TECHNOLOGY (TECH)

**TECH 10001 INFORMATION TECHNOLOGY** 3 Credit Hours
Introduction to the operation and use of computer systems in technology-related applications. Laboratory assignments include the use of microcomputers for solving technical problems.
Prerequisite: None.
Schedule Type: Laboratory, Lecture
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

**TECH 13580 ENGINEERING GRAPHICS I** 3 Credit Hours
Technique of engineering drawing, lettering, instrument use, freehand drawing, orthogonal projection, sections, single and double auxiliaries, dimensioning, screw threads, charts and graphs.
Prerequisite: None.
Schedule Type: Laboratory, Lecture
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

**TECH 20001 ENERGY/POWER** 3 Credit Hours
Study of basic thermodynamic laws and how they apply to the conversion and transfer of heat energy into useful power.
Prerequisite: TECH 21021.
Schedule Type: Laboratory, Lecture
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

**TECH 20002 MATERIALS AND PROCESSES** 3 Credit Hours
Study and practice addressing the nature of basic manufacturing materials and the processes by which they are converted into manufactured products. Includes laboratory experience.
Prerequisite: None.
Schedule Type: Laboratory, Lecture
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

**TECH 20004 FUNDAMENTALS OF CIRCUIT ANALYSIS** 3 Credit Hours
Analysis of DC and AC electrical circuits consisting of resistive and reactive components using the basic circuit theorems, descriptions of AC signals in terms of phasors, power and resonance in electrical circuits, transformers and polyphase systems.
Prerequisite: PHY 23102.
Schedule Type: Laboratory, Lecture
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

**TECH 21021 SURVEY OF ELECTRICITY AND ELECTRONICS** 4 Credit Hours
Survey of DC and AC circuits, semiconductors, and electronic devices, including diodes and transistors. Includes laboratory.
Prerequisite: PHY 13002.
Schedule Type: Laboratory, Lecture
Contact Hours: 3 lecture, 2 lab
Grade Mode: Standard Letter

**TECH 22095 SPECIAL TOPICS IN TECHNOLOGY** 1-4 Credit Hours
(repeated registration permitted) various special topics to be announced in the schedule of classes, offering current topics in technology based areas of study.
Prerequisite: Permission.
Schedule Type: Combined Lecture and Lab
Contact Hours: 1-4 other
Grade Mode: Standard Letter-IP

**TECH 23010 COMPUTER HARDWARE I** 3 Credit Hours
Introduction to the hardware, architecture and operation of the personal computer and associated devices. Topics include personal computer architecture and operation fundamentals; basic hardware; data buses and ports; hardware component packaging; auxiliary hardware components; computer assembly; basic hardware installation and configuration; and basic troubleshooting.
Prerequisite: DSCI 26010 or TECH 26010.
Schedule Type: Lecture
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

**TECH 23581 COMPUTER-AIDED ENGINEERING GRAPHICS** 3 Credit Hours
Study of working drawings, descriptive geometry, geometrical tolerancing, structural/weldments, cams, gears, piping and considerable time with the Hewlett Packard 900 CAD system.
Prerequisite: TECH 10001 or TECH 26010; and TECH 13580.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

**TECH 26200 PROGRAMMING FOR ENGINEERS I** 3 Credit Hours
Introduction to engineering problem solving and use of programming language to solve those problems. Students are expected to develop basic mathematical modeling and engineering problem solving skills using mathematical tools and programming languages. Developing modeling and logical thinking are the core objective of this course.
Prerequisite: Sophomore standing.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

**TECH 26301 NETWORKING HARDWARE I** 3 Credit Hours
A hands-on, applied engineering-focused course emphasizing the operation, maintenance, and performance aspects of personal computer networking hardware. Topics include networking hardware operation, characteristics, configuration, and troubleshooting fundamentals. Course also includes network standards, protocols, configuration, topologies, and administrative fundamentals as related to networking hardware systems.
Prerequisite: DSCI 26010 or TECH 21021 or TECH 26010.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter
<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credit Hours</th>
<th>Description</th>
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<tbody>
<tr>
<td>TECH 26310</td>
<td>WEB DESIGN AND DEVELOPMENT</td>
<td>3</td>
<td>An introduction to Web Programming. Concepts, principles, techniques, and methods associated with the design and implementation of Web pages and Internet-based applications. Includes fundamentals of web site and web page creation, development, and maintenance; Web page programming languages; Web design software and production tools; creation of dynamic, interactive web-based multimedia presentations; and Web client and server technologies.</td>
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</tbody>
</table>

**Prerequisite:** None.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter

<table>
<thead>
<tr>
<th>Course Code</th>
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</table>
| TECH 31016 | MANUFACTURING TECHNOLOGY                  | 3            | Classroom, laboratory and field experiences involving the major aspects of a manufacturing enterprise including product design, production financing and marketing.  
**Prerequisite:** TECH 10001 and TECH 13580 and TECH 20002.  
**Schedule Type:** Combined Lecture and Lab  
**Contact Hours:** 5 other  
**Grade Mode:** Standard Letter

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</table>
| TECH 31020 | AUTOMATED MANUFACTURING                   | 3            | Theory and operation of computer controlled machine tools, robots and processes.  
**Prerequisite:** None.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter

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</thead>
</table>
| TECH 31032 | POWER TECHNOLOGY                           | 3            | Principles of energy conversion and power application. Overview of basic heat engines, machines and transmission devices. Alternative energy systems and conservation techniques.  
**Prerequisite:** TECH 20001 and TECH 20004.  
**Schedule Type:** Combined Lecture and Lab  
**Contact Hours:** 3 other  
**Grade Mode:** Standard Letter

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<tr>
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</table>
| TECH 31043 | PRINCIPLES OF CONCRETE CONSTRUCTION       | 3            | An introductory course on the use of concrete in the construction industry. Students will gain a basic understanding of the strength and behavior of reinforced concrete members and simple reinforced concrete structural systems.  
**Prerequisite:** TECH 21071.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter

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</table>
| TECH 31065 | CAST METALS                                | 3            | Principles and processes of metal casting with a focus on current industrial practices. Includes laboratory experience with nonferrous metals and industrial tours.  
**Prerequisite:** TECH 20002.  
**Schedule Type:** Combined Lecture and Lab  
**Contact Hours:** 5 other  
**Grade Mode:** Standard Letter

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| TECH 31043 | PRINCIPLES OF CONCRETE CONSTRUCTION       | 3            | An introductory course on the use of concrete in the construction industry. Students will gain a basic understanding of the strength and behavior of reinforced concrete members and simple reinforced concrete structural systems.  
**Prerequisite:** TECH 21071.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter

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</table>
| TECH 31071 | WOODS TECHNOLOGY                           | 2            | Emphasis on basic woodworking machinery processes, fundamental construction and materials. Project design and development.  
**Prerequisite:** TECH 11071.  
**Schedule Type:** Combined Lecture and Lab  
**Contact Hours:** 5 other  
**Grade Mode:** Standard Letter

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</table>
| TECH 32002 | MATERIALS AND PROCESSES II                | 3            | Advanced study and practice in materials and processes. Emphasis will be upon developing skills and knowledge in producing a product and conducting problem solving activities.  
**Prerequisite:** TECH 20002.  
**Schedule Type:** Combined Lecture and Lab  
**Contact Hours:** 7 other  
**Grade Mode:** Standard Letter

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</table>
| TECH 32101 | POLYMERS I                                 | 3            | Description of various polymers, thermoplastics and thermosets. Processes used to produce products. Outline of polymer chemistry including methods of testing and identification.  
**Prerequisite:** None.  
**Schedule Type:** Lecture  
**Contact Hours:** 3 lecture  
**Grade Mode:** Standard Letter
TECH 32105  CONSTRUCTION JOBSITE MANAGEMENT  3 Credit Hours
Course concentrates on the procedures and methods that are used by the construction contractor during the construction and post-construction phases of a project.
Prerequisite: None.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 33010  COMPUTER HARDWARE  3 Credit Hours
Introduction to the hardware, architecture and operation of the personal computer and associated devices. Topics include personal computer architecture and operation fundamentals, basic hardware, data busses and ports, hardware component packaging, auxiliary hardware components, computer assembly, basic hardware installation, configuration and troubleshooting.
Prerequisite: junior standing.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 33016  PC/NETWORK ENGINEERING AND TROUBLESHOOTING  3 Credit Hours
Covers the service, maintenance, upgrade and optimization of personal computers. Specification, installation and maintenance of local area networks are covered. Students learn communication protocols and network architecture. Two lectures and two labs a week.
Prerequisite: EERT 22014 or TECH 33010.
Schedule Type: Combined Lecture and Lab
Contact Hours: 3 other
Grade Mode: Standard Letter

TECH 33020  COMPUTER HARDWARE II  3 Credit Hours
An in-depth look at personal computer design and hardware components, and an introduction to the fundamentals of personal computer networks. Topics include the operation, assembly, configuration, diagnosis, and unit-level troubleshooting of personal computers and their associated hardware components. Also includes an introduction to PC network configuration, hardware, and troubleshooting fundamentals.
Prerequisite: TECH 23010.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 33030  COMPUTER PERIPHERALS AND SPECIAL USE HARDWARE  3 Credit Hours
Operation, installation, hardware configuration, software configuration, fault analysis, troubleshooting, and repair of various peripheral devices, interface cards, and special use hardware components used by personal computers.
Prerequisite: TECH 23010 and TECH 26301.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 33031  PROGRAMMABLE LOGIC CONTROLLERS  3 Credit Hours
An introduction to programmable logic controllers (PLCs) covering hardware, ladder logic programming, networking and communications. Programming timers, counters and sequencers and an introduction to human machine interfaces (HMIS).
Prerequisite: TECH 10001 and TECH 21021.
Schedule Type: Combined Lecture and Lab
Contact Hours: 3 other
Grade Mode: Standard Letter

TECH 33032  PROGRAMMABLE LOGIC CONTROLLERS II  3 Credit Hours
Advanced principles and applications of programmable logic controllers with a focus on using sequential function charts to control complex industrial processes. Includes real time control issues, PLC networking, programming languages other than ladder logic, standards, motion control, supervisory control and data acquisition, process control, alarm management, power failure strategies and safety.
Prerequisite: TECH 33031.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 33033  HYDRAULICS/PNEUMATICS  3 Credit Hours
Fluid properties, hydraulic design, viscosity, hydraulic components, pumps, systems and circuits, maintenance and safety, pneumatics, air systems control and design.
Prerequisite: PHY 13001 or PHY 23101.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 33040  MOTORS AND CONTROLLERS  3 Credit Hours
AC and DC motors, motor control, and machine operations in mechatronic systems. Includes introduction to basic control system terms and devices, input and output transducers, signal conditioning, open loop and closed loop control, stability and performance.
Prerequisite: TECH 21021.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 33092  COOPERATIVE EDUCATION - PROFESSIONAL DEVELOPMENT (ELR) (WIC)  1-3 Credit Hours
(Repeatable for a maximum of 6 credit hours) Supervised work-study experience in approved business or industrial environment relative to the student's major. The 3 credit hour co-op experience must be for a period of at least 12 consecutive weeks at 40 hours per week, or 30 hours per week for 15 weeks, totaling not less than 450 hours. Most co-ops occur during the summer. Students can earn up to an additional 3 credit hours (one to three per co-op – 150 work hours per credit hour) over the course of their college career as long as each co-op has a different focus.
Prerequisite: sophomore standing; 2.25 GPA; and special approval.
Schedule Type: Field Experience
Contact Hours: 10-30 other
Grade Mode: Standard Letter-IP
Attributes: Experiential Learning Requirement, Writing Intensive Course
TECH 33095  SPECIAL TOPICS: APPLIED SCIENCE AND TECHNOLOGY  1-3 Credit Hours
(Repeatable for credit) Special topics of immediate interest in applied science and technology.
Prerequisite: Junior standing and special approval.
Schedule Type: Lecture
Contact Hours: 1-3 lecture
Grade Mode: Standard Letter

TECH 33111  STATICS AND STRENGTH OF MATERIALS  3 Credit Hours
An algebra based analytical study of equilibrium of extended 2dimensional bodies, the concepts of elastic and thermal properties of materials, centroid and moment of inertia, and the relationship between the external forces applied to extended objects (generally beams and columns) and the resulting bending and shear stresses, the resulting strains and deformation of the object.
Prerequisite: PHY 13001 or PHY 23101.
Schedule Type: Laboratory, Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 33220  ELECTRONIC DEVICES  4 Credit Hours
Introduction to electronic non-linear devices including, diodes, transistors, opto-electronic devices and operational amplifiers. Use and application of these devices in different types of application like rectifiers, amplifiers and linear integrated circuits.
Prerequisite: TECH 20004.
Schedule Type: Laboratory, Lecture
Contact Hours: 3 lecture, 2 lab
Grade Mode: Standard Letter

TECH 33222  DIGITAL DESIGN FOR COMPUTER ENGINEERING  3 Credit Hours
Introduction to digital design. The operation and use of digital devices and components as used in microprocessors and digital computers. Topics include binary arithmetic operations, Boolean algebra, logic gates, combinational and sequential logic, buffers, registers, memory devices. Students are exposed to applied problem solving via basic programming with microcontrollers and microprocessors.
Prerequisite: TECH 21021.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 33223  ELECTRONIC COMMUNICATION  3 Credit Hours
Principles of digital and analog telecommunications and data signals. Topics include electromagnetic signal time and frequency characteristics, signal propagation, signal modulation, transmission lines, wireless signals, antennas, digital signal characteristics and protocols, signal multiplexing, microwave devices and applications.
Prerequisite: TECH 21021.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 33225  INDUSTRIAL CONTROL SYSTEMS  3 Credit Hours
The application of electronics to the control of industrial machines and processes. Includes laboratory.
Prerequisite: TECH 33220.
Schedule Type: Laboratory, Lecture
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 33320  APPLIED EMBEDDED SYSTEMS I  3 Credit Hours
This course builds upon the content of several other Applied Engineering courses to establish a foundation for students to utilize embedded systems for engineering problem solving. The course will expose the student to the history of the microcontroller that is at the heart of modern Embedded Systems. Students will learn about the different classes of Embedded Systems and will form a foundation from which the student can begin to develop solutions to simple real world problems using simple Embedded microcontrollers, electronic devices and sensors. Basic coding principals are explained from an engineering problem solving perspective.
Prerequisite: TECH 21021, TECH 26200 and TECH 33222.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 3333  INDUSTRIAL ROBOTICS  3 Credit Hours
Classification, characteristics, and functions of industrial robots. Covers basic safety precautions for working with robots. Laboratory time will be spent programming FANUC industrial robots and utilizing FANUC robot teach pendants. Students will have the opportunity to obtain a FANUC Robotics Handling Tool Operation and Programming Certificate of Completion.
Prerequisite: PHY 13002.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 33363  METALLURGY AND MATERIALS SCIENCE  3 Credit Hours
Scientific study of modern manufacturing materials (metals, plastics and ceramics) and the laboratory test methods used to determine their manufacturing specifications and properties.
Prerequisite: Junior standing.
Schedule Type: Combined Lecture and Lab
Contact Hours: 3 other
Grade Mode: Standard Letter

TECH 33657  INTRODUCTION TO LEAN SIX SIGMA  3 Credit Hours
An introduction to lean six sigma. Including understanding the systems, measuring and defining performance, analyzing, improving, and controlling processes, and leading six sigma initiatives.
Prerequisite: MATH 11010.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 33700  QUALITY TECHNIQUES  3 Credit Hours
Introduction to quality management and the tools and techniques including the basic tools identified by ASQ (American Society for Quality) as well as an introduction to Lean and Six Sigma. Information presented helps prepare the student to qualify for the Quality Process Analyst Certification.
Prerequisite: none.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter
TECH 33870  FACILITY DESIGN AND MATERIAL HANDLING  3 Credit Hours
Provides students with a fundamental understanding of how layout affects the flow through a system. Both qualitative and quantitative tools are presented for complete approach to facility design and material handling.
Prerequisite: junior standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 34002  ADVANCED COMPUTER-AIDED DESIGN II  3 Credit Hours
Continuation of CADT 22000 with an emphasis on the use of a Parametric-based CAD software (PRO-ENGINEER) for the design and modeling of industrial products.
Prerequisite: MERT 12001 and CADT 22000; or TECH 23581.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 35765  QUALITY AND RELIABILITY ENGINEERING  3 Credit Hours
Introduction to reliability and quality engineering with an emphasis on manufacturing and techniques for improving quality and reliability. Includes reliability, reliability prediction, quality techniques, modeling statistical process control, control charts, sampling, experimental design, and designing and manufacturing for quality and reliability.
Prerequisite: MATH 11010.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 36200  PROGRAMMING FOR ENGINEERS II  3 Credit Hours
Emphasizes engineering problems and applications of programming language and mathematical tools to analyze and solve them. Students are expected to learn problem solving techniques, modeling, simulation, presentation of engineering application oriented problems using programming languages. Advanced modeling, simulations and analysis are the core objective of this course.
Prerequisite: TECH 26200; and junior standing.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 36302  NETWORKING HARDWARE II  3 Credit Hours
Continuation of TECH 26301. In-depth coverage of personal computer-based enterprise networking systems hardware with a focus on network hardware and software configuration, fault analysis, diagnostics, and troubleshooting. Topics include router and switch operation, programming, configuration, and troubleshooting, along with overall enterprise network maintenance, troubleshooting, and repair. Course also includes WAN and VLAN fundamentals, intermediate TCP/IP, and network administration and maintenance as related to fielding and maintaining networking hardware components and systems.
Prerequisite: TECH 26301.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 36337  INFORMATION TECHNOLOGY SECURITY  3 Credit Hours
This course provides the foundation for understanding the key issues associated with protecting information assets. It covers the essential principles for information security and risk management; making it an important stepping stone of an IT security career. The course is supported with case based industry problems and their solutions through simulation based labs. Additionally, this course prepares students for CompTIA's Security+ SY0-501 certification exam.
Prerequisite: None.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 36620  PROJECT MANAGEMENT IN ENGINEERING AND TECHNOLOGY  3 Credit Hours
The planning, organizing, directing, and controlling of company technology resources for project-based management functions. Includes project coordination requirements, management and planning methods and the use of various management and planning tools.
Prerequisite: Junior standing or Senior standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 37666  KINEMATICS AND DYNAMICS OF MACHINERY  3 Credit Hours
The study of the kinematics and dynamics of machinery with an emphasis on links, cams and gears.
Prerequisite: MATH 32051 and MATH 23102.
Corequisite: MATH 32052.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 41055  INDUSTRIAL PRACTICE  1-8 Credit Hours
Practicum or Internship
Prerequisite: TECH 31065 and TECH 34002.
Schedule Type: Practicum or Internship
Contact Hours: 1-8 other
Grade Mode: Standard Letter

TECH 41065  SOLID MODELING AND SOLIDIFICATION  3 Credit Hours
Introduction to casting simulation software with emphasis on projects related to design and filling of casting molds.
Prerequisite: TECH 31065 and TECH 34002.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 41093  VARIABLE TITLE WORKSHOP IN TECHNOLOGY  1-3 Credit Hours
Specialized instructional unit oriented toward the application of current technology concepts.
Prerequisite: None.
Schedule Type: Workshop
Contact Hours: 1-3 other
Grade Mode: Satisfactory/Unsatisfactory/IP
TECH 41096  INDIVIDUAL INVESTIGATION IN TECHNOLOGY
EDUCATION  1-4 Credit Hours
(Repeatable for a maximum of 4 credit hours) Individual investigation course.
Prerequisite: Special approval.
Schedule Type: Individual Investigation
Contact Hours: 1-4 other
Grade Mode: Standard Letter-IP

TECH 41196  INDIVIDUAL INVESTIGATION IN TECHNOLOGY
EDUCATION  1-4 Credit Hours
(Repeatable for a maximum of 4 credit hours) Individual investigation course.
Prerequisite: Special approval by department.
Schedule Type: Individual Investigation
Contact Hours: 1-4 other
Grade Mode: Standard Letter-IP

TECH 42100  TRAINING TOPICS IN TECHNOLOGY  1-4 Credit Hours
(Repeatable for credit) Specialized advanced instruction oriented primarily to the theoretical base and application of current technology developed by experts in the specific technology. This course requires substantial base knowledge.
Prerequisite: Permission.
Schedule Type: Laboratory, Lecture
Contact Hours: 3 lecture, 2 lab
Grade Mode: Standard Letter

TECH 42103  CONSTRUCTION SPECIFICATIONS AND SERVICES  3 Credit Hours
Educates the student in the fundamental tenants that all the stakeholders in the design and construction industry hold to. With a firm understanding of what the roles and responsibilities that each stakeholder has to the others the student participates in the process of construction confident that they understand what they are expected to do in their role as well as what they can expect of the architect, the owner and the various trades.
Prerequisite: TECH 22200.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 42200  RADIATION PROCESSING OF MATERIALS  3 Credit Hours
Description of the radiation sources used in radiation technology and the study of the effects of electrons and gamma rays on materials of technological interest. Experiments deal with the effects of radiation in different materials.
Prerequisite: PHY 13002 or PHY 12202; and MATH 12002 or MATH 19002; and TECH 32100 and TECH 33363.
Schedule Type: Combined Lecture and Lab
Contact Hours: 3 other
Grade Mode: Standard Letter

TECH 42400  RADIATION DOSIMETRY AND SAFETY  3 Credit Hours
(Slashed with TECH 52400) Basic concepts of dosimetry and its units as applied to radiation technology, including theory of dosimeter response. Safety principles and practices followed in radiation environments, including terminology, policies and procedures to minimize exposure to radiation.
Prerequisite: TECH 42200.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 43016  ADVANCED PC-NETWORK ENGINEERING AND TROUBLESHOOTING  3 Credit Hours
An in-depth look at the architecture, operation, configuration, fault analysis, troubleshooting and repair of personal computer and computer network hardware components. Topics include the operation, assembly, configuration, diagnosis, and unit-level troubleshooting of personal computer hardware, computer networking hardware, and related hardware components.
Prerequisite: TECH 33020 and TECH 36302.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 43026  MICROPROCESSOR SYSTEMS  4 Credit Hours
Introduction to the architecture, operation and applications of an advanced microprocessor, focusing on assembly language programming and interfacing of standard programmable peripherals.
Prerequisite: TECH 33222 and TECH 46330.
Schedule Type: Laboratory, Lecture
Contact Hours: 3 lecture, 2 lab
Grade Mode: Standard Letter

TECH 43030  MECHATRONICS  3 Credit Hours
Application of automation concepts in motion control, electrical circuits, fundamental mechanics, control systems and programming including modeling, interfacing and signal conditioning.
Prerequisite: TECH 43030.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 1 lab
Grade Mode: Standard Letter

TECH 43031  MECHATRONICS II  3 Credit Hours
Advanced modeling, system response, closed loop control and system software for mechatronic systems.
Prerequisite: TECH 43030.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 1 lab
Grade Mode: Standard Letter

TECH 43050  INVENTIVE PROBLEM SOLVING  3 Credit Hours
Theory of Inventive Problem Solving, TRIZ, is a collection of powerful problem-solving tools for a broad range of inventive problems. Capstone web-based course for students finishing their bachelor's degree. Assists students in utilizing material learned in earlier courses to solve many real world problems in multiple disciplines.
Prerequisite: Junior or senior standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 43060  MANAGEMENT OF TECHNOLOGY INNOVATION  3 Credit Hours
Subjects covered in this course are case studies of innovative companies, elements of an innovation process, review of major problem solving methods, technical opportunity analysis, technical planning, technological forecasting, concept development and elements of patents. A project is included that utilizes TRIZ software and innovation model elements.
Prerequisite: Junior or senior standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter
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<tr>
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<tbody>
<tr>
<td>TECH 43080</td>
<td>INDUSTRIAL AND ENVIRONMENTAL SAFETY</td>
<td>3</td>
<td>Examines the occupational safety and health act and fundamentals of industrial safety programs.</td>
<td>None.</td>
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<td></td>
<td><strong>Grade Mode:</strong> Standard Letter</td>
<td><strong>Schedule Type:</strong> None</td>
<td><strong>Contact Hours:</strong> 3 lecture</td>
<td><strong>Grade Mode:</strong> Standard Letter</td>
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<td></td>
<td><strong>Schedule Type:</strong> Lecture</td>
<td><strong>Contact Hours:</strong> 3 lecture</td>
<td><strong>Grade Mode:</strong> Standard Letter</td>
<td><strong>Corequisite:</strong> TECH 23224.  <strong>Schedule Type:</strong> Laboratory, Lecture  <strong>Contact Hours:</strong> 3 lecture  <strong>Grade Mode:</strong> Standard Letter</td>
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<td><strong>Schedule Type:</strong> Laboratory, Lecture, Combined Lecture and Lab</td>
<td><strong>Contact Hours:</strong> 2 lecture</td>
<td><strong>Grade Mode:</strong> Standard Letter</td>
<td><strong>Corequisite:</strong> TECH 33223.  <strong>Schedule Type:</strong> Laboratory, Lecture  <strong>Contact Hours:</strong> 3 lecture  <strong>Grade Mode:</strong> Standard Letter</td>
</tr>
<tr>
<td>TECH 43221</td>
<td>DIGITAL CONTROL SYSTEMS AND INSTRUMENTATION</td>
<td>4</td>
<td>Focuses on applications of instrumentation and control systems using computers and microcontrollers including sensors, transducers, instruments, data acquisition boards, software programs, signal conditioning and transmission methods.</td>
<td>TECH 43026 and MATH 12003 and PHY 23102.</td>
</tr>
<tr>
<td></td>
<td><strong>Grade Mode:</strong> Standard Letter</td>
<td><strong>Schedule Type:</strong> Laboratory, Lecture</td>
<td><strong>Contact Hours:</strong> 3 lecture, 2 lab</td>
<td><strong>Corequisite:</strong> TECH 33223.  <strong>Schedule Type:</strong> Laboratory, Lecture  <strong>Contact Hours:</strong> 3 lecture  <strong>Grade Mode:</strong> Standard Letter</td>
</tr>
<tr>
<td>TECH 43222</td>
<td>ELECTRICAL MACHINERY</td>
<td>3</td>
<td>Principles of operation and application of motors, generators, transformers and other magnetic devices; electrical power generation, distribution and use.</td>
<td>TECH 23224.</td>
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<td></td>
<td><strong>Grade Mode:</strong> Standard Letter</td>
<td><strong>Schedule Type:</strong> Lecture</td>
<td><strong>Contact Hours:</strong> 3 lecture</td>
<td><strong>Corequisite:</strong> TECH 33223.  <strong>Schedule Type:</strong> Laboratory, Lecture  <strong>Contact Hours:</strong> 3 lecture  <strong>Grade Mode:</strong> Standard Letter</td>
</tr>
<tr>
<td>TECH 43220</td>
<td>COMPUTER HARDWARE ENGINEERING AND ARCHITECTURE</td>
<td>3</td>
<td>Internal architecture and operation of digital computers. Topics include computer processor datapaths and control, computer memory datapaths and control, pipelining and parallel processing, memory architecture and management, IO control, system bus architecture and properties, storage systems, and computer control timing and synchronization. Students gain understanding in how system software manages system resources and abstracts programming requirements. Alternative architectures such as embedded systems and SoC platforms are discussed. Industry standards for calculating system performance are used.</td>
<td>DSCI 26010 or TECH 33222.  <strong>Schedule Type:</strong> Laboratory, Lecture, Combined Lecture and Lab  <strong>Contact Hours:</strong> 2 lecture, 2 lab  <strong>Grade Mode:</strong> Standard Letter</td>
</tr>
<tr>
<td>TECH 43320</td>
<td>APPLIED EMBEDDED SYSTEMS II</td>
<td>3</td>
<td>This course serves as an extension of TECH 33333. The student will develop advanced engineering problem solving techniques using embedded system microcontrollers. Further programming in Embedded C is supported by this practical problem solving approach. Assembler language is discussed to solve specific hardware issues. A broad survey of special use computing hardware such as FPGAs, ASICs and SoC platforms is covered with basic approaches to leverage and program these devices.</td>
<td>TECH 33333 and TECH 36200.  <strong>Schedule Type:</strong> Laboratory, Lecture, Combined Lecture and Lab  <strong>Contact Hours:</strong> 2 lecture, 2 other  <strong>Grade Mode:</strong> Standard Letter</td>
</tr>
<tr>
<td>TECH 43550</td>
<td>COMPUTER-AIDED MANUFACTURING</td>
<td>3</td>
<td>The application of computers to the preparation of machine tool control programs.</td>
<td>TECH 10001 or TECH 26010; and TECH 20002.</td>
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<td><strong>Grade Mode:</strong> Standard Letter</td>
<td><strong>Schedule Type:</strong> Combined Lecture and Lab</td>
<td><strong>Contact Hours:</strong> 5 other</td>
<td><strong>Corequisite:</strong> TECH 20001 or TECH 26010; and TECH 33111 and TECH 34002 and MATH 12002 and PHY 13001.  <strong>Schedule Type:</strong> Lecture  <strong>Contact Hours:</strong> 3 lecture  <strong>Grade Mode:</strong> Standard Letter</td>
</tr>
<tr>
<td>TECH 43580</td>
<td>COMPUTER-AIDED MACHINE DESIGN</td>
<td>3</td>
<td>Description and Prerequisite Data Currently in Banner:Application of the principles of mechanics and strength of materials, with computer assistance to the design and selection of machine components under both static and dynamic loads.</td>
<td>TECH 10001 or TECH 26010; and TECH 33111 and TECH 34002 and MATH 12002 and PHY 13001.</td>
</tr>
<tr>
<td>TECH 43700</td>
<td>COMPUTER INTEGRATED MANUFACTURING</td>
<td>3</td>
<td>Study of the computer integrated manufacturing system as it relates to product design, estimating inventory, machining and assembly, quality control and distribution.</td>
<td>TECH 43550.</td>
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<td></td>
<td><strong>Grade Mode:</strong> Standard Letter</td>
<td><strong>Schedule Type:</strong> Combined Lecture and Lab</td>
<td><strong>Contact Hours:</strong> 5 other</td>
<td><strong>Corequisite:</strong> TECH 43550.  <strong>Schedule Type:</strong> Combined Lecture and Lab  <strong>Contact Hours:</strong> 3 lecture  <strong>Grade Mode:</strong> Standard Letter</td>
</tr>
<tr>
<td>TECH 43800</td>
<td>APPLIED ENGINEERING TECHNOLOGY SEMINAR (ELR)</td>
<td>3</td>
<td>As the capstone course in Applied Engineering, students will develop and participate in all aspects of a project involving the solution of a problem through application of technology. Students must pass the ATMAE Certified Technical Manager (CTM) exam.</td>
<td>TECH 43800.                          <strong>Schedule Type:</strong> Individual Investigation, Lecture  <strong>Contact Hours:</strong> 1 lecture, 2 other  <strong>Grade Mode:</strong> Standard Letter  <strong>Attributes:</strong> Experiential Learning Requirement</td>
</tr>
<tr>
<td>TECH 45099</td>
<td>CAPSTONE: FOUNDRY TOOLING AND PATTERN MAKING</td>
<td>3</td>
<td>Capstone course for Applied Engineering Foundry Technology concentration. A project based lecture-lab focused on production of foundry tooling, testing, and quality approval.</td>
<td>TECH 41065 and TECH 43550.  <strong>Schedule Type:</strong> Laboratory, Lecture, Combined Lecture and Lab  <strong>Contact Hours:</strong> 2 lecture, 2 lab  <strong>Grade Mode:</strong> Standard Letter</td>
</tr>
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TECH 46000  COMPUTER ENGINEERING TECHNOLOGY CAPSTONE (ELR)  3 Credit Hours
The course provides students with an integrative experience, applying aspects of the student's required coursework in computer engineering technology. Students gain experience in developing requirements in engineering specifications for a practical problem in networking and or telecom-related projects. This course will address emerging issues, capabilities and challenges in the current field of study.
Prerequisite: senior standing.
Corequisite: TECH 46350.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter
Attributes: Experiential Learning Requirement

TECH 46300  NETWORK SECURITY  3 Credit Hours
Introduction to Network security with emphasis in identifying, analyzing and preventing various threats and attack patterns on computer networks. Students will gain practical knowledge on network security protocols, firewalls, VPN, Intrusion detection and prevention systems. Prepares students for industry certification.
Prerequisite: TECH 26301.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 46312  WIRELESS NETWORK AND TELECOMMUNICATION SYSTEMS  3 Credit Hours
(Slashed with TECH 56312) This course builds upon existing wired networking skills from Network Hardware I & II and extends the students knowledge into the world of wireless networking. Students learn digital wireless fundamentals, wireless standards, how to implement a wireless network in an enterprise environment and how to troubleshoot wireless issues. Curriculum follows and prepares students for industry certification in wireless networking.
Prerequisite: TECH 26301.
Corequisite: TECH 36302.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 46316  SERVER ADMINISTRATION AND CONFIGURATION I  3 Credit Hours
This course emphasizes on configuring and administering server operating systems to solve engineering problems. Students are expected to learn MS server management, Active Directory, OUs and server roles by utilizing variety of on-based and cloud based solutions.
Prerequisite: None.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 46330  VISUAL BASIC PROGRAMMING IN ENGINEERING TECHNOLOGY  3 Credit Hours
The course content includes programming in a high-level object-oriented, event- driven visual programming language, Visual Basic 2010 Express, conditional statements, iterative statements, arrays, object oriented programming, classes, objects, methods, inheritance, exception handling, graphical user interfaces with Windows Forms.
Prerequisite: TECH 26010 or DSCI 26010.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 4 other
Grade Mode: Standard Letter

TECH 46350  NETWORK MANAGEMENT AND DESIGN TECHNOLOGY  3 Credit Hours
Course covers the technical aspects of centrally managed and distributed Wide Area Networks, with an emphasis on the techniques used to maintain and improve the performance of telecommunications and data networks. Students will use software packages to monitor the real-time performance of a network and to diagnose various networking hardware and software problems. Topics include the five stacks of network management (fault management, configuration management, performance management, security management, and accounting management). Examples of current specific network management products are reviewed.
Prerequisite: TECH 36302.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 46411  REQUIREMENTS ENGINEERING AND ANALYSIS  3 Credit Hours
Describes requirements engineering concepts for practical systems. Topics include identifying stakeholders and how to work with them effectively, requirements elicitation techniques, requirements engineering in the Problem Domain, developing Use-Case scenarios, reference models, systems requirements specifications, validating and prototyping requirements and case study presentations by Industry SMEs. Some knowledge of a programming language or good analytical background is assumed. Prerequisite may be waived for students with industry experience in software development or consent from the instructor.
Prerequisite: minimum C (2.000) grade in TECH 26010 or DSCI 26010.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 46510  APPLIED INFORMATION TECHNOLOGY SECURITY  3 Credit Hours
The purpose of the course is to provide the student with an overview of the field of information security and assurance. Students will be exposed to the spectrum of security activities, methods, methodologies, and procedures. Coverage will include inspection and protection of information assets, detection of and reaction to threats to information assets, and examination of pre and post incident procedures and an overview of the information technology security.
Prerequisite: none.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 47200  SYSTEMS ENGINEERING  3 Credit Hours
(Slashed with TECH 57200) Systems engineering as a method to solve problems. Introduction to the fundamental systems engineering principles, processes, and methodologies used to analyze, design, develop, and deploy complex, sustainable systems. Focuses on systems engineering as a logical, disciplined, systematic, and coherent approach to the design and development of a system, across the full life cycle of the system. Special emphasis is made on the concepts, methods, and activities used to analyze systems, to define and allocate requirements, to transform requirements into a system design, and to verify and validate the system.
Prerequisite: junior standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter
TECH 47210  SUSTAINABLE ENERGY I  3 Credit Hours
A comprehensive overview of energy sources and energy systems, with an emphasis on renewable energy and the implementation and sustainability of various forms of energy. Examines the characteristics of conventional non-renewable energy systems, along with alternate, renewable energy sources and systems. Includes fundamental energy concepts and the conversion, delivery, distribution, and storage of energy. Explores the technological application of various sources of energy and compares their benefits and limitations. Also presents an overview of present U.S. and global energy needs and demands, and the sustainable energy technologies that may be used to meet future energy demands.
Prerequisite: None.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 47211  SUSTAINABLE ENERGY II  3 Credit Hours
An in-depth study of the analysis, selection, and implementation of various energy and power sources, with an emphasis on the use of renewable, sustainable energy systems. Focuses on determining energy needs, and on assessing and comparing energy systems with respect to efficiency, technical feasibility, available resources, cost and sustainability characteristics. Includes economics of energy systems, methods for determining costs, and cost-benefit analysis of various energy and power systems. Also includes the social, economic and environmental impact associated with the development, implementation and use of various forms of energy.
Prerequisite: TECH 47210.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 50000  QUALITY STANDARDS  3 Credit Hours
This course introduces students to issues in quality standards, quality assurance and statistical inference in applied technology and process control. Topics include systems reliability, quality control, SPC, control charts, principles and methods of statistical analysis and prediction, and hypothesis testing.
Prerequisite: Graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 50092  INDUSTRIAL PRACTICE  1-4 Credit Hours
Practical experience in industry of a cooperative work-study nature.
Prerequisite: graduate standing; and special approval.
Schedule Type: Practicum or Internship
Contact Hours: 3-12 other
Grade Mode: Standard Letter

TECH 51001  METHODS IN TECHNOLOGY EDUCATION  3 Credit Hours
Methods of teaching curriculum development and evaluation which are unique to the profession of technology education.
Prerequisite: Graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 51002  ORGANIZATION IN TECHNOLOGY EDUCATION  3 Credit Hours
Principles and practices involved in curriculum and facility design appropriate for technology education including equipment maintenance.
Prerequisite: Graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 51003  METHODS AND ORGANIZATION IN TECHNOLOGY EDUCATION  3 Credit Hours
Curriculum development, organization, and evaluation for technology education's role in STEM. Includes demonstration techniques and safety instruction, lesson plan development and facility design principles.
Prerequisite: graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 51051  FOUNDATIONS AND CONTEMPORARY THEORIES OF TECHNOLOGY EDUCATION  3 Credit Hours
This course explores the history, contemporary theories and practices of technology education. Included are site visits to exemplary technology education programs.
Prerequisite: Graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 51052  TECHNOLOGY AND ENGINEERING FOR K TO 8 STEM  3 Credit Hours
Using discussion, laboratory experience and field experiences this course explores technology education as it relates to all content areas of the K-12 curriculum.
Prerequisite: Graduate standing.
Schedule Type: Combined Lecture and Lab
Contact Hours: 3 other
Grade Mode: Standard Letter

TECH 51093  VARIABLE TITLE WORKSHOP IN TECHNOLOGY  1-3 Credit Hours
(Repeatable for credit)Specialized instructional unit oriented toward the application of current technology concepts.
Prerequisite: Graduate standing.
Schedule Type: Workshop
Contact Hours: 1-3 other
Grade Mode: Satisfactory/Unsatisfactory

TECH 52200  INTERACTION OF RADIATION WITH MATERIALS  3 Credit Hours
Understand the basic mechanisms of the interaction of alpha, beta, and gamma radiation with matter. Understand how radiation is absorbed in matter. Learn the effects of radiation in different materials of consumers' importance like, biological materials, medical devices, polymers, inks and coatings.
Prerequisite: TECH 52400; and graduate standing.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter
TECH 52400  RADIATION DOSIMETRY AND SAFETY  3 Credit Hours
Basic concepts of dosimetry and its units as applied to radiation technology, including theory of dosimeter response and use of dosimeters in radiation environments. Safety principles and practices followed in radiation environments, including terminology, maximum exposure limits, and procedures to minimize exposure to radiation.
Prerequisite: PHY 12202 or PHY 13002; and MATH 12002 or MATH 19002; and TECH 32100 and TECH 33363; and graduate standing.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 53026  INTRODUCTION TO MICROPROCESSORS  4 Credit Hours
Introduction to the architecture, operation and applications of an advanced microprocessor, focusing on assembly language programming and interfacing of standard programmable peripherals.
Prerequisite: TECH 33222 and 46330.
Schedule Type: Laboratory, Lecture
Contact Hours: 3 lecture, 2 lab
Grade Mode: Standard Letter

TECH 53221  DIGITAL CONTROL SYSTEMS AND INSTRUMENTATION  4 Credit Hours
Focuses on applications of instrumentation and control systems using computers and microcontrollers including sensors, transducers, instruments, data acquisition boards, software programs, signal conditioning and transmission methods.
Prerequisite: TECH 33223; and TECH 43026 or 53026; and graduate standing.
Schedule Type: Laboratory, Lecture
Contact Hours: 3 lecture, 2 lab
Grade Mode: Standard Letter

TECH 53222  COMPUTER HARDWARE ENGINEERING AND ARCHITECTURE  3 Credit Hours
Internal architecture and operation of digital computers. Topics include computer processor datapaths and control, computer memory datapaths and control, pipelining and parallel processing, memory architecture and management, IO control, system bus architecture and properties, computer control timing, and synchronization of controls.
Prerequisite: graduate standing.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 53550  COMPUTER-AIDED MANUFACTURING  3 Credit Hours
The application of computers to the preparation of machine tool control programs, rapid prototyping and robotic control. Two hours lecture and two hours lab.
Prerequisite: TECH 23581 and graduate standing.
Schedule Type: Combined Lecture and Lab
Contact Hours: 4 other
Grade Mode: Standard Letter

TECH 53700  COMPUTER INTEGRATED MANUFACTURING  3 Credit Hours
The study of computer integrated manufacturing as system control, product design, machining, assembly, material logistics, quality, information usage and system integration relates to it.
Prerequisite: TECH 31020 and TECH 53550 and graduate standing.
Schedule Type: Combined Lecture and Lab
Contact Hours: 4 other
Grade Mode: Standard Letter

TECH 53800  APPLIED ENGINEERING TECHNOLOGY SEMINAR  2 Credit Hours
An individual or group project involving the solution of a problem through the application of technology.
Prerequisite: Special approval and graduate standing.
Schedule Type: Seminar
Contact Hours: 2 other
Grade Mode: Standard Letter

TECH 55551  INTRODUCTION TO NANOTECHNOLOGY  3 Credit Hours
Provides an in-depth overview of the fundamentals of nanoscience and nanotechnology. Includes a survey of developments within the breadth of the nanotechnology in various fields such as electronics, materials, energy, and biomedical science, etc.
Prerequisite: graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 56312  WIRELESS NETWORK AND TELECOMMUNICATION SYSTEMS  3 Credit Hours
Wireless and telecommunication electronic systems technologies. Topics covered include the Public Switch Telephone Network infrastructure, electronic switching systems, transmission systems, and emerging wireless networks.
Prerequisite: graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 56321  WEB DATABASE INTEGRATION  3 Credit Hours
Laboratory course focused on integrating data sources into web sites. Current topics include server-side processing principles, Web forms, database programming objects and structured query language.
Prerequisite: COMT 21005 and COMT 21036 and graduate standing.
Schedule Type: Combined Lecture and Lab
Contact Hours: 3 other
Grade Mode: Standard Letter

TECH 56330  VISUAL BASIC PROGRAMMING IN ENGINEERING TECHNOLOGY  3 Credit Hours
The course content includes programming in a high-level object-oriented, event-driven visual programming language, Visual Basic 2010 Express, conditional statements, iterative statements, arrays, object oriented programming, classes, objects, methods, inheritance, exception handling, graphical user interfaces with Windows Forms. Includes a graduate-level VB programming project.
Prerequisite: graduate standing.
Schedule Type: Combined Lecture and Lab
Contact Hours: 3 other
Grade Mode: Standard Letter
TECH 56350  NETWORK MANAGEMENT AND DESIGN TECHNOLOGY  3 Credit Hours
The technical aspects of centrally managed and distributed Wide Area Networks, with an emphasis on the techniques used to maintain and improve the performance of telecommunications and data networks. Students will use software packages to monitor the real-time performance of a network and to diagnose various networking hardware and software problems. Topics include the five stacks of network management (fault management, configuration management, performance management, security management, and accounting management). Examples of current specific network management products are reviewed.
Prerequisite: graduate standing.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 56411  REQUIREMENTS ENGINEERING AND ANALYSIS TECHNOLOGY  3 Credit Hours
Techniques to conceptualize, develop and analyze requirements engineering specifications for software and telecommunications systems. Topics covered include identifying stakeholders and how to effectively work with them, requirements elicitation techniques; requirements engineering in the problem and solution domains. Strong analytic skills, algorithms or programming experience is recommended.
Prerequisite: graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 57000  SUSTAINABLE SYSTEMS AND TECHNOLOGY  3 Credit Hours
Introduction to the fundamental concepts and principles of sustainability, sustainable technologies and sustainable systems. Provides students with an understanding of the basic principles and key issues of environmental, social and economic sustainability. Closely examines sustainability as it applies to the relationships among human beings, technology and the environment, with a special emphasis on sustainability in the context of "meeting humanity’s current needs." Also stresses the ethics and importance of sustainability and the use of sustainable systems.
Prerequisite: graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter-S/U-IP

TECH 57010  ETHICS, TECHNOLOGY AND THE ENVIRONMENT  3 Credit Hours
Explores the fundamental issues of the interconnections between human beings and the environment, with an emphasis on the ethics and the importance of the sustainability. Takes an in-depth look at basic environmental concepts, ethics and values, as they relate to a wide range of practical subject matters, including technology, from global and national perspectives. Provides an in-depth look at sustainable systems and the ethical issues associated with sustainability as it relates to technology by focusing on common and future impacts as they apply to ethics, values and justice. Prerequisite: graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter-S/U-IP

TECH 57200  SYSTEMS ENGINEERING  3 Credit Hours
(Slashed with TECH 47200) Systems engineering as a method to solve problems. Introduction to the fundamental systems engineering principles, processes, and methodologies used to analyze, design, develop, and deploy complex, sustainable systems. Focuses on systems engineering as a logical, disciplined, systematic, and coherent approach to the design and the development of a system, across the full life cycle of the system. Special emphasis is made on the concepts, methods and activities used to analyze systems, to define and allocate requirements, to transform requirements into a system design, and to verify and validate the system.
Prerequisite: graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter-S/U-IP

TECH 57210  SUSTAINABLE ENERGY I  3 Credit Hours
(Cross-listed with TECH 47210) A comprehensive overview of energy sources and energy systems, with an emphasis on renewable energy and the implementation and sustainability of various forms of energy. Examines the characteristics of conventional non-renewable energy systems, along with alternate, renewable energy sources and systems. Includes fundamental energy concepts and the conversion, delivery, distribution, and storage of energy. Explores the technological application of various sources of energy and compares their benefits and limitations. Also presents an overview of presents U.S. and global energy needs and demands, and the sustainable energy technologies that may be used to meet future energy demands.
Prerequisite: graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter-S/U-IP

TECH 57211  SUSTAINABLE ENERGY II  3 Credit Hours
(Cross-listed with TECH 47211) An in-depth study of the analysis, selection, and implementation of various energy and power sources, with an emphasis on the use of renewable, sustainable energy systems. Focuses on determining energy needs, and on assessing and comparing energy systems with respect to efficiency, technical feasibility, available resources, cost and sustainability characteristics. Includes economics of energy systems, methods for determining costs, and cost-benefit analysis of various energy and power systems. Also includes the social, economic, and environmental impact associated with the development, implementation, and use of various forms of energy.
Prerequisite: graduate standing and TECH 57210.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter-S/U-IP

TECH 60000  PROJECT MANAGEMENT IN A TECHNOLOGICAL ENVIRONMENT  3 Credit Hours
The planning, organizing, directing and controlling of company technology resources for relatively short term objectives. Students will also learn to make application of current projects.
Prerequisite: Graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter
TECH 60001  QUANTITATIVE METHODS IN TECHNOLOGY  3 Credit Hours
Descriptive and inferential statistics used in technology and engineering. Emphasis is on the methods of analysis and the interpretation of data associated with research and development in technological and engineering environments. Course topics include representation of data, descriptive statistics, probability and probability distributions, inferential statistics, statistical design, and the analysis of experiments. No previous familiarity with probability or statistics is assumed. The ability to utilize basic algebra is required.
Prerequisite: graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 60003  SIX-SIGMA: TOOLS AND APPLICATIONS FOR TECHNOLOGY MANAGEMENT  3 Credit Hours
Principles and concepts of six-sigma to improve organizational efficiency, effectiveness and productivity by improving quality, reducing waste, defects and failures.
Prerequisite: TECH 50000 and 60001; and graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 60010  RADIATION SOURCES FOR RADIATION PROCESSING  3 Credit Hours
Description of the basic types of radiations used for Radiation Processing and how these radiations are produced. Describe the types of gamma, electron, and Bremsstrahlung facilities used in the area of Radiation Processing and the qualifications of an irradiator to be used in this area. The student will also learn about the different industries that use ionizing radiation in their processes.
Prerequisite: TECH 52400; and graduate standing.
Schedule Type: Laboratory, Lecture, Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 60078  RESEARCH METHODS IN TECHNOLOGY  3 Credit Hours
Research techniques for the technologist. Methods for designing, conducting, analyzing and interpreting results of technological research.
Prerequisite: Graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 61000  INDUSTRIAL TECHNOLOGY EDUCATION  3 Credit Hours
This course provides students with an understanding of the rationale and issues related to developing the industrial technology education program.
Prerequisite: Graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 61095  SPECIAL TOPICS IN APPLIED ENGINEERING  1-4 Credit Hours
(Repeatable for credit) Study of significant and current issues in various Applied Engineering topics not covered in regular courses. Offered when opportunities and resources permit; the topic is announced when the course is scheduled.
Prerequisite: graduate standing.
Schedule Type: Lecture
Contact Hours: 1-4 lecture
Grade Mode: Standard Letter

TECH 61098  RESEARCH  1-15 Credit Hours
(Repeatable for credit) Research or individual investigation for master's level graduate students. Credits earned may be applied toward meeting degree requirements if department approves.
Prerequisite: Graduate standing.
Schedule Type: Research
Contact Hours: 1-15 other
Grade Mode: Satisfactory/Unsatisfactory-IP

TECH 61199  THESIS I  2-6 Credit Hours
Thesis option student must register for a total of 6 hours, 2 to 6 in a single semester or to be distributed over several semesters if desired.
Prerequisite: Advisor's special approval and graduate standing.
Schedule Type: Masters Thesis
Contact Hours: 2-6 other
Grade Mode: Satisfactory/Unsatisfactory-IP

TECH 62396  INDIVIDUAL INVESTIGATION IN ELECTRONIC TECHNOLOGY  2 Credit Hours
(Repeatable for credit) Individual investigation of a student-selected topic oriented toward the technical aspects of electronics.
Prerequisite: TECH 53221 and graduate standing.
Schedule Type: Individual Investigation
Contact Hours: 3 other
Grade Mode: Standard Letter-IP

TECH 63010  COMPUTER HARDWARE  3 Credit Hours
Introduction to the hardware, architecture and operation of the personal computer and associated devices. Topics include personal computer architecture and operation fundamentals, basic hardware, data busses and ports, hardware component packaging, auxiliary hardware components, and computer assembly, basic hardware installation, configuration and troubleshooting.
Prerequisite: graduate standing.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 63020  FIBER OPTIC SYSTEMS  3 Credit Hours
Principles and characteristics of fiber optics, fiber optic system components and applications of fiber optics in electronic communication systems.
Prerequisite: TECH 33220 and graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter
### TECH 63031  PROGRAMMABLE LOGIC CONTROLLERS  3 Credit Hours
Programmable logic controllers (PLCs) covering hardware, ladder logic programming, networking and communications. Programming timers, counters and sequencers and an introduction to human machine interfaces (HMIS). An understanding of basic electricity and computer technology is required.

**Prerequisite:** graduate standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 2 lecture, 1 lab

**Grade Mode:** Standard Letter

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### TECH 63050  TRIZ-THEORY OF INVENTIVE PROBLEM SOLVING  3 Credit Hours
Theory of Inventive Problem Solving, TRIZ, is a collection of powerful problem-solving tools for a broad range of inventive problems. The theory originated in Russia by the study of over 2 million patents. Web-based capstone for students finishing their master’s degree. Students utilize material learned in earlier courses to solve real world problems in multiple disciplines.

**Prerequisite:** graduate standing.

**Schedule Type:** Lecture

**Contact Hours:** 3 lecture

**Grade Mode:** Standard Letter

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### TECH 63040  ELECTRONIC COMMUNICATIONS  3 Credit Hours
Study of electronic communications systems fundamentals, characteristics, design considerations and implementation. Topics include signal modulation and demodulation, multiplexing, noise, transmitters, receivers, signal propagation, digital communications, transmission lines, antennas and practical applications.

**Prerequisite:** graduate standing.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 2 lab

**Grade Mode:** Standard Letter

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### TECH 63032  ADVANCED PROGRAMMABLE LOGIC CONTROLLERS  3 Credit Hours
Advanced principles and applications of programmable logic controllers with a focus on using sequential function charts to control complex industrial processes. Includes real time control issues, PLC networking, programming languages other than ladder logic, standards, motion control, supervisory control and data acquisition, process control, alarm management, power failure strategies and safety.

**Prerequisite:** TECH 33031 or TECH 63031; and graduate standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 2 lecture, 2 lab

**Grade Mode:** Standard Letter

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### TECH 63040  ELECTRONIC COMMUNICATIONS  3 Credit Hours
Study of electronic communications systems fundamentals, characteristics, design considerations and implementation. Topics include signal modulation and demodulation, multiplexing, noise, transmitters, receivers, signal propagation, digital communications, transmission lines, antennas and practical applications.

**Prerequisite:** graduate standing.

**Schedule Type:** Laboratory, Lecture, Combined Lecture and Lab

**Contact Hours:** 2 lecture, 2 lab

**Grade Mode:** Standard Letter

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### TECH 63041  MOTORS AND CONTROLLERS  3 Credit Hours
Theory and application of AC and DC motors, motor control, and machine operations in mechatronic systems. Includes introduction to basic control system terms and devices, input and output transducers, signal conditioning, open loop and closed loop control, stability and performance.

**Prerequisite:** TECH 21021 and graduate standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 2 lecture, 2 lab

**Grade Mode:** Standard Letter

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### TECH 63045  MECHATRONICS  3 Credit Hours
Application of automation concepts in motion control, electrical circuits, fundamental mechanics, control systems and programming including modeling, interfacing and signal conditioning.

**Prerequisite:** TECH 33032 or TECH 63932; and TECH 33040 or TECH 63040; and PHY 23102; and graduate standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 2 lecture, 2 lab

**Grade Mode:** Standard Letter

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### TECH 63046  ADVANCED MECHATRONICS  3 Credit Hours
Advanced modeling, system response, closed loop control and system software for mechatronic systems.

**Prerequisite:** TECH 43030 or TECH 63045; and graduate standing.

**Schedule Type:** Combined Lecture and Lab

**Contact Hours:** 2 lecture, 2 lab

**Grade Mode:** Standard Letter
TECH 63870  FACILITY DESIGN AND MATERIAL HANDLING  3 Credit Hours
Intended to provide students with a fundamental understanding of how layout affects the flow through a system. Both qualitative and quantitative tools are presented for a complete approach to facility design and material handling.
Prerequisite: graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 64010  CONNECTIVITY AND INTEROPERABILITY IN INDUSTRY  3 Credit Hours
This course focuses on integrating and administering multiple systems in an industrial environment. Two-and-a-half-hour lecture and 30-minute lab weekly.
Prerequisite: TECH 46311 and graduate standing.
Schedule Type: Combined Lecture and Lab
Contact Hours: 3 other
Grade Mode: Standard Letter

TECH 64095  SPECIAL TOPICS IN COMPUTER ENGINEERING TECHNOLOGY  1-4 Credit Hours
(Repeatable for credit) Study of significant and current issues in computer and network engineering technologies not covered in regular courses. Offered when opportunities and resources permit; the topic is announced when the course is scheduled.
Prerequisite: Graduate standing.
Schedule Type: Lecture
Contact Hours: 1-4 lecture
Grade Mode: Standard Letter

TECH 64312  ADVANCED WIRELESS TELECOMMUNICATION SYSTEM AND NETWORK TECHNOLOGIES  3 Credit Hours
Describes technologies associated with wireless and telecommunications systems. Topics covered include Public Switch Telephone Network Infrastructures, Intelligent Networks, Wireless Technologies in Manufacturing Enterprises, 3GPP Standards, ITU Standards.
Prerequisite: TECH 56350; and graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 64396  INDIVIDUAL INVESTIGATION IN COMMUNICATION TECHNOLOGY  2 Credit Hours
(Repeatable for credit) Independent research consisting of a problem statement followed by literature search and application of an industrial practice. A proposal must be developed and a written paper project presented to faculty and industrial representatives.
Prerequisite: Special approval and graduate standing.
Schedule Type: Individual Investigation
Contact Hours: 2 other
Grade Mode: Standard Letter

TECH 65330  ADVANCED VISUAL BASIC PROGRAMMING IN ENGINEERING TECHNOLOGY  3 Credit Hours
Advanced concepts in Visual Basic Programming for solving engineering problems. Topics cover include classes and objects; SQL server databases, Language Integrated Query, creating web apps, programming web forms, and security. Familiarity with Visual Basic Programming in Engineering Technology (TECH 56330) is strongly recommended.
Prerequisite: graduate standing and TECH 56330.
Schedule Type: Combined Lecture and Lab
Contact Hours: 2 lecture, 2 lab
Grade Mode: Standard Letter

TECH 65400  EVALUATING QUALITY SYSTEM THROUGH PROCESS CONTROL  3 Credit Hours
Evaluating industrial quality through statistical process control. Methods to produce design process control and process capability are analyzed and evaluated for industrial quality control. Use of inspection equipment and assurance of receiving fabricating and shipping acceptable materials/products and systems. Scientific management.
Prerequisite: Graduate standing.
Schedule Type: Combined Lecture and Lab
Contact Hours: 3 other
Grade Mode: Standard Letter

TECH 65500  QUALITY SYSTEMS AND INDUSTRIAL PRODUCTIVITY  3 Credit Hours
Tools and techniques for increasing industrial productivity through total quality management. Productivity improvement techniques involving human, technology, material, product and processes, utilizing value engineering, analytical models and scientific management tools in high-technology environment.
Prerequisite: Graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 65550  DESIGN AND ANALYSIS OF EXPERIMENTS IN TECHNOLOGY  3 Credit Hours
Introduces planning and conducting experiments, as well as analyzing the resulting data using statistical techniques to obtain valid and objective conclusions. Also focuses on experiments performed in areas such as product design, manufacturing process development and process improvement.
Prerequisite: graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter

TECH 65700  APPLIED RELIABILITY ENGINEERING  3 Credit Hours
Introduction to Reliability Engineering for Engineering-Technology Management Professionals. Course includes design for reliability, failure mode and failure effect analysis, reliability testing and measurement, statistical and mathematical modeling, assessment and forecasting.
Prerequisite: graduate standing.
Schedule Type: Lecture
Contact Hours: 3 lecture
Grade Mode: Standard Letter
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Description</th>
<th>Prerequisites</th>
<th>Schedule Type</th>
<th>Contact Hours</th>
<th>Grade Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>TECH 65800</td>
<td>BURN-IN/STRESS TESTING FOR RELIABILITY</td>
<td>3</td>
<td>Comprehensive course on reliability testing to analyze and establish reliability standards for components, products and systems. Specific emphasis on burn-in and stress testing procedures to perform effective reliability statistical calculations will be the major focus of the course.</td>
<td>TECH 65700 and graduate standing.</td>
<td>Combined Lecture and Lab</td>
<td>3</td>
<td>Standard Letter</td>
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<tr>
<td>TECH 66350</td>
<td>ADVANCED NETWORK MANAGEMENT AND DESIGN</td>
<td>3</td>
<td>Covers network management techniques including the TMN framework and the ISO Model for managing WAN communication networks. Topics covered include network management technologies, TMN protocols, Common Management Information Protocol, ISO Model, Management Information Base (MIB) architecture, Network Operations Center and Network Design. Examples of current network management tools are reviewed. Upon completion of this course, students will have a good understanding of network management framework and network management technologies for communication networks.</td>
<td>TECH 56350; and graduate standing.</td>
<td>Lecture</td>
<td>3</td>
<td>Standard Letter</td>
</tr>
<tr>
<td>TECH 66380</td>
<td>ADVANCED NETWORKING</td>
<td>3</td>
<td>Provides student with experience in advanced computer networking techniques including network architectures, network security, network virtualization and storage area networks.</td>
<td>TECH 56350; and graduate standing.</td>
<td>Lecture</td>
<td>3</td>
<td>Standard Letter</td>
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<tr>
<td>TECH 66382</td>
<td>NETWORK SECURITY</td>
<td>3</td>
<td>Provides student with experience in fundamental and advanced computer networking techniques including network architectures, LAN systems, network security, and network management and administration.</td>
<td>graduate standing.</td>
<td>Lecture</td>
<td>3</td>
<td>Standard Letter</td>
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<tr>
<td>TECH 66411</td>
<td>WIRELESS AND TELECOMMUNICATION SYSTEMS</td>
<td>3</td>
<td>Methods and techniques to develop requirements engineering specifications for wireless and telecommunication systems. Topics covered include Industry standards for telecom and wireless communications, reference data models, functional requirements specifications, performance analysis, the requirements review process, and systems verification. Familiarity with Requirements Engineering and Analysis (TECH 56411) concepts is recommended.</td>
<td>TECH 56411 and graduate standing.</td>
<td>Lecture</td>
<td>3</td>
<td>Standard Letter</td>
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<tr>
<td>TECH 66596</td>
<td>INDIVIDUAL INVESTIGATION IN MATERIALS</td>
<td>2</td>
<td>(Repeatable for credit)Research directed toward the study and application of metallic and nonmetallic materials.</td>
<td>TECH 20002 or TECH 33363 and graduate standing.</td>
<td>Individual Investigation</td>
<td>2</td>
<td>Standard Letter-IP</td>
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<tr>
<td>TECH 66796</td>
<td>INDIVIDUAL INVESTIGATION IN INDUSTRIAL PROCESSES</td>
<td>2</td>
<td>(Repeatable for credit)Individual investigation of a student-selected topic oriented towards industrial/manufacturing processes.</td>
<td>TECH 20002 and graduate standing.</td>
<td>Individual Investigation</td>
<td>3</td>
<td>Standard Letter-IP</td>
</tr>
<tr>
<td>TECH 67220</td>
<td>LIFE CYCLE DESIGN I</td>
<td>3</td>
<td>An in-depth investigation of Life Cycle Design of sustainable systems. Explores the cradle to cradle path of products with an emphasis on system Life Cycle stages and processes from a sustainability perspective. Examines how environmentally conscious system design can be accomplished by considering the environmental impact of technology and engineering as the part of the sustainable design process. Includes the study of sustainable development with respect to Green Technologies, hazardous materials and processes and reducing the environmental impact of product development and utilization. Also includes an introduction to Life Cycle Assessment and various Environmental and Life Cycle standards.</td>
<td>graduate standing.</td>
<td>Lecture</td>
<td>3</td>
<td>Standard Letter-IP</td>
</tr>
<tr>
<td>TECH 67221</td>
<td>LIFE CYCLE DESIGN II</td>
<td>3</td>
<td>An in-depth study of environmental performance, environmentally conscious design and sustainable development. Focuses on Life Cycle Analysis and Assessment as a means to determine the potential economic, environmental, and ecological impact of products, processes, and activities across their entire life cycle. Takes a close look at the beneficial and detrimental effects of various technologies, materials, products and processes with special attention to the reduction of harmful effects to human beings, the ecosystem, and the environment. Covers the analysis and assessment of energy consumption, natural resource depletion, and environmental degradation, and ways to minimize detrimental effects on the environment. Includes the use of various life cycle engineering and assessment processes, models and analytical tools to identify, evaluate, and compare the environmental consequences associated with various products/activities, across a wide range of impact categories, to assist in design and decision making.</td>
<td>graduate standing and TECH 67220.</td>
<td>Lecture</td>
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TECH 67596  INDIVIDUAL INVESTIGATION IN MANUFACTURING TECHNOLOGY  2 Credit Hours
(Repeatable for credit) Independent study related to manufacturing industries. The study may include the development of a product for manufacture (or service) or the in depth examination of an element of manufacturing.
Prerequisite: Graduate standing.
Schedule Type: Individual Investigation
Contact Hours: 3 other
Grade Mode: Standard Letter-IP

TECH 68196  INDIVIDUAL INVESTIGATION IN ENGINEERING GRAPHICS
2 Credit Hours
(Repeatable for credit) Investigation of selected topics within engineering graphics including computer-aided design.
Prerequisite: TECH 31087 and graduate standing.
Schedule Type: Individual Investigation
Contact Hours: 3 other
Grade Mode: Standard Letter-IP

TECH 68796  INDIVIDUAL INVESTIGATION IN INDUSTRIAL TECHNOLOGY SYSTEMS DESIGN  2 Credit Hours
(Repeatable for credit) The study of two-and three dimensional design as related to manufacturing construction communication and energy power including patents creativity and problem solving approaches.
Prerequisite: Graduate standing.
Schedule Type: Individual Investigation
Contact Hours: 3 other
Grade Mode: Standard Letter-IP