

COMPUTER ENGINEERING SPECIALIZATION

The school offers a special program for students interested in computer engineering. Students wishing to become involved in this rapidly growing field will find courses in the Klipsch School, as well as the Computer Science Department which cover the following areas:

- Integrated Circuits and Applications
- Digital Logic and System Design
- High Performance Computer Design
- Digital Signal Processing
- Digital Control and Instrumentation Systems
- Computer Architecture
- Data Networks
- Software Engineering
- Operating Systems

These courses offer the student an opportunity to obtain an in-depth knowledge of digital systems and practical experience in the design, operation, programming, and applications of digital computers.

RELATED AREAS OF STUDY

Electrical and computer engineering students wishing to broaden their educational experience may elect to earn additional bachelors degrees in

- Engineering Physics
- Physics
- Mathematics
- Computer Science

Klipsch School students may also choose to earn a minor in one or more of the following fields:

- Physics
- Mathematics
- Computer Science

Students must consult with an academic adviser in the offering department for specific requirements related to additional degrees and minors.

DESIGNATED MINORS

Students from outside the Klipsch School may earn a minor in Electrical or Computer Engineering.

MINOR: Electrical Engineering (total credits 22)

Prerequisites¹ (12 credits) all may be transferred

| | |
|---|---|
| MATH 191, Calculus I ⁴ | 3 |
| MATH 192, Calculus II ⁴ | 3 |
| MATH 291, Calculus III ⁴ | 3 |
| MATH 392, Differential Equations ⁴ | 3 |

Lower Division (12 credits) maximum of 8 transfer credits

| | |
|---|---|
| E E 111, Introduction to Electrical and Computer Engineering ^{2, 3, 4} | 4 |
| E E 211, AC Circuits ^{2,4} | 4 |
| E E 221, Electronics I ^{2, 4} | 4 |

Upper Division (10 credits) no transfer credit accepted

| | |
|--|---|
| E E 311, Signals and Systems ^{2, 4} | 4 |
| Electives*..... | 6 |

¹ Certain electives may require additional prerequisites.
² Including laboratory
³ E E 201 may be substituted
⁴ A grade of C or better is required
 *Lists of approved electives are available from the Klipsch School office

MINOR: Computer Engineering (total credits 21)

Prerequisites¹ (9 credits) all may be transferred

| | |
|--|---|
| E E 111, E E 201, or an equivalent DC Circuits course ⁴ | 3 |
| MATH 191, Calculus I ⁴ | 3 |
| MATH 192, Calculus II ⁴ | 3 |

Lower Division (8 credits) all may be transferred

| | |
|--|---|
| E E 161, Computer Aided Problem Solving ^{2, 3, 4} | 4 |
| E E 261, Digital Design I ^{2, 4} | 4 |

Upper Division (13 credits) no transfer credit accepted

| | |
|---|---|
| E E 361, Digital Design II..... | 3 |
| E E 363, Computer Architecture I ² | 4 |
| Electives*..... | 6 |

¹ Certain electives may require additional prerequisites
² Including laboratory
³ A challenge exam is required before transfer credit is accepted
⁴ A grade of C or better is required
 *Lists of approved electives are available from the Klipsch School office

ENGINEERING TECHNOLOGY

Associate Professor Sonya L. Cooper*, department head

Professors Alexander*, Beasley, Hyde, P. Ricketts*, **Associate Professors** Cooper*, Cox, Jenkins, Kelly, C. Ricketts, Rico, Stevens*; **Assistant Professors** Morrell
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DEGREE: Bachelor of Science in Engineering Technology
PROGRAM: Civil Engineering Technology
EMPHASIS: Construction Technology
PROGRAM: Electronics & Computer Engineering Technology
PROGRAM: Mechanical Engineering Technology

DEGREE: Bachelor of Information and Communication Technology
MINORS: Manufacturing Security Technology and Intelligence Studies

Engineering Technology

Engineering technology education places an emphasis on the practical application of engineering principles and methods. Engineering technology graduates have employment opportunities in areas such as product and systems development, manufacturing, technical and project management, construction, facilities planning and operation, and testing.

Lists of course equivalencies are available for students transferring to NMSU from most New Mexico and some out-of-state institutions. In addition, the department has some extended articulation agreements or can provide a method of validation of transfer coursework in many technical subject areas. The department requires that at least 21 credits specifically in the transfer student's program must be earned at the main campus of NMSU. General degree requirements of the College of Engineering and university apply to students in the Department of Engineering Technology. Many ET-prefixed courses carry one or more prerequisites. The instructor of a course may waive a prerequisite(s) for a student, if doing so will not negatively impact the quality of the student's educational experience.

The department also offers associate degree programs in Electronics and Computer, Mechanical, and Civil Engineering Technology.

The mission of the Department of Engineering Technology is to provide students with a quality engineering technology education that links theory and application and that gives students enhanced career opportunities. The department's goals supporting this mission are: (1) to provide educational and social environments that promote and facilitate student learning; (2) to have a highly respected and visible department; (3) to foster the development of the department; and (4) to graduate students who are competent and sought after by industry.

Engineering technology graduates will demonstrate the following skills:

- an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines;
- an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology;
- an ability to conduct, analyze and interpret experiments and apply experimental results to improve processes;
- an ability to apply creativity in the design of systems, components or processes appropriate to program objectives;
- an ability to function effectively on teams;
- an ability to identify, analyze and solve technical problems;
- an ability to communicate effectively;

- an ability to recognize the need for and possess the ability to pursue lifelong learning;
- an ability to understand professional, ethical and social responsibilities;
- an ability to recognize contemporary professional, societal and global issues and be aware of and respect diversity; and
- an ability to have a commitment to quality, timeliness and continuous improvement.

INFORMATION AND COMMUNICATION TECHNOLOGY

Information and Communication Technology is a distance education, degree completion program. The program focuses on the knowledge and experience that is required to design, implement, and manage a variety of information systems. The curriculum includes the study of computer hardware, application and operating systems software, system integration, database design and management, networking, and network security. Graduates of the program can expect to enter the workforce with titles that include Information Technologist, Systems or Network Administrator, Project Manager, Database Administrator, and Computer Support Specialist.

The program is designed to be an educational path to the baccalaureate degree for graduates of computer and technology-related associate degree programs from community colleges or other two-year institutions. It is also a viable degree path for students who have completed the freshmen and sophomore years of computer or technology-related programs at four-year institutions including, of course, New Mexico State University.

The program is predominantly conducted in distance format, although a limited number of brief, on-campus laboratory or testing sessions may be required in certain classes. Students who are successful in distance education programs typically are self-motivated, do not rely heavily on face-to-face instruction, work independently, and can remain on schedule.

This program was not designed to be an engineering or engineering technology program although there is significant overlap with one of the engineering technology programs offered by the department. **Thus, the Information and Communication Technology Program differs from the other baccalaureate programs offered by the departments in the College of Engineering in that it is not accredited by the Accreditation Board for Engineering and Technology (ABET).**

Upon completion of the degree requirements, graduates will demonstrate the following:

- an appropriate mastery of the knowledge, techniques, skills and modern tools of information and communications technology;
- an ability to apply current knowledge and adapt to emerging applications of technology;
- an ability to communicate effectively;
- an ability to understand professional, ethical and social responsibilities;
- an ability to apply creativity in the design of systems;
- an ability to identify, analyze and solve technical problems;
- an ability to recognize the need for and possess the ability to pursue lifelong learning;
- an ability to recognize contemporary professional, societal, and global issues and be aware of and respect diversity; and
- an ability to have a commitment to quality, timeliness and continuous improvement.

DEGREE: Bachelor of Science in Engineering Technology

PROGRAM: Civil Engineering Technology (Total credits 133)

Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

Freshman Year (34 credits)

| | |
|---|---|
| CHEM 110G, Principles and Applications of Chemistry | 4 |
| ENGL 111G, Rhetoric and Composition | 4 |
| E T 101, Introduction to Engineering Technology | 1 |
| E T 109, Computer Drafting Fundamentals | 3 |
| E T 120, Computation and Presentation Software | 3 |
| E T 154, Construction Methods and Communications | 3 |
| E T 254, Concrete Technology | 3 |
| MATH 180, Trigonometry | 3 |
| MATH 121, College Algebra | 3 |
| PHYS 211-211L, General Physics I, General Physics Lab I | 4 |
| Approved Literature or Fine Arts elective* | 3 |

Sophomore Year (36 credits)

| | |
|--|---|
| COMM 265G, Principles of Human Communication | 3 |
| ECON 251G, Principles of Macroeconomics, or ECON 252, Principles of Microeconomics | 3 |
| ENGL 218G, Technical and Scientific Communication | 3 |
| ET 143, Civil/Survey Drafting I | 3 |
| E T 240, Applied Statics | 3 |
| E T 241, Applied Dynamics | 2 |
| Approved Human Thought and Behavior elective* | 3 |
| Approved Historical Perspective elective* | 3 |
| MATH 235, 236, Calculus for the Technical Student I, II | 6 |
| PHYS 212-212L, General Physics II, General Physics Lab II; or ET 190, Applied Circuits | 4 |
| SUR 222, Plane Surveying | 3 |

Junior Year (34 credits)

| | |
|---|---|
| E ST 311G, Statistical Applications | 3 |
| E T 306, Fundamental and Applied Thermodynamics | 3 |
| E T 308, Fluid Technology | 3 |
| E T 308L, Fluid Technology Lab | 1 |
| E T 310, Applied Strength of Materials | 3 |
| E T 310L, Applied Strength of Materials Lab | 1 |
| E T 332, Applied Design of Structures I | 4 |
| E T 354, Soil and Foundation Technology | 4 |
| E T 355, Site/Land Development and Layout | 3 |
| E T 361, Safety Systems and Programs | 3 |
| General Education management course | 3 |
| Technical elective** | 3 |

Senior Year (29 credits)

| | |
|--|---|
| C E 450, Engineering Economy and Law, or I E/CH E 451, Engineering Economy** | 3 |
| E T 410, Senior Seminar | 1 |
| E T 412, Highway Technology | 3 |
| E T 418, Applied Hydraulics | 3 |
| E T 420, Senior Internship, or E T 435, Senior Design and Project Management | 3 |
| E T 432, Applied Design of Structures II | 4 |
| Approved surveying elective** | 3 |
| Approved technical electives** | 6 |
| Approved Viewing a Wider World elective* | 3 |

**Construction Emphasis Requirements

For the construction emphasis, the five courses denoted with ** in the general civil program above are replaced with the following courses:

| | |
|--|---|
| BLAW 317, Business Law | 3 |
| E T 454, Advanced Construction Technology | 3 |
| E T 455, Cost Estimating and Scheduling | 3 |
| Management courses numbered 400 or above, or E T 490, Selected Topics (subtitle: Project Management) | 3 |
| SUR 328, Construction Surveying | 3 |

DEGREE: Bachelor of Science in Engineering Technology

PROGRAM: Electronics and Computer Engineering Technology (Total Credits 129)

Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology

Freshman Year (32 credits)

| | |
|---|---|
| COMM 265G, Principles of Human Communication | 3 |
| ENGL 111G, Rhetoric and Composition | 4 |
| E T 101, Introduction to Engineering Technology | 1 |
| E T 120, Computational and Presentation Software | 3 |
| E T 182, Digital Logic | 3 |
| E T 190, Applied Circuits | 4 |
| E T 191, Applied Circuits Laboratory | 1 |
| MATH 180, Trigonometry | 3 |
| MATH 121, College Algebra | 3 |
| PHYS 211-211L, General Physics I, General Physics Lab I | 4 |
| Approved Human Thought and Behavior elective* | 3 |

Sophomore Year (35 credits)

CHEM 110G, Principles and Applications of Chemistry 4
 ENGL 218G, Technical and Scientific Communication 3
 E T 246, Electronic Devices I 4
 E T 262, Software Technology I 3
 E T 272, Electronic Devices II 4
 E T 282, Digital Electronics 4
 MATH 235, 236, Calculus for the Technical Student I, II 6
 PHYS 212-212L, General Physics II, General Physics Lab II 4
 ECON 251G, Principles of Macroeconomics or ECON 252G, Principles of Microeconomics* 3

Junior Year (31 credits)

E ST 311G, Statistical Applications, or E T 302, Manufacturing Data Analysis 3
 E T 324, Linear Integrated Circuits 4
 E T 344, Microcomputer Systems 3
 E T 362, Software Technology II 3
 E T 377, Computer Networking 3
 E T 398, Digital Systems 3
 MGT 315G, Human Relations in Organizations or MGT 388G, Leadership and Society 3
 Approved technical elective 3
 Approved Literature of Fine Arts elective* 3
 Approved Historical Perspective elective* 3

Senior Year (31 credits)

C E 450, Engineering Economy and Law, or I E /CH E 451, Engineering Economy 3
 E T 361, Safety Systems and Programs 3
 E T 402, Instrumentation 3
 E T 404, Quality in Manufacturing 3
 E T 410, Senior Seminar 1
 E T 444, Hardware Senior Design 3
 E T 462, Operating Systems and Interfacing 3
 Approved management, business, or marketing elective 3
 Approved technical electives 6
 Approved Viewing a Wider World elective* 3

DEGREE: Bachelor of Science in Engineering Technology

PROGRAM: Mechanical Engineering Technology (Total credits 133)

Accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

Freshman Year (34 credits)

ENGL 111G, Rhetoric and Composition 4
 E T 101, Introduction to Engineering Technology 1
 E T 110, Introduction to Mechanical Engineering Technology 3
 E T 117, Introduction to Materials 2
 E T 120, Computation and Presentation Software 3
 E T 182, Digital Logic 3
 E T 190, Applied Circuits 4
 E T 191, Applied Circuits Laboratory 1
 MATH 180, Trigonometry 3
 MATH 121, College Algebra 3
 PHYS 211-211L, General Physics I, General Physics Lab I 4
 Approved Literature of Fine Arts elective* 3

Sophomore Year (35 credits)

CHEM 110G, Principles and Applications of Chemistry 4
 COMM 265G, Principles of Human Communication 3
 ENGL 218G, Technical and Scientific Communication 3
 E T 217, Manufacturing Processes 2
 E T 217L, Manufacturing Processes Lab 1
 E T 240, Applied Statics 3
 E T 241, Applied Dynamics 2
 E T 262, Software Technology I 3
 E T 306, Fundamental and Applied Thermodynamics 3
 E T 306L, Thermodynamics Lab 1
 MATH 235, 236, Calculus for the Technical Student I, II 6
 PHYS 212-212L, General Physics II, General Physics Lab II 4

Junior Year (30 credits)

Approved Human Thought and Behavior elective* 3
 ECON 251G, Principles of Macroeconomics, or ECON 252G, Principles of Microeconomics 3
 E ST 311G, Statistical Applications, or E T 302, Manufacturing Data Analysis 3
 E T 310, Applied Strength of Materials 3
 E T 310L, Applied Strength of Materials Lab 1
 E T 308, Fluid Technology 3
 E T 308L, Fluid Technology Lab 1
 E T 328, Kinematics of Machines 4
 E T 396, Heat Transfer and Applications 3
 General Education management course 3
 Approved technical elective 3

Senior Year (34 credits)

C E 450, Engineering Economy and Law, or I E /CH E 451, Engineering Economy 3
 E T 361, Safety Systems and Programs 3
 E T 402, Instrumentation 3
 E T 404, Quality in Manufacturing 3
 E T 410, Senior Seminar 1
 E T 426, Analysis/Design of Machine Elements 3
 E T 435, Senior Design and Project Management 3
 Approved management, business, marketing elective, or upper division math course 3
 Approved technical electives 6
 Approved Historical Perspective elective* 3
 Approved Viewing a Wider World elective* 3

Note: Lists of approved technical and General Education electives are available from the Department of Engineering Technology.

*Courses taken to satisfy these General Education requirements may be taken in any order.

DEGREE: Bachelor of Information and Communication Technology

The following are prerequisites for entry into the Information and Communication Technology Program:

(a) An associate's degree or at least 62 credits from an accredited educational institution to include courses as follows:

- freshman English
- technical or research writing
- oral communications
- college algebra
- a second mathematics course from an approved list
- basic computer literacy, including office productivity tools
- at least one course in computer programming
- a 4-credit, natural science course with an accompanying laboratory (e.g., chemistry, physics, biology)

The applicant must have familiarity with and access to a computer with a CD drive, a current web browser, a 56K or higher data rate connection to the Internet, and email capability. Software that may be required for specific courses will often be available at student discount prices from the university bookstore, as well as from other sources.

(b) Completion of the following courses (37 credits):

ICT 320, Applications Software for Engineering Technologists 3
 ICT 339, Computer Forensics 3
 ICT 345, Computer Hardware Fundamentals 3
 ICT 362, Software Technology II 3
 ICT 377, Computer Networking I 3
 ICT 410, Senior Seminar 1
 ICT 420, Senior Internship or ICT 435, Senior Design and Project Management, or an approved elective 3
 ICT 456, Analysis of Physical Security Systems 3
 ICT 457, Introduction to Information Security 3
 ICT 458, Database Design And Applications 3
 ICT 462, Operating Systems and Interfacing 3
 ICT 463, Computer Systems Administration 3
 ICT 477, Computer Networking II 3

(c) Completion of the university's general education requirements (see the "General Education Courses and Requirements" section of this Catalog).

(d) An advisor will assist students in selecting any additional courses that may be required to meet the baccalaureate degree requirements of 128 credits with at least 54 credits in upper division (junior or senior level) courses. Information and Communication Technology majors must comply with all New Mexico State University, College of Engineering, and Department of Engineering Technology requirements for the baccalaureate degree as specified in the relevant sections of this Catalog.

MINOR: Manufacturing

A student must pass 18 credits with a grade of C or higher as outlined below. No courses may be taken S/U.

| | |
|--|----|
| ET 110 Introduction to Computer-Aided Drafting and Design or ME 159, Graphical Communication and Design or similar approved course; ET 217/217L or IE 217/217L, Manufacturing Processes/Laboratory; ET 415, Manufacturing Management & Productivity or IE 316, Methods Engineering or ET 309G, Manufacturing: History and Technology; ET 305, Design for Manufacturing or IE 424, Production and Inventory Control | 12 |
| One of the following: ET 404, Quality in Manufacturing; IE 310G, Continuous Quality Improvement; IE 365, Quality Control; or MGT 345, Operations Planning and Control | 3 |
| ET 482 or IE 482, Concepts in Computer Integrated Manufacturing I | 3 |

Note: Students in the College of Engineering cannot use ET 309G as a technical elective or to meet Viewing Wider World General Education requirements.

MINOR: Security Technology and Intelligence Studies

A student must pass 18 credits with a grade of C or higher as outlined below. No courses may be taken S/U. A student must register in the minor before enrolling in any upper division Criminal Justice courses.

| | |
|--|---|
| 1. All students must complete the following: ET/ICT 456, Analysis of Physical Security Systems | 3 |
| 2. Any two C J courses from the following: CJ 321, Criminal Investigation and Intelligence; CJ 412, Introduction to Security Technology and Loss Prevention; CJ 425, Ethics in Criminal Justice | 6 |
| 3. One of the following ET courses: ET/ICT 457, Introduction to Information Security; ET/ICT 458, Database Design and Application | 3 |
| 4. Any two courses from the following, or any courses listed in #2 and #3 not completed: CJ 322, Organized Crime; CJ 411, Nature of Crime; CJ 432, Issues in Criminal Justice to be Approved by CJ Department Head; CJ 480, Criminal Justice Planning & Crime Analysis; CJ 483, Terrorists CJ 484, Hate Crimes & Domestic Terrorism; ET/ICT 339, Computer Forensics; ET/ICT 377, Computer Networking (for use by students not majoring in ETE); ET/ICT 490, Selected Topics to be Approved by ET Department Head | 6 |

Three upper division CJ courses may meet 3 of the 6-credit Viewing a Wider World requirements for students majoring outside of the College of Arts and Sciences. Three upper division ET courses may meet 3 of the 6-credit Viewing a Wider World requirements for students majoring outside of the College of Engineering.

INDUSTRIAL ENGINEERING

Associate Professor Edward Pines, department head

Associate Professors Cecil, Mullen, Pines; Assistant Professors Sohn, Valles-Rosales; College Associate Professor Green
(505) 646-4923

DEGREE: Bachelor of Science in Industrial Engineering

Industrial engineers design, develop, install and improve integrated systems of people, equipment, information, financial resources, software, materials, and energy. Industrial engineers work in a variety of manufacturing, health care, utility, retail, government and research settings, therefore the tools and methods of the industrial engineer are both varied and broad. They use knowledge and skills in engineering, mathematics, and physical and social sciences along with the principles and methods of engineering analysis and design to monitor and improve such systems. New Mexico State University's undergraduate degree program in Industrial Engineering prepares students to

join the work force or pursue graduate education while setting the foundation for life-long learning.

Specifically, graduates of the program will be:

- able to apply various industrial engineering techniques in an integrated fashion to solve real world problems in process design and/or improvement;
- able to obtain meaningful employment or enroll in a graduate program; and
- prepared for a long-term, successful career sustained by life-long learning experiences.

In addition, the Accreditation Board of Engineering and Technology Engineering Criteria 2000, in conjunction with the Institute of Industrial Engineers, requires that:

- baccalaureate degree graduates will be able to demonstrate the ability to design, develop, implement and improve integrated systems that include people, materials, information, equipment and energy;
- industrial engineering curriculums include in-depth instruction allowing students to accomplish the integration of systems using appropriate analytical, computational and experimental practices; and
- that faculty teaching in industrial engineering departments show evidence of understanding professional practice and maintain currency in their respective professional areas. Program faculty must have responsibility and sufficient authority to define, revise, implement, and achieve program objectives.

Requirements (Total credits 133)

In addition to the university requirements for graduation, a student must have a 2.0 grade-point average in all departmental courses and take the Fundamentals of Engineering Examination prior to graduation.

Freshman Year (33 credits)

| | |
|---|---|
| CHEM 111, General Chemistry I | 4 |
| ENGL 111G, Rhetoric and Composition | 4 |
| IE 110, Industrial Engineering Orientation | 1 |
| IE 151, Computational Methods in Industrial Engineering I | 3 |
| IE 152, Introduction to Industrial Engineering | 2 |
| MATH 191, 192, Calculus and Analytic Geometry I, II | 6 |
| ME 159, Graphical Communication and Design | 2 |
| PHYS 215, Engineering Physics I | 3 |
| PHYS 215L, Engineering Physics I Lab | 1 |
| Approved general education elective: Literature and Fine Arts** | 3 |
| Science elective* | 4 |

Sophomore Year (33 credits)

| | |
|---|---|
| C E 233, Mechanics-Statics, or M E 236, Engineering Mechanics I | 3 |
| ECON 251G, Principles of Macroeconomics | 3 |
| IE 217, Manufacturing Processes | 2 |
| IE 217L, Manufacturing Processes Lab | 1 |
| IE 311, Engineering Data Analysis | 3 |
| IE 351, Computation Methods in Industrial Engineering II | 3 |
| MATH 291 Calculus and Analytic Geometry II | 3 |
| PSY 201G, Introduction to Psychology | 3 |
| Engineering science elective* | 6 |
| Math elective* (Linear Algebra) | 3 |
| Science elective* | 3 |

Junior Year (33 credits)

| | |
|--|---|
| ACCT 251, Management Accounting | 3 |
| CH E 361, Engineering Materials | 3 |
| ENGL 218G, Technical and Professional Communication | 3 |
| IE 316, Methods Engineering | 3 |
| IE 365, Quality Control | 3 |
| IE 467, Simulation Modeling | 4 |
| MATH 392, Differential Equations | 3 |
| Math elective*, upper-division | 3 |
| Engineering elective* | 3 |
| Approved general education elective: Historical Perspectives** | 3 |
| Approved general education elective: Viewing a Wider World† | 3 |

Senior Year (33 credits)

| | |
|--|---|
| COMM 265G, Principles of Human Communication | 3 |
| IE 413, Engineering Operations Research I | 3 |
| IE 423, Engineering Operations Research II | 3 |