

**Prerequisite(s):** SUR 222 and (MATH 191G or MATH 235G).

**SUR 384. Surveying Practicum****1-3 Credits**

Surveying practice under the direction of a licensed, professional land surveyor requiring 45 hours per credit as per a plan worked out between the student and the surveyor and approved by the Surveying Engineering faculty. Work must be certified by the licensed, professional land surveyor. Requires a written report by the student.

**Prerequisites:** SUR 222 and junior standing.

**SUR 401. Ethics and Professionalism in Surveying and Mapping****3 Credits**

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**

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. Advanced Survey Measurements, Analysis, and Adjustments****3 Credits**

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. May be repeated up to 3 credits.

**Prerequisite(s):** SUR 351, (MATH 280 or MATH 480).

**SUR 452. Spatial Data Integration and Analysis**

**3 Credits (2+2P)**

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. May be repeated up to 3 credits.

**Prerequisite(s):** SUR 451.

**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**

Concepts of real property, land tenure and ethics, and land registration systems; the function and design of multipurpose cadastre and land information systems. May be repeated up to 3 credits. Consent of Instructor required.

**Prerequisite(s):** SUR 312.

**SUR 498. Emerging Technology in Geomatics**

**3 Credits**

Hydrographic/Bathymetric, Altimetry, Space borne Imaging Systems, Mobile Mapping Systems, Mining and Agriculture Surveying Principles, and advanced ranging data acquisition systems. May be repeated up to 3 credits. Consent of Instructor required.

**Prerequisite(s):** Consent of instructor and senior standing.

**Name: Engineering Technology and Surveying Engineering (ETSE)**

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