Northwestern State
University of Louisiana

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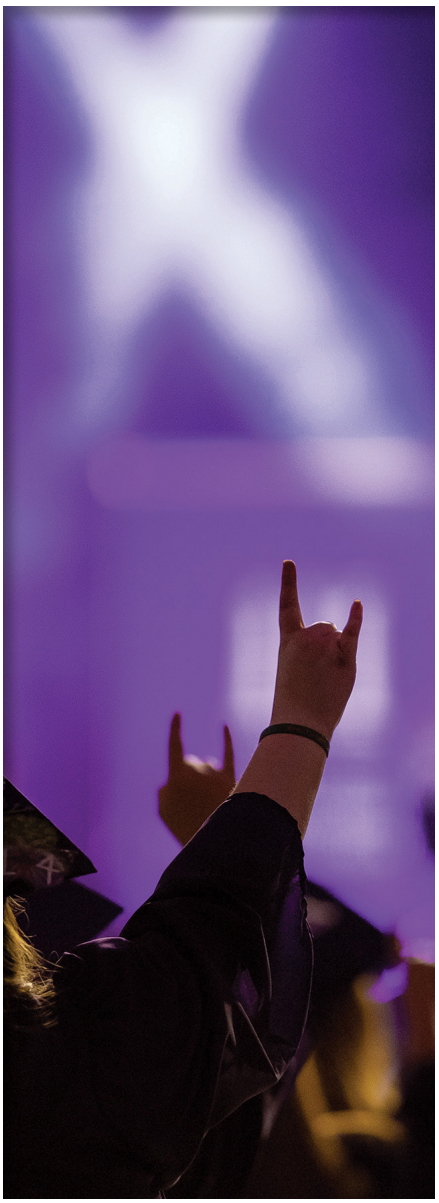
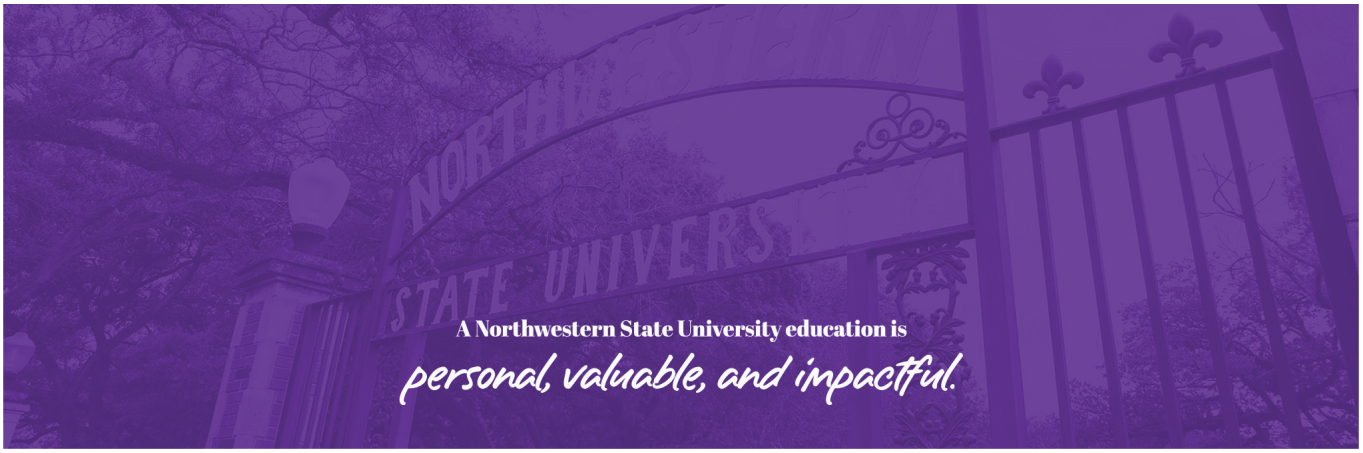


2024-2025 UNIVERSITY CATALOG



Project Lead The Way (PLTW) – An Articulated College Credit Program for Current High School Students

I. Engineering

Northwestern State University invites high school students to enroll in PLTW Engineering High School Courses in PLTW High Schools as a means for enriching their educational experiences and, at the same time, earn articulated college credits which may be applied toward a degree upon graduation from high school. This PLTW program is available during each school session—fall and spring semesters.

To be eligible for this program at Northwestern State University a student must:

1. Successfully complete a PLTW administered end of course examination in selected Engineering courses with a Stanine score of 7 or better.

2. Engineering courses eligible for articulated college credit are:

PLTW Engineering Course	NSU Engineering Technology Course				Semester Hours Credited
	IET 1400	IET 1700	EET 1311	IET 3460	
IED	X				3
POE		X			1
DE			X		1
CEA				X	3

IED (Introduction to Engineering Design); POE (Principles of Engineering); DE (Digital Electronics); CEA (Civil Engineering and Architecture)

3. Apply for this credit program during the year in which he/she takes the PLTW administered end of course examination.
4. Upon completion of their high school career and graduation from high school, a student must meet Northwestern State University Admission requirements for the respective academic year they enter Northwestern as an undergraduate.
5. Student must apply for admission to Northwestern State University in an applicable Engineering Technology degree program and pay admission application fees.
6. Award of credit for PLTW courses will be applied to a student's transcript following their admission, matriculation, and the beginning of their first semester's course work in Engineering Technology at NSU.

Admission to the PLTW Engineering program:

Applications and inquiries about Project Lead The Way Program must be addressed to:

Northwestern State University of Louisiana
Department of Engineering Technology
Room 101, Williamson Hall
Natchitoches, LA 71497
Phone: 318 357-6751
E-mail: engineering@nsula.edu

Letters of invitation, instructions, and application forms for participating students will be provided by the Department of Engineering Technology to high school teachers, counselors or principals of students qualifying for this program.

DEPARTMENT OF ENGINEERING TECHNOLOGY

101 Williamson Hall
318-357-6751
engineering@nsula.edu

Interim Department Head: MD Shahriar Hossain, *Associate Professor*

Professor Emeritus: Thomas M. Hall
Professors: Al-Sharab, Islam
Associate Professors: Chen, Sapkota
Assistant Professor: Ali

Degree Programs Available Through the Department of Engineering Technology:

Associate of Science program in: Engineering Technology, with concentrations in: advanced manufacturing, electronics, industrial

Bachelor of Science programs in: Electronics Engineering Technology, with concentrations in: biomedical and electronics; Industrial Engineering Technology

Pre-professional Program:

Pre-engineering

Post Baccalaureate Certificates Offered Through the Department of Engineering Technology:

Project Management Post Baccalaureate Certification
Quality Control Post Baccalaureate Certification

Northwestern State University has been authorized by the Louisiana Board of Regents to offer the above Post Baccalaureate Certificates (PBCs). Refer to the Engineering Technology web page at https://engrtech.nsula.edu for detailed information on the Project Management and Quality Control certification programs.

Accreditation

The Bachelor of Science in Electronics Engineering Technology, and the Bachelor of Science in Industrial Engineering Technology are accredited by the Engineering Technology Accreditation Commission of ABET, http://www.abet.org.

Electronics Engineering Technology

Electronics Engineering Technology Major Requirements: (66-69 semester hours) Students seeking a major in Electronics Engineering Technology must complete 66-69 semester hours, within the 120 semester hour Electronics Engineering Technology curriculum, which include the 46 semester hour Electronics Engineering Technology core and a 20-23 semester hour concentration.

Core: (46 semester hours) Electronics Engineering Technology 1300-1301, 1320-1321, 1330-1331, 2320-2321, 2330-2331, 2350-2351, 3310-3311, 3360-3361, 4300-4301, 4390, 4940 or Industrial Engineering Technology 4940; Industrial Engineering Technology 1400, 1700.

Available Concentrations:

Electronics (141A): (20 semester hours): Electronics Engineering Technology 4310-4311, 4350-4351, 4950 or Industrial Engineering Technology 4960; Industrial Engineering Technology 2790, 3740; and three additional hours of technical electives[1].

Biomedical (141B): (23 semester hours): Biomedical Engineering Technology 3320-3321, 3370-3371, 4950 (4 hours); Industrial Engineering Technology 3740; Biology 2250-2251, 2260-2261.

Electronics Engineering Technology Minor Requirements: (25 semester hours) Electronics Engineering Technology 1300-1301, 1320-1321, 1330-1331, 2320-2321, 2330-2331, 3310-3311 or 3340-3341 or 3360-3361, and Industrial Engineering Technology 1700.

Curriculum for Electronics Engineering Technology (141)

FIRST YEAR	SEM. HRS.
Electronics Engineering Technology 1300-1301, 1311, 1320-1321, 1330-1331	13
English 1010	3
Industrial Engineering Technology 1400, 1700	4
Mathematics 1820, 1830, 2130, 2140	12
University Studies 1000	1
	33

SECOND YEAR	SEM. HRS.
Biological Science[2]	0-3
Electronics Engineering Technology 2320-2321, 2330-2331, 2350-2351, 3310-3311	16
EET concentration area[3]	3-8
English 1020	3
Physics 2030-2031	4
	29-31

THIRD YEAR	SEM. HRS.
Chemistry[4]	3
Computer Science 1060 or Industrial Engineering Technology 1080	3
Electronics Engineering Technology 3360-3361, 4300-4301, 4390	11
EET concentration area[3]	8
English 2110; 3230 or 3190	6
	31

FOURTH YEAR	SEM. HRS.
Communication 1010	3
Economics 2000	3
Electronics Engineering Technology 4940 or Industrial Engineering Technology 4940	3
EET concentration area[3]	7-9
Fine Arts 1040	3
History[5]	3
Behavioral Science[1]	3
	25-27

Total Semester Hours for Degree: 120

Footnotes:

1. Technical electives may be selected from any Biomedical Engineering Technology, Computer Science, Electronics Engineering Technology, or Industrial Engineering Technology courses, or Mathematics 2050. Electives may include a maximum of three hours of occupational field experience.
2. Students in the Biomedical concentration must take the Biology courses specified within the concentration, students in the Electronics concentration area must meet the University core curriculum requirements for biological science.
3. Chosen from concentration area.
4. Students can take CHEM 1030, CHEM 1070 or SCI 1010.
5. Must meet the University core curriculum requirements.

Industrial Engineering Technology

Industrial Engineering Technology Major Requirements: (67 semester hours) Students seeking a major in Industrial Engineering Technology must complete 67 semester hours within the 120 semester hour Industrial Engineering Technology curriculum, which includes Electronic Engineering Technology 1300-1301, 1311, 1320-1321; Industrial Engineering Technology 1400, 1700, 1800, 2020, 2040, 2790, 3150, 3510, 3570, 3740, 3900, 4700, 4720, 4730, 4820, 4890, 4940 or Electronics Engineering Technology 4940, 4960 or Electronics Engineering Technology 4950; and six hours of electives from any Industrial Engineering Technology or Electronics Engineering Technology courses.

Requirements for a Minor in Industrial Engineering Technology: (23 semester hours) Electronics Engineering Technology 1311; Industrial Engineering Technology 1400, 1700, 1800, 2020, 2040, 3510, 4730, and 4820.

Curriculum for Industrial Engineering Technology (145)

FIRST YEAR	SEM. HRS.
CHEM 1030 or CHEM 1070 or SCI 1010	3
Electronics Engineering Technology 1300, 1301, 1311	5
English 1010	3
Industrial Engineering Technology 1400, 1700, 1800	7
Mathematics 1820, 1830, 2130, 2140	12
University Studies 1000	1
	31

SECOND YEAR	SEM. HRS.
Communication 1010	3
Computer Science 1060 or Industrial Engineering Technology 1080	3
Electronics Engineering Technology 1320-1321	4
English 1020, 2110	6
Industrial Engineering Technology 2020, 2040, 2790	9
Physics 2030-2031	4
	29

THIRD YEAR	SEM. HRS.
ECON 2000	3
English 3230	3
Industrial Engineering Technology 3150, 3510, 3570, 3740, 3900, 4720, 4730, 4820	24
	30

FOURTH YEAR	SEM. HRS.
Biological Science[1]	3
Electives[2]	6
Fine Arts 1040	3
Humanities[1]	3
Industrial Engineering Technology 4700, 4890, 4960 or Electronics Engineering Technology 4950	9
Behavioral Science[1]	3
Electronics Engineering Technology 4940 or Industrial Engineering Technology 4940	3
	30

Total Semester Hours for Degree 120

Footnotes:
1 Must meet University core requirements.
2 Electives may be selected from any Industrial Engineering Technology, Biomedical Engineering Technology, or Electronics Engineering Technology courses. Electives may include a maximum of three hours of occupational field experience.

Associate of Science Degree

Engineering Technology

Students seeking an Associate of Science in Engineering Technology must complete 62-66 semester hours which include a 28-semester hour core and 34-38 semester hour concentration.

Available Concentrations:

Advanced Manufacturing (140C): (38 semester hours): Electronics Engineering Technology 1350, 1370, 2210-2211, 2330-2331; Industrial Engineering Technology 1400, 1520, 1800, 2020, 2700, 2920, 3150.

Electronics (140A): (35 semester hours): Electronics Engineering Technology 1300-1301, 1311, 1320-1321, 1330-1331, 2320-2321, 2330-2331, 2350-2351; Industrial Engineering Technology 1400, 1700; Mathematics 2130, 2140.

Industrial (140B): (34 semester hours): Electronics Engineering Technology 1300-1301, 1311, 1320-1321: Industrial Engineering Technology 1080. 1400,1700, 1800, 2020, 2040: Elective[1], Mathematics 2130, 2140.

Curriculum for Engineering Technology (140)

FIRST YEAR	SEM. HRS.
Engineering Technology concentration area	13-19
English 1010	3
Fine Arts 1040	3
Mathematics 1020 or 1820, 1090 or 1830	6
Physical Science[2]	3
University Studies 1000	1
	29-35

SECOND YEAR	SEM. HRS.
Communication 1010	3
Engineering Technology concentration area	19-22
English 1020	3
Science 1020	3
Social/behavioral science[3]	3
	31-34

Total Semester Hours for Degree: 62-66

Footnotes:
1 One course from IET 2110, 2700, 2830, 2840, or 2920.
2 Students can choose either CHEM 1030, 1070, or SCI 1010.
3 Students can choose either EPSY 2020 or PSYC 1010 or 2050 or SOC 1010.

Pre-professional Program

Pre-Engineering

Curriculum for Pre-Engineering (141E)

FIRST YEAR	SEM. HRS.
Chemistry 1030, 1031, 1040, 1041	8
English 1010, 1020	6
Industrial Engineering Technology 1400, 1700	4
Mathematics 2100, 2110[1]	10
University Studies 1000	1
Social/behavioral science	3
	32

SECOND YEAR	SEM. HRS.
Computer Science 2010	3
Economics 2010	3
English literature	3
Mathematics 3130, 3160	6
Physics 2510-2511, 2520-2521	10
Social/behavioral science	3
Technical electives[2]	6
	34

Total Semester Hours 66

Footnotes:
1 Students who are deficient in algebra and trigonometry should take Mathematics 1100.
2 Electives determined by field of engineering to be pursued.

BIOMEDICAL ENGINEERING TECHNOLOGY (BMET)

For Undergraduates Only

2020. INTRODUCTION TO BIOFLUID MECHANICS. (3-3-0). This course covers essential scientific and engineering principles applied in healthcare and the human body. Review of fundamental physics principles and their practical applications in healthcare, such as imaging techniques, prosthetics, drug delivery, and nanotechnology. Engineering analysis of the cardiovascular system, focusing on pressure-flow dynamics in arteries and the elastic properties of arterial walls. Prerequisites: MATH 1020 or consent of the instructor.

3320. DIGITAL SIGNAL PROCESSING. (3-3-0). Overview of medical equipment networking and telecommunications. Digital signal processing. Digital image processing systems. Prerequisites: Credit for or registration in Electronics Engineering Technology 3310-3311 and Biomedical Engineering Technology 3321 or consent of the instructor.

3321. DIGITAL SIGNAL PROCESSING LABORATORY. (1-0-2). Laboratory course to accompany BMET 3320. DSP software and programming, sinc function, digital filters and Z-transform, statistical analysis, convolution, image processing, Fourier and fast Fourier transforms, digital signal processors. Prerequisite: Credit for or registration in 3320.

3370. BIOMEDICAL INSTRUMENTATION. (3-3-0). Introduction to electronic acquisition and analysis of biomedical signals and imaging; biomedical transducers and actuators; signal conditioning; instrumentation amplifiers; characteristics, practical design, testing, and applications of electronic biomedical measuring instruments. Principles of machine learning. Prerequisites: 3320-3321, credit for or registration in 3371; Electronics Engineering Technology 3310-3311 or consent of instructor.

3371. BIOMEDICAL INSTRUMENTATION LABORATORY. (1-0-2). Laboratory course to accompany BMET 3370. Basic biomedical equipment, data acquisitions and analysis, practical aspects of measurement and instrumentation, biomedical transducers and actuators, amplifiers and instrumentation amplifiers, microcontrollers, computers and programming in medical instruments, patient monitoring systems, x-rays and radiation, temperature and pressure sensors, ECG/EKG testing, biomaterials properties and testing, principles of machine learning. Prerequisite: credit for or registration in 3370 or consent of instructor.

4950. BIOMEDICAL ENGINEERING TECHNOLOGY INTERNSHIP. (3 to 6-0-0). This course, along with Electronics Engineering Technology 4940, is the capstone experience for students in the biomedical concentration within the Electronics Engineering Technology program. Students will complete no fewer than 180 hours of student internship. Students must complete periodic evaluations, special projects, and a final report. Prerequisites: 3370, 3371, Electronic Engineering Technology 4300, 4301, 4940, English 3230, and senior status.

ELECTRONICS ENGINEERING TECHNOLOGY (EET)

For Undergraduates Only

1300. ELECTRICAL PRINCIPLES I. (3-3-0). Principles governing current, voltage, resistance and power in DC circuits. Series, parallel, and series-parallel DC circuits. Prerequisite: Credit for or registration in 1301 and MATH 1020 or 1820.

1301. ELECTRICAL PRINCIPLES I LABORATORY. (1-0-2). Electrical principles lab dealing with DC circuits. Measurement of DC voltages and currents. Characteristics and measurement of resistances. Application of Ohm's law, energy, and power. Connection, measurement and application of series, parallel, and series-parallel DC circuits. Application of circuit theorems. Prerequisite: Credit for or registration in 1300.

1311. ELECTRONIC FABRICATION LABORATORY. (1-0-2). Fabrication techniques for analog and digital circuits. Device symbols and markings, soldering, antistatic techniques, measurement, testing and troubleshooting.

1320. ELECTRICAL PRINCIPLES II. (3-3-0). Alternating current. Capacitors, inductors, and impedance. AC circuit analysis theorems and techniques. Prerequisite: 1300-1301, credit for or registration in 1321 and MATH 1090 or 1830.

1321. ELECTRICAL PRINCIPLES II LABORATORY. (1-0-2). Electrical principles lab dealing primarily with AC circuits. Measurement of AC and DC voltages, pulse width and duty cycle using oscilloscope. Measurement and application of capacitors, inductors, and transformers. Series RC, RL and RLC circuits connection and characteristics. Parallel RC, RL and RLC circuits connection and characteristics. Series and parallel resonances. Prerequisite: Credit for or registration in 1320.

1330. DIGITAL ELECTRONICS I. (3-3-0). Logic function, logic gates, number systems and conversions, Boolean algebra, logic simplification, combinational circuits, programmable logic devices, and flip-flops. Analysis and design of basic digital logic circuits. Prerequisites: 1300-1301, credit for or registration in 1331.

1331. DIGITAL ELECTRONICS I LABORATORY. (1-0-2). Number systems, logical gates, Boolean algebra, implementation of Boolean function by logic gates, simplification of Boolean function, Karnaugh map, design and optimization of digital circuits. Prerequisite: Credit for or registration in 1330.

1350. ELECTRICAL CIRCUITS (AC/DC). (3-2-2). Direct Currents (DC). Laws, principles, and theorems governing current, voltage, resistance, and power in dc circuits, i.e., series, parallel and series - parallel circuits. Alternating current (AC), capacitors, inductors, and impedance. Hands-on laboratory experiments and projects. Prerequisite: Credit for or registration in MATH 1020 or 1820.

1370. BASIC ANALOG AND DIGITAL ELECTRONICS. (3-2-2). Logic functions, logic gates, number systems and conversions, Boolean algebra, logic simplification, combinational logic circuits, functions of combinational logic, Principles of semiconductor devices and circuits. Analysis of diodes and bipolar junction transistors in switching and amplifier circuits. Hands-on laboratory experiments and projects. Prerequisites: 1350, and credit for or registration in MATH 1090 or 1830.

1380. ALTERNATIVE ENERGY SYSTEMS. (3-3-0). A study of alternative energy ("green") sources and resources: the solar resource, solar photovoltaic technologies, solar thermal applications, wind energy systems, biomass energy systems, transportation energy technologies, and ocean wave energy. A comparative study of the United States and the developing world.

2200. POWER SYSTEMS AND PROTECTION. (3-3-0). Single phase and three phase circuits, generation of three phase electric power, transmission and distribution of electric power, study of power system faults, and application of relays for power system protection.

2210. PROGRAMMABLE LOGIC CONTROLLERS (3-3-0). Safety, Relay logic, Introduction to programmable logic controllers covering programming and maintaining PLC systems, programming functions, input/output modules, and industrial communication networks. Prerequisite: 1350, 1370 and credit for or registration in EET 2211.

2211. PROGRAMMABLE LOGIC CONTROLLERS LABORATORY (1-0-2). Laboratory course to accompany EET 2210. Topics include safety issues, learning of an Industrial PLC trainer and RSLogix Micro, input/output modules, relay type devices, timers, counters, data manipulators, and programming with an emphasis on industry applications. Prerequisites: EET 1350, 1370 and credit for or registration in EET 2210.

2320. BASIC ELECTRONICS. (3-3-0). Principles of semiconductor devices and circuits. Design and analysis of diode and bipolar junction transistor in switching and amplifier circuits. Prerequisite: 1320-1321, credit for or registration in 2321.

2321. BASIC ELECTRONICS LABORATORY. (1-0-2). Characteristics of diodes and BJT transistors, rectification circuits, BJT bias circuits, BJT amplifiers and switching circuits, FET characteristics of FE, FET amplifiers, power amplifiers. Prerequisite: Credit for or registration in 2320.

2330. ELECTRIC MOTOR CONTROLS. (3-3-0). Theory of operation of electric motors with emphasis placed on ac motors in terms of circuit diagrams and safety. Basics of industrial motor control, sensors and control devices, electronic control of direct-current (DC) motors, electronic control of alternating-current (AC) motors, manual contactors, magnetic motor starters, and installation of control devices and maintenance procedures. Prerequisite: EET 1320-1321 or consent of instructor.

2331. ELECTRIC MOTOR CONTROLS LABORATORY. (1-0-2). Laboratory course to accompany EET 2330. Different types of motor controls as they are applied to industrial circuits. Topics include safety issues, methods of controlling, protecting and specifying motors (both ac and dc) and their controls. Components covered will include starters, sensors, timers, speed drives, and programmable logic controllers with emphasis on industry applications. Prerequisite: EET 1320 and EET 1321. Credit for or registration in 2330.

2340. MICROCOMPUTERS. (3-3-0). Computer overview with emphasis on hardware. The basic components of a microcomputer system, microprocessor basics, memory, secondary storage, input and output devices, operating systems, networks, and security. Prerequisite: EET 1330-1331 or permission of the instructor.

2350. ADVANCED ELECTRONICS. (3-3-0). Advanced semiconductor devices. Power amplifiers, Class A, B, and C amps, and the emitter follower. JFET and MOSFET devices and circuits, differential and operational amplifiers. Prerequisite: 2320-2321, credit for or registration in 2351.

2351. ADVANCED ELECTRONICS LABORATORY. (1-0-2). Power amplifiers, FET characteristics, FET bias circuits, FET amplifiers, operational amplifiers characteristics and applications, integrator circuits, oscillator circuits. Prerequisite: Credit for or registration in 2350.

2360. ELECTRIC GENERATORS, MOTORS, AND TRANSFORMERS. (3-3-0). Principles of magnetism and electromagnetic circuits. Transformer principles. AC and DC generators and motors-single phase, three phase, and synchronous machines. Prerequisite: 1320-1321, credit for or registration in 2361.

2361. ELECTRIC GENERATORS, MOTORS, AND TRANSFORMERS LABORATORY. (1-0-2). Safety issues of motors, generators and transformers. The characteristics of different types of DC motors. The characteristics of different types of single phase and three phase AC motors. Operation, synchronization, and phase sequence of three phase generators. Single and three phase transformers operations, connections, and applications. Prerequisite: Credit for or registration in 2360.

2920. SPECIAL PROBLEMS. (1 to 3-0-0). Selection of special problems in engineering technology. Individual or small group work. Prerequisite: Credit for or registration in 2320-2321 and consent of instructor.

3310. DIGITAL ELECTRONICS II. (3-3-0). Programming and applications of programmable logic devices, sequential networks, state machine analysis and design, memories, integrated circuit technologies. Introduction to microprocessors and interfacing. Prerequisite: 1330-1331, credit for or registration in 3311.

3311. DIGITAL ELECTRONICS II LABORATORY. (1-0-2). Characteristics, functions and operations of digital devices and logic circuits, such as flip-flops, counters, shift registers, memory, etc., and their applications in digital circuits and systems. Prerequisite: Credit for or registration in 3310.

3330. DIGITAL SIGNAL PROCESSING. (3-3-0). Overview of digital equipment networking and telecommunications. Digital signal processing. Digital image processing systems. Prerequisites: Credit for or registration in EET 3310-3311 and 3331 or the consent of the instructor.

3331. DIGITAL SIGNAL PROCESSING LABORATORY. (1-0-2). Laboratory course to accompany EET 3330. DSP software and programming, sinc function, digital filters and Z-transform, statistical analysis, convolution, image processing, Fourier and fast Fourier transforms, and digital signal processors. Prerequisite: Credit for or registration in 3330.

3360. INSTRUMENTATION AND CONTROL. (3-3-0). Transducers, signal conditioning, open and closed loop control. Proportional, derivative, and integral control modes. Analog-to-digital and digital-to-analog conversion. Analysis and design of control systems. site: Prerequisite: 1320-1321, credit for or registration in 3361; MATH 2010 or credit for or registration in MATH 2130.

3361. INSTRUMENTATION AND CONTROL LABORATORY. (1-0-2). Laplace transform of signals, transfer functions, block diagrams, stability analysis, time specifications, and controller designs. Applications of MATLAB and Simulink. Prerequisite: Credit for or registration in 3360.

4300. MICROPROCESSOR FUNDAMENTALS. (3-3-0). Micro-processor architecture, programming, and interfacing. Topics include addressing modes, instruction set, I/O operations, interrupts, timing, memory, peripheral interface devices, microprocessor system design, and an overview of advanced microprocessors. Prerequisite: 3310-3311, credit for or registration in 4301.

4301. MICROPROCESSOR FUNDAMENTALS LABORATORY. (1-0-2). Programming of microcontrollers in Assembly and C/C++ language. Program development tools and interfacing microcontrollers to PC and electronic circuits. Controlling electrical and mechanical systems with microcontrollers. Prerequisite: Credit for or registration in 4300.

4310. COMMUNICATION ELECTRONICS. (3-3-0). Principles of filters and oscillation. Active and passive filters and oscillator circuits. Principles of AM, FM, and PM transmitters, and receivers. Phase Locked Loops. Prerequisite: 3340-3341, credit for or registration in 4311.

4311. COMMUNICATION ELECTRONICS LABORATORY. (1-0-2). Practical aspects of passive RC and LC filters, and active filters, oscillator circuits and their applications, operation and characteristics analysis of linear integrated circuit (LIC) function generator, voltage control oscillator, phase locked loop, AM modulator, characteristics of class C AM amplifier, AM DSBFC transistor modulators, AM peak detector, FM modulator, and demodulator. Prerequisite: Credit for or registration in 4310.

4350. AUTOMATION AND CONTROL. (3-3-0). Control of discrete processes, programmable logic controllers, continuous process controllers, robotics architecture and application, stability analysis of a process. Prerequisite: 3360-3361, credit for or registration in 4351 or consent of instructor.

4351. AUTOMATION AND CONTROL LABORATORY. (1-0-2). Familiarization with AMATROL Programmable Logic Controllers (PLCs) systems Trainer. Introduction to programmable controllers. PLC program operators and programming. Timer and counter instructions and program control instructions. Characteristics of industrial cell with PLCs and Robotics. Prerequisite: Credit for or registration in 4350. Consent of instructor.

4360. WIRELESS COMMUNICATIONS SYSTEMS. (3-3-0). Overview of communications systems with emphasis on wireless communications. Cellular and PCS communication systems, microwave and satellite systems, LMDS, wireless LAN, antennas and advanced topics in fiber optic communication systems. Prerequisites: Credit for 4310-4311, 4390, credit for or registration in 4361.

4361. WIRELESS COMMUNICATIONS SYSTEMS LABORATORY. (1-0-2). Characteristics of time domain reflectometry (TDR) and spectrum analyzer, fiber optic links, wireless LAN using ethernet modems, microwave and satellite communications, cellular communications with cell site, base station and frequency reuse plan. Prerequisite: Credit for or registration in 4360.

4390. DIGITAL COMMUNICATIONS. (3-3-0). Digital and data communications and transmission, protocols and standards, local and wide-area networks, multiplexing, satellite and fiber optic communications, and digital signal processing. Prerequisites: 3310-3311, 4310-4311, or consent of instructor.

4920. ADVANCED SPECIAL PROBLEMS. (1 to 3-0-0). Selection of advanced special problems in engineering technology. Individual or small group work. Prerequisite: Credit for or registration in 3340-3341 and consent of instructor.

4940. PROJECT DESIGN I. (3-3-0). Principles of project management and engineering economics. Development of proposals for senior design project. Prerequisites: Credit for or registration in English 3230, 3190 or IET 3720 and senior status or consent of instructor.

4950. PROJECT DESIGN II. (3-0-0). This is a capstone course. Students will independently design (including specifications), construct, and test an approved electronics project within budget and on schedule. Students will prepare a written project report and give an oral presentation. Prerequisites: 4940.

ENGINEERING TECHNOLOGY (ET)

For Graduates Only

5010. PROJECT ENGINEERING. (3-3-0). Fundamental concepts of project engineering/management, project planning, resource management, tools and techniques in project management to assess budget, establish schedule and meet performance matrices.

5020. ENGINEERING STATISTICS. (3-3-0). Basic probability, continuous and discrete probability distributions, hypothesis testing, regression analysis, Analysis of Variance, and non-parametric statistics.

5030. ENGINEERING ECONOMIC ANALYSIS. (3-3-0). Economic worth of a business entity, constrained economic optimization, economic risk and uncertainty, foundations of utility functions. Time value of money, capital investment, risk analysis and investment decision.

5040. ENVIRONMENT OF MANUFACTURING ORGANIZATION. (3-3-0). Provides necessary concepts and principles for technologist, engineers or other professionals to successfully transform into managers in technology driven industries or business environments.

5050. COST ENGINEERING. (3-3-0). Principles of cost and budget estimation and techniques, identifying and measuring cost elements, managing cost over the life cycle of product and project.

5060. OPERATIONS MANAGEMENT. (3-3-0). Operations strategy, process design and reengineering, forecasting, inventory management, scheduling and quality management.

5070. MANAGEMENT INFORMATION SYSTEMS. (3-3-0). Design and implementation of Management Information Systems (MIS), organizational, managerial, and economic aspects of MIS. Use of information system in problem solving and decision making process.

5080. **LAW AND SPECIFICATION FOR MANUFACTURING MANAGERS.** (3-3-0). Legal rules and ethical constraints in business decisions and commercial transactions, contract law, property and sales contracts, any commercial document, agency law, and ethics.

5090. **LEADERSHIP AND TECHNICAL MANAGERS.** (3-3-0). Leadership theories and myths, qualities of an effective leader, developing leadership potential.

6000. **PRODUCTION PLANNING AND SCHEDULING.** (3-3-0). Planning and control of production; operations analysis; routing, scheduling, dispatching; production charts; inventory control; accumulation of material requirements; use of critical path techniques.

6010. **FINANCE AND ACCOUNTING FOR ENGINEERING MANAGERS.** (3-3-0). Development, analysis and use of accounting reports, financial report, knowledge of earning, assets, liability and equity, accounts receivables, inventory, etc.

6020. **DECISON ANALYSIS.** (3-3-0). Decision models building, analysis, decision tree, decision under uncertainty, risk analysis, multi criteria decision making.

6030. **SUPPLY CHAIN MANAGEMENT.** (3-3-0). Supply chain management principles, supply chain networks, relationship of supply chain in product life cycle, developing and implementing supply chains.

6040. **ENGINEERING MANAGEMENT.** (3-3-0). Applying engineering processes to management and organizational issues. Provides knowledge, capabilities, and understanding of engineering and technology management topics emphasizing language, principles, and environment of real business organization.

6050. **ADVANCED CONCEPTS IN SAFETY, ERGONOMICS AND DESIGN.** (3-3-0). Principles and practices of accident prevention; safety and health program operations in industrial facilities; employee and management responsibilities; Occupational Safety and Health Act and Regulations. Overview of the human body, its systems and how it interacts with environmental stressors; designing to fit body movements; office (computer) workstation design considerations; designing for special populations; handling loads.

6060. **INDUSTRIAL ROBOTICS.** (3-3-0). Concepts, principles, and relationships of automated assembly devices, computer-aided manufacturing, industrial robots and its working principles, programming of robots.

6070. **ADVANCED QUALITY OPERATIONS.** (3-3-0). Methods and procedures employed in industrial quality management, theories of measurement, error, prediction, sampling, tests of significance and models. Prerequisite: ET 5020.

INDUSTRIAL ENGINEERING TECHNOLOGY (IET)

For Undergraduates Only

1020. ENGINEERING TOOLS AND DIMENSIONAL ANALYSIS. (3-2-2). Principles and practices of measurement technology; use of tools; dimensional analysis; and the use of all the above in applications of technology.

1080. PROGRAMMING FOR ENGINEERING TECHNOLOGY. (3-3-0). Introduction to computer and its architecture, algorithms and flowcharts, introduction to programming languages, numerical solution of algebraic and transcendental equations, matrices, interpolation. Computer applications in solving engineering technology related problems. Prerequisite: MATH 1090 or 1830, or consent of the instructor.

1400. TECHNICAL DRAFTING I. (3-2-2). Introduction to drafting, with computer-aided drafting (CAD) applications. Orthographic projection, geometric construction, sectioning, dimensioning, auxiliary views, and text. Includes display and editing techniques as well as working with drawing files.

1420. BLUEPRINT READING. (3-2-2). Technical and symbolic communication used on blueprints and working drawings.

1520. WELDING TECHNOLOGY (3-1-4). An introduction to the principles of shielded metal arc welding and cutting with a plasma torch and oxyfuels. Safe handling and use of the welding equipment, consumables, and safety gears. Basic hands-on practices on various types of welding joints using arc welding cutting mild steel with plasma torch and oxyfuels. Prerequisite: IET 1800.

1700. INTRODUCTION TO ENGINEERING TECHNOLOGY. (1-1-0). Specific information for engineering technology students about degree requirements, scholastic resources, careers in engineering technology, job opportunities, academic skills for success in engineering technology, scholarship, and preparing for the future.

1800. OCCUPATIONAL SAFETY AND HEALTH. (3-3-0). Principles and practices of accident prevention and safety program operation in industrial facilities and school laboratories; effective safety organization, management and supervision; teacher, administrator and management liabilities; Occupational Safety and Health Act (OSHA).

2020. METALS MACHINING I. (3-2-2). Machine tool technology; operator control and computer numerical control (CNC) machining, computer-aided manufacturing (CAM), and production centers. Precision measurement and layout. Survey of nontraditional machining processes. Prerequisites: 1400 and credit for or registration in MATH 1090 or 1830.

2040. PROBABILITY AND STATISTICS FOR ENGINEERING TECHNOLOGY. (3-3-0). Axioms of probability; combinatorial and geometrical probability; probability distributions; measures of location and dispersion; sampling and sampling distributions; estimation and tests of hypotheses, regression analysis, engineering applications. Prerequisite: Credit for or registration in MATH 2140.

2110. FUNDAMENTALS OF INDUSTRIAL ROBOTICS. (3-3-0). Basic concept of automation and robotics. History of robots in manufacturing industries. Safety issues involved with industrial robots. Anatomy and working principles of robots. Jogging and programming of robots. Computer aided manufacturing (CAM). Prerequisite: IET 1400; MATH 1090 or 1830 or consent of the instructor.

2400. TECHNICAL DRAFTING II. (3-2-2). Continuation of 1400, with intermediate CAD applications. Working drawings, limit dimensioning, threads and fasteners, secondary auxiliary views, descriptive geometry, assembly drawings, and production illustrations. Prerequisite: 1400.

2700. OCCUPATIONAL FIELD EXPERIENCE I. (1 to 3-0-6 to 18). Work experience supervised by the student's departmental coordinator in related occupational areas. May be repeated. Prerequisite: Consent of instructor and placement in a related job.

2740. ENGINEERING MATERIALS. (3-2-2). Methods of making basic engineering materials; phase diagrams; crystalline lattice structures; material properties; methods for changing material properties. Prerequisites: 1020; CHEM 1030 or 1070 or SCI 1010: MATH 1090 or 1830.

2790. STATICS. (3-3-0). Principles of statics, vector algebra and vector quantities. Resultants in coplanar force systems, equilibrium in coplanar force systems, analysis of structures, trusses, beams, chains and cables, friction, centroids and centers of gravity, moments of inertia. Prerequisite: MATH 1090 or 1830, PHYS 2030 or consent of instructor.

2830. ADVANCED INDUSTRIAL SAFETY ENGINEERING AND MANAGEMENT. (3-3-0). Recognition and control of occupational safety and health hazards; human relations for safety; psychological considerations; human engineering; management and supervisory leadership. Prerequisite: 1800 or consent of instructor.

2840. DEVELOPMENT OF OCCUPATIONAL SAFETY AND HEALTH PROGRAMS. (3-3-0). Programs for plants and systems operations; systems analysis. Comprehensive occupational safety and health programs developed by students. Prerequisite: 1800.

2920. SPECIAL PROBLEMS. (1 to 3-0-0). Selection of special problems. Individual or group independent work. Prerequisite: Consent of instructor.

3100. TECHNICAL PROJECT MANAGEMENT. (3-3-0). Project evaluation and selection; project planning, organizing, managing and controlling. Software tools and techniques for work breakdown structure; project networks; scheduling; critical path method; program evaluation and review technique; project crashing for small/large project of commercial/academic or nonprofit organizations. Prerequisite: Junior or senior standing or consent from instructor.

3150. FLUID POWER. (3-2-2). Compressible and incompressible fluid statics and dynamics of industrial hydraulic and pneumatic circuits and controls. Software and functional components used to design, construct, and analyze piping circuits. Prerequisites: MATH 1090 or 1830.

3410. ADVANCED CAD APPLICATIONS. (3-2-2). Detail and assembly drawing; cams, gears, graphs; pipe, welding, and structural drafting; 3D and surface modeling. Prerequisite: 1400.

3460. ARCHITECTURAL DRAFTING AND CAD. (3-2-2). Principles and practices of home planning; procedures in residential construction; preparation of plans and specifications for a modern home using CAD software. Prerequisite: 1400.

3510. METHODS AND WORK DESIGN. (3-3-0). Analysis of motions necessary to perform industrial operations; motion economy; development of ratings, standards, allowance, standard data, formula construction, work sampling, wage payment and performance training, industrial ergonomics and work design. Prerequisite: MATH 1090 or 1830.

3550. MATERIAL HANDLING. (3-3-0). Material handling as related to manufacturing, warehousing and distribution centers. Topics include methods of movement, storage, inventory control, and retrieval. Prerequisites: 3510; MATH 1090 or 1830.

3570. ENGINEERING ECONOMICS. (3-3-0). Principles and applications of economic analysis presented through engineering-oriented examples. Introduction and definitions of economic factors, analysis methods for evaluating alternative choices, and decision making tools for real-world situations. Prerequisite: MATH 1090 or 1830.

3720. TECHNICAL WRITING. (3-3-0). Fundamentals of technical report writing, industrial communications, preparation of materials for publication. Prerequisite: English 1020.

3730. INDUSTRIAL TRAINING PRACTICES. (3-3-0). Employee educational and training methods, management, and evaluation. Task analysis, job safety analysis; development of training materials; delivery methods and media. Prerequisite: Junior standing or consent of instructor.

3740. SUPERVISION IN ORGANIZATIONS. (3-3-0). Focus on the functions, skills, responsibilities, and challenges of a supervisor in an organizational setting. Topics include planning, organizing, staffing, leading and controlling. Other areas discussed are managing diversity, workplace conflicts, ethics, safety, life-long learning, globalization, teamwork, and corporate social responsibility. Prerequisite: Junior standing or consent of the instructor.

3820. ERGONOMIC DESIGN. (3-3-0). Overview of the human body, its systems and how it interacts with environmental stressors; designing to fit body movements; office (computer) workstation design considerations; designing for special populations; handling loads. Prerequisite: 1800.

3900. INDUSTRIAL MACHINERY. (3-3-0). Principles and applications of thermodynamics; operating principles and applications of industrial machinery such as boilers, gas turbines, IC engines, electric motors and generators, HVAC systems, and industrial robots. Prerequisite: EET 1300; MATH 2140, PHYS 2030, or consent of the instructor.

4020. ADVANCED METALS MACHINING. (3-1-4). Special practices of metals processing; CNC machining and CAD-CAM interfacing; machining systems. Prerequisite: 2020: MATH 1090 or 1830.

4420. TOOL DESIGN. (3-1-4). Design and construction of jigs and fixtures applicable to industrial production. Prerequisite: 2020, 3410; MATH 1090 or 1830.

4700. MANUFACTURING FACILITIES. (3-3-0). Study of the planning processes for facilities location and design, material handling equipment, and manpower requirements. Analysis of production line requirements, assembly line balancing, and automation. Prerequisite: 2040, 3570 and MATH 2140.

4720. QUALITY CONTROL. (3-3-0). Methods and procedures employed in industrial quality control, theories of statistical process control, process capability and reliability. Prerequisites: 2040; MATH 1090 or 1830 or consent of instructor.

4730. MATERIALS AND PROCESSES. (3-2-2). Engineering materials and their properties. Design, economics, and control of manufacturing processes. Methods engineering, job shop and automation practices; machining and fabrication processes. Prerequisite: IET 2020; CHEM 1030 or 1070 or SCI 1010 or consent of instructor.

4790. STRENGTH OF INDUSTRIAL MATERIALS. (3-2-2). Internal stresses and deformation of bodies resulting from action of external forces; concepts and techniques of testing tensile, compression, shear, transverse, elasticity on various materials and fasteners. Prerequisite: 2790, credit for or registration in MATH 2130.

4820. PRODUCTION AND INVENTORY CONTROL. (3-3-0). Planning and control of production; operation analysis; routing, scheduling, dispatching; production charts and boards; inventory control; accumulation of material requirements; use of critical path techniques. Prerequisite: 2040, Math 2140, or consent of instructor.

4890. OPERATIONS RESEARCH. (3-3-0). Introduction to linear, nonlinear, and dynamic programming. Course covers theories of deterministic and stochastic models for decision making purposes through applications and interpretation of results. Prerequisite: 1080, 2040 and MATH 2140.

4900. RESEARCH METHODS. (3-3-0). This course provides foundational preparation and understanding of scientific research methods, types of research, tools for research tools, research ethics, acquisition of prior research knowledge and presentation of findings. Prerequisite: Credit for or registration in EET 4940.

4910. MODELING AND SIMULATION. (3-3-0). Introduction to discrete event and continuous simulation models for decision making purposes. Course includes input data modeling, output data analysis, model verification and validation, and optimization of system parameters. Prerequisite: 1080, 2040, and MATH 2140 or consent of the instructor.

4920. SPECIAL PROBLEMS. (1 to 3-0-0). Selection of advanced special problems. Individual or group independent work. Prerequisite: At least twelve (12) semester hours credit in IET and/or EET courses and consent of instructor.

4940. PROJECT DESIGN I. (3-3-0). Principles of project management and engineering economics. Development of proposals for senior design project. Prerequisites: Credit for or registration in English 3230, 3190 or IET 3720 and senior status or consent of instructor.

4950. RESEARCH PROBLEMS. (1 to 3-0-0). The student selects a problem in his major field and through investigation formulates an acceptable solution. Prerequisite: Upper level status and consent of instructor.

4960. PROJECT DESIGN II. (3-0-0). This is a capstone course for ET majors. Students will work with a professor to design a project that reflects several aspects of the student's curriculum. Independent or group work. Students will prepare a written project report and give an oral presentation. Prerequisite: EET 4940.