DEPARTMENT OF ENGINEERING TECHNOLOGY AND INDUSTRIAL DISTRIBUTION

The Department of Engineering Technology and Industrial Distribution offers four baccalaureate degree programs in electronics systems engineering technology, industrial distribution, manufacturing and mechanical engineering technology, and multidisciplinary engineering technology. While these degrees are distinct, they share several common features including a sound foundation of mathematics and basic sciences, a strong core of technical courses, and an emphasis on written and oral communications. The curricula emphasize the latest state-of-the-art technologies, innovation and entrepreneurship. Finally, all four degrees are designed to prepare students for careers in industry with strong opportunities for advancement. Because these programs are highly applied and have a focus on project-based learning and experiential education, most of the department’s courses have hands-on laboratories that allow students to put theory to practice.

The mission of the Department of Engineering Technology and Industrial Distribution is to:

- maintain nationally recognized programs in engineering technology and industrial distribution
- focus on educating highly-qualified students with hands-on skills, providing them with experiences in advanced integration of both conventional and emerging technologies, a unique understanding of management and business practices, and an entrepreneurial point of view
- provide leadership within the COE and university in interdisciplinary applied research, to include the development and deployment of new technology
- promote and develop long term partnerships with industry and government that foster enhancements and interactions in education, research, and professional development

Electronic Systems Engineering Technology (ESET)

Electronic Systems Engineering Technology (ESET) prepares graduates for careers in electronic product and system development across a diverse range of industries that include the information/communication technologies, computer, power, oil & gas, automotive, medical and quality of life sectors.

The Electronic Systems Engineering Technology program is accredited by the Engineering Technology Accreditation Commission of ABET, http://www.abet.org. For more information about the Electronic Systems Engineering Technology program including the mission and program educational objectives, please see the program requirements (http://catalog.tamu.edu/undergraduate/engineering/technology-industrial-distribution/technology-electronic-systems-bs).

Graduates are awarded the Bachelor of Science in Electronic Systems Engineering Technology.

Industrial Distribution (IDIS)

Industrial Distribution (IDIS) prepares graduates for sales engineering, technical sales, supply chain management, operations management, sales management and other managerial positions. Industry segments include: automation solutions; building materials; chemical and petrochemical; electrical; electronics and semiconductors; fluid power; heating and air conditioning, mechanical power; plumbing; safety equipment; welding; oil and gas; defense; material handling; healthcare; automotive; heavy equipment; packaging; and logistics. The day-to-day challenges faced by the industrial distributor or the manufacturer’s representative require the person to be a professional with many capabilities. For more information about the Industrial Distribution program, please see the program requirements (http://catalog.tamu.edu/undergraduate/engineering/technology-industrial-distribution/industrial-distribution-bs).

Graduates are awarded the Bachelor of Science in Industrial Distribution.

Manufacturing and Mechanical Engineering Technology (MMET)

Manufacturing and Mechanical Engineering Technology (MMET) prepares students for dynamic careers in a wide range of industries ranging from oil and gas, to aerospace, and food and beverage. These careers involve design, manufacturing, maintenance, and sometimes sales. Graduates are versatile and effective in diverse areas that require understanding of the dependencies among material properties, product design, costs, manufacturing systems, and process technologies.

The Manufacturing and Mechanical Engineering Technology program is accredited by the Engineering Technology Accreditation Commission of ABET, http://www.abet.org. For more information about the Manufacturing and Mechanical Engineering Technology program including the mission and program educational objectives, please see the program requirements (http://catalog.tamu.edu/undergraduate/engineering/technology-industrial-distribution/technology-manufacturing-mechanical-bs).

Graduates are awarded the Bachelor of Science in Manufacturing and Mechanical Engineering Technology.

Multidisciplinary Engineering Technology (MXET)

Multidisciplinary Engineering Technology (MXET) combines core concepts from the electronics and mechanical engineering technology disciplines and provides students with a strong background in embedded systems, electronic system design, instrumentation, controls, statics, dynamics, thermodynamics, mechanical system design, and project management. The curriculum is then augmented through a 29-hour technical focus area. The Mechatronics and STEM Education focus areas are currently available and additional focus areas will be identified and created. The Mechatronics focus prepares graduates for diverse careers in aerospace, automotive, oil and gas, medical and communications industries where entry-level employees require a broad-based education in system-level design, development, documentation and delivery of new and innovative products. The STEM Education focus prepares graduates to teach math, science, and/or engineering at the secondary education level.

For more information about the Multidisciplinary Engineering Technology program including the mission and program educational objectives, please see the program requirements here (http://catalog.tamu.edu/undergraduate/engineering/technology-industrial-distribution/multidisciplinary-engineering-technology-bs/mechatronics-track) and here (http://catalog.tamu.edu/undergraduate/engineering/technology-industrial-distribution/multidisciplinary-engineering-technology-bs/stem-education-track).
Graduates are awarded the Bachelor of Science in Multidisciplinary Engineering Technology.

Department Academic Policies

The Department of Engineering Technology and Industrial Distribution (ETID) imposes academic requirements in addition to those imposed by the University (Texas A&M University Student Rules) and college. For complete details concerning these and other academic policies, students should contact the ETID Undergraduate Advising Office and are referred to the ETID (http://engineering.tamu.edu/etid) website.

A student must complete all prerequisites for a course with a grade of C or better by the start of the semester in which the student plans to enroll in the course. A student is responsible for checking the prerequisites for each course to ensure the prerequisite requirements have been satisfied. A student who registers for a course for which he/she lacks the necessary prerequisite course(s) and/or the prerequisite grade requirement will be required to drop the course. A student who is told to drop a course and is still enrolled by the deadline set each semester may be administratively dropped by the department. If a student is administratively dropped from a course, the student is responsible for all financial obligations associated with the drop. An administrative drop may adversely impact (including, but not limited to): health insurance benefits, financial aid, athletic eligibility, INS status, veterans' benefits, and eligibility to participate in extracurricular activities.

The department encourages students to participate in industrial internships or the Cooperative Education Program to acquire practical experience to complement their engineering technology education.

Before commencing course work in the major, students must be admitted to the major or have the approval of the department.

Faculty

Alvarado, Jorge L, Professor
Eng Tech & Ind Distribution
PHD, University of Illinois, 2004

Asadi, Amir, Assistant Professor
Eng Tech & Ind Distribution
PHD, University of Manitoba, 2013

Borsh Jr, Robert M, Associate Professor of the Practice
Eng Tech & Ind Distribution
MID, Texas A&M University, 2003

Bosshard, John C, Lecturer
Eng Tech & Ind Distribution
PHD, Texas A&M University, 2012

Buchanan, Walter W, Professor
Eng Tech & Ind Distribution
PHD, Indiana University, 1993

Burke, Adam J, Lecturer
Eng Tech & Ind Distribution
BS, Texas A&M University, 1997

Butler, Scott N, Lecturer
Eng Tech & Ind Distribution
MS, Sam Houston State University, 1986

Capar, Ismail, Associate Professor
Eng Tech & Ind Distribution
PHD, Mississippi State University, 2007

Chang, Yanling, Assistant Professor
Eng Tech & Ind Distribution
PHD, Georgia Institute of Technology, 2015

Clark Jr, Norman L, Instructional Associate Professor
Eng Tech & Ind Distribution
PHD, Texas A&M University, 2015

Conrad, Craig E, Senior Lecturer
Eng Tech & Ind Distribution
BS, Northern Illinois University, 1975

Fang, Gwo-Ping, Associate Professor
Eng Tech & Ind Distribution
PHD, Texas A&M University, 1996

Fink, Rainer J, Associate Professor
Eng Tech & Ind Distribution
PHD, Texas A&M University, 1995

Friar, Kevin B, Senior Lecturer
Eng Tech & Ind Distribution
BS, Texas A&M University, 1988

Golla, Michael R, Senior Lecturer
Eng Tech & Ind Distribution
MBA, Texas A&M University, 2002

Goulart, Ana E, Associate Professor
Eng Tech & Ind Distribution
PHD, Georgia Institute of Technology, 2005

Gunasekaran, Senthilmu, Research Assistant Professor
Eng Tech & Ind Distribution
DEN, Texas A&M University, 2014

Hsieh, Sheng-Jen, Professor
Eng Tech & Ind Distribution
PHD, Texas Tech University, 1995

Hung, Nguyen P, Associate Professor
Eng Tech & Ind Distribution
PHD, University of California, Berkeley, 1987

Hur, Byul, Assistant Professor
Eng Tech & Ind Distribution
PHD, University of Florida, 2011

Iakovou, Eleftherios, Professor
Eng Tech & Ind Distribution
PHD, Cornell University, 1992

Jennings, Daniel F, Professor
Eng Tech & Ind Distribution
PHD, Texas A&M University, 1986

Johnson III, John W, Lecturer
Eng Tech & Ind Distribution
MBA, Texas A&M University, 2001
Johnson, Mark H, Associate Professor of the Practice  
Eng Tech & Ind Distribution  
MS, Central Michigan University, 1991

Johnson, Michael D, Associate Professor  
Eng Tech & Ind Distribution  
PHD, Massachusetts Institute of Technology, 2004

Keblis, Matthew F, Associate Professor  
Eng Tech & Ind Distribution  
PHD, University of Michigan, 1995

Krishnadevarajan, Pradip K, Lecturer  
Eng Tech & Ind Distribution  
MS, Texas A&M University, 2003

Kuttolamadom, Mathew A, Assistant Professor  
Eng Tech & Ind Distribution  
PHD, Clemson University, 2012

Lawrence, Frederick B, Professor  
Eng Tech & Ind Distribution  
PHD, Texas A&M University, 1999

Leon, Victor J, Professor  
Eng Tech & Ind Distribution  
PHD, Lehigh University, 1991

Leonard, Matthew J, Lecturer  
Eng Tech & Ind Distribution  
BS, Texas A&M University, 1987

Ma, Chao, Assistant Professor  
Eng Tech & Ind Distribution  
PHD, University of California, 2015

Morgan, Joseph A, Senior Professor  
Eng Tech & Ind Distribution  
DEN, Texas A&M University, 1983

Nagarathnam, Bharani B, Instructional Assistant Professor  
Eng Tech & Ind Distribution  
MS, Texas A&M University, 2002

Natarajarathinam, Malini, Associate Professor  
Eng Tech & Ind Distribution  
DOC, University of Alabama, 2007

Nepal, Bimal P, Associate Professor  
Eng Tech & Ind Distribution  
PHD, Wayne State University, 2005

Obeidat, Suleiman M, Instructional Assistant Professor  
Eng Tech & Ind Distribution  
PHD, University of Oklahoma, 2008

Porter, Jay R, Professor  
Eng Tech & Ind Distribution  
PHD, Texas A&M University, 1993

Price, Angie H, Associate Professor  
Eng Tech & Ind Distribution  
PHD, Texas A&M University, 1999

Song, Xingyong, Assistant Professor  
Eng Tech & Ind Distribution  
PHD, University of Minnesota, Twin Cities, 2011

Thompson, James W, Senior Lecturer  
Eng Tech & Ind Distribution  
BS, Auburn University, 1973

Vanajakumari, Manoj N, Associate Professor  
Eng Tech & Ind Distribution  
PHD, University of Texas at Dallas, Richardson, 2007

Vestal, Evan D, Lecturer  
Eng Tech & Ind Distribution  
MBA, Sam Houston State University, 1998

Wallace, James P, Lecturer  
Eng Tech & Ind Distribution  
MS, Texas A&M University, 1993

Wang, Jyhwen, Professor  
Eng Tech & Ind Distribution  
PHD, Northwestern University, 1991

Webb, Don A, Senior Lecturer  
Eng Tech & Ind Distribution  
MBA, Harvard Business School, 1979

Whiteacre, Matthew M, Senior Lecturer  
Eng Tech & Ind Distribution  
MEN, Texas A&M University, 1984

Willey, Harley M, Lecturer  
Eng Tech & Ind Distribution  
BS, Texas A&M University, 1978

Zhan, Wei, Associate Professor  
Eng Tech & Ind Distribution  
PHD, Washington University in St. Louis, 1991

Zoghi, Behbood B, Professor  
Eng Tech & Ind Distribution  
PHD, Texas A&M University, 1993

**Majors**

- Bachelor of Science in Electronic Systems Engineering Technology (http://catalog.tamu.edu/undergraduate/engineering/technology-industrial-distribution/technology-electronic-systems-bs)
- Bachelor of Science in Industrial Distribution (http://catalog.tamu.edu/undergraduate/engineering/technology-industrial-distribution/industrial-distribution-bs)
- Bachelor of Science in Manufacturing and Mechanical Engineering Technology (http://catalog.tamu.edu/undergraduate/engineering/technology-industrial-distribution/technology-manufacturing-mechanical-bs)
- Bachelor of Science in Multidisciplinary Engineering Technology, Mechatronics Track (http://catalog.tamu.edu/undergraduate/engineering/technology-industrial-distribution/multidisciplinary-engineering-technology-bs/mechatronics-track)
- Bachelor of Science in Multidisciplinary Engineering Technology, STEM Education Track (http://catalog.tamu.edu/undergraduate/
Minors

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- Electronic Systems Engineering Technology (ESET) (p. 4)
- Industrial Distribution (IDIS) (p. 6)
- Manufacturing and Mechanical Engineering Technology (MMET) (p. 8)
- Multidisciplinary Engineering Technology (MXET) (p. 10)

Engineering Technology Courses
ENTC 289 Special Topics in...
Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours.
I, II, S Selected topics in an identified area of engineering technology. May be repeated for credit.
Prerequisite: Approval of instructor.

ENTC 399 High Impact Experience
Credits 0. 0 Other Hours.
Participation in an approved high-impact learning practice; reflection on professional outcomes; documentation and self-assessment of learning experience at mid-curriculum point.
Prerequisites: Grade of C or better in ESET 350, IDIS 343 or MMET 376; approval of instructor.

ENTC 481 Seminar
Credit 1. 1 Lecture Hour.
Presentation of selected topics from current literature and related industrial operations in various technical areas; films showing practical application of manufacturing and industrial processes; lectures from industrial representatives.
Prerequisite: Senior classification.

ENTC 484 Professional Internship
Credit 1. 1 Lecture Hour.
Directed internship in a private firm, government agency/laboratory, or non-governmental organization to provide work and/or research experience related to the student’s program and career objectives. May be taken two times for credit.
Prerequisites: Junior and senior classification and approval of internship agency and instructor.

ENTC 485 Directed Studies
Credits 1 to 6. 1 to 6 Other Hours.
Permits work in a special problem area on an individual basis with the intent of promoting independent reading, research and study; to supplement existing course offerings or subjects not presently covered.
Prerequisites: Senior classification and approval of instructor.

ENTC 489 Special Topics in...
Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours.
Selected topics in an identified area of engineering technology.
Prerequisite: Approval of instructor.

ENTC 491 Research
Credits 0 to 4. 0 to 4 Other Hours.
Research conducted under the direction of faculty member in the college of engineering. May be taken four times for credit.
Prerequisites: Junior or senior classification and approval of instructor.

Electronic Systems Engineering Technology Courses
ESET 210 Circuit Analysis
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Fundamentals of energy systems; power generation/distribution; motors/generators; AC power analysis; power factor correction; application of Thevenin’s and Norton’s theorems, Superposition Theorem, and Mesh and Nodal analysis; resonant circuits; passive filters; non-sinusoidal circuits; pulse waveforms; measurements of AC circuits; circuit analysis using Multisim.
Prerequisites: Grade of C or better in ESET 210 and MATH 152; electronic systems engineering technology major.

ESET 219 Digital Electronics
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Survey of digital applications, number systems, digital logic devices and circuits, sequential logic.

ESET 250 Introduction to Electronics Technology
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Hardware and software tools used in the electronics industry; software tools include LabVIEW and PSPICE; designed for anyone who needs knowledge, awareness and working familiarity of the software tools used in industry.

ESET 269 Embedded Systems Development in C
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Introduction to programming using the C programming language and embedded microcontroller systems; fundamental language syntax and semantics, concentration of the application to embedded systems.
Prerequisites: Grade of C or better in ESET 219 or concurrent enrollment; electronic systems engineering technology or multidisciplinary engineering technology majors.

ESET 315 Local-and-Metropolitan-Area Networks
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Design, operation, application and management of LANs and MANs; topologies, cabling systems, protocols, bridges, routers, hubs, switches, security; media and transport systems; Internet and TCP/IP topics including the protocol stack, router operation and addressing issues.
Prerequisites: Grade of C or better in ESET 219; electronic systems engineering technology major.
ESET 319 Engineering Leadership
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Exploration of Emotional Intelligence (EI), identification of personal EI competencies and areas for improvement, and development of these competencies and skills; determination of techniques to anticipate and manage our emotions, and to anticipate and work with the emotions of others.
Prerequisite: Grade of C or better in ENGL 103 or ENGL 104; electronic systems engineering technology major.

ESET 329 Six Sigma and Applied Statistics
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Concepts of probability and statistics, mean, variance, Gaussian/uniform/Student/Weibull distributions, and their applications in electronics design, analysis, and troubleshooting; Six Sigma process and tools including Gauge R&R, test of hypotheses, analysis of variance, linear regression, response surface method, control chart, and design of experiments.
Prerequisites: Grade of C or better in ESET 210 and MATH 152; electronic systems engineering technology major.

ESET 333 Product Development
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Process of product development to create an idea; development of a business plan; market research; voice of customer; managing resources; project management; identifying product partners; creating a unique product and/or company.
Prerequisite: Grade of C or better in ESET 329; grade of C or better in ENGR 217/PHYS 217 or PHYS 217/ENGR 217, or concurrent enrollment; electronic systems engineering technology major.

ESET 349 Microcontroller Architecture
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Microcontrollers including type of circuits and how they function; architecture of microcontrollers; instruction sets and how they are programmed.
Prerequisites: Grade of C or better in ESET 219 and ESET 269; electronic systems engineering technology major.

ESET 350 Analog Electronics
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Study of semiconductor devices including diodes, field effect transistors, bipolar junction transistors, and operational amplifiers; applications include signal conditioning, power supplies, active filters, discrete transistor amplifiers, and transistor switching/driver circuits.
Prerequisites: Grade of C or better in ESET 210, CHEM 107 and CHEM 117; grade of C or better in ENGL 103 or ENGL 104, ENGR 216/PHYS 216 or PHYS 216/ENGR 216 and MATH 151, MATH 152, and PHYS 206; junior or senior classification in electronic systems engineering technology.

ESET 352 Electronics Testing I
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Testing of electronic devices and systems; including test planning, test reporting, test specifications, parametric testing, measurement accuracy, test hardware, sampling theory, digital signal processing based testing, and calibrations; both circuit analysis (2/3) and circuit design (1/3) with several analog and mixed-signal systems.
Prerequisites: Grade of C or better in ENTC 329 and ESET 350; junior or senior classification in electronic systems engineering technology.

ESET 355 Electromagnetics and High Frequency Systems
Credits 4. 3 Lecture Hours. 3 Lab Hours.
High frequency concepts including topics in basic electromagnetics, transmission lines, antennas, and RF circuit design; applications including wireless communication systems, fiber optic systems, and high frequency PCB layout.
Prerequisites: Grade of C or better in ESET 211, PHYS 207, and ENGR 217/PHYS 217 or PHYS 217/ENGR 217; junior or senior classification in electronic systems engineering technology.

ESET 359 Electronic Instrumentation
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Fundamentals of controls, measurement systems, sensors, sampling theorem, analog to digital and digital to analog conversions; signal conditioning; digital signal processing; computer-based data acquisition using graphical development environment; and digital communication protocols.
Prerequisites: Grade of C or better in ESET 349 and ESET 350; grade of C or better in ENGL 103 or ENGL 104, ENGR 216/PHYS 216 or PHYS 216/ENGR 216, and MATH 151, MATH 152, CHEM 107, CHEM 117, and PHYS 206; junior or senior classification in electronic systems engineering technology.

ESET 366 Communications Electronics
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Fundamental communications concepts, frequency domain, analog and digital modulation, transmitter and receiver architectures, communication circuits including filters/oscillators/PLPs/amplifiers/mixers, fiber optics.
Prerequisites: Grade of C or better in ESET 350 or concurrent enrollment; junior or senior classification; or approval of instructor.

ESET 369 Embedded Systems Software
Credits 4. 3 Lecture Hours. 3 Lab Hours.
A study of the technical aspects of embedded computer software systems, with emphasis on embedded real-time systems, programming techniques and development methodologies.
Prerequisites: Grade of C or better in ESET 349; junior or senior classification in electronic systems engineering technology.

ESET 415 Advanced Network Systems and Security
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Practical network systems and security; topics include network design and protocol such as VLAN, HSRP, IP Routing, MPLS, and SAN; network security such as ACLs, TCP/IP security, IDS, and VPN; network service and management such as DHCP, DNS, NAT, SNMP, and MIB; and network verification and testing.
Prerequisites: Grade of C or better in ESET 315 and ESET 349; junior or senior classification in electronic systems engineering technology.

ESET 419 Engineering Technology Capstone I
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Project management tools for a formal technical proposal; addresses scope, schedule, risk, cost, milestones and deliverables; planning and initial design of prototype implemented in ESET 420; teams must have sponsor and technical advisor.
Prerequisites: Grade of C or better in ESET 319 or MXET 300, ESET 333 or MMET 361, and ESET 369; must be taken the fall or spring semester immediately prior to ESET 420; senior classification.
ESET 420 Engineering Technology Capstone II
Credits 2. 6 Lab Hours.
Second semester course in capstone design sequence; focus on design implementation, testing, documentation, demonstration, and presentation of a fully functional prototype; professional design tools for schematic capture, printed circuit board layout and software development, integration and validation.
Prerequisites: Grade of C or better in ESET 419; grade of C or better in ESET 352, ESET 415, ESET 455 and ESET 462, or concurrent enrollment; senior classification in electronic systems engineering technology.

ESET 435 Data Communications
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Data communications concepts and techniques involving error detection and correction, data link control, switching, client-server computing, data compression, data security, internet protocol (IP), transmission control protocol (TCP), includes development of a data link control layer and a client server system utilizing socket by using C Programming Language in Visual C++ environment.
Prerequisites: ESET 315 and ESET 369 with a grade of C or better; junior or senior classification in electronic systems engineering technology.

ESET 444 Building Energy Management Systems
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Essential elements of energy management from understanding energy production to consumption; identification of the major components of energy management of buildings, energy audit to business (strategy), Heating Ventilating Air Conditioning (HVAC), control systems, economics (ROI) and engineering system integration.
Prerequisites: Junior or senior classification or approval of instructor.

ESET 452 Electronics Testing II
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Advanced testing techniques of electronic devices and systems; study of advanced electronics test methodologies; emphasis on circuits containing analog to digital converters (ADCs) and digital to analog converters (DACs); device interface board design and data analysis; both circuit analysis (2/3) and circuit design (1/3) using industry grade state-of-the-art equipment.
Prerequisites: Grade of C or better in ESET 349 and ESET 352; junior or senior classification in electronic systems engineering technology.

ESET 453 Validation and Verification
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Validation of semiconductor devices; differences between validation and production testing; extensive use of Altium for simulation and layout of circuits; use of Spotfire to analyze data acquired as part of validation process; focus on acquisition of valid data and clear and concise presentation of data to stakeholders
Prerequisites: Grade of C or better in ESET 352; junior or senior classification in electronic systems engineering technology.

ESET 455 Wireless Transmission Systems
Credits 4. 3 Lecture Hours. 3 Lab Hours.
System engineering aspects of microwave, satellite and cellular communication systems; power budget calculations, propagation analysis, systems descriptions; CNR, CIR; review of modulations practical engineering considerations.
Prerequisites: Grade of C or better in ESET 315 and ESET 355; junior or senior classification in electronic systems engineering technology.

ESET 456 Embedded Sensors and Internet of Things (IoT) Systems
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Integration of off-the-shelf sensors and embedded intelligence components to form data acquisition, monitoring and control of remote equipment and systems through wired and wireless networks; algorithm development and implementation in interrupt-driven and RTOS-based firmware environments; collection, reduction, analysis and information extraction of data from multiple edge devices using industry-standard cloud-based software environments.
Prerequisites: Grade of C or better in ESET 355, ESET 359, and ESET 369; junior or senior classification in electronic systems engineering technology.

ESET 462 Control Systems
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Fundamentals of real-time closed-loop analog and digital control (the proportional, integral and derivative controller); distributed control systems, sensors, electronics, stepper and servo motors on a 16-bit microcontroller platform; design an autonomous vehicle; open industrial networks, such as Control Area Network (CAN) and DeviceNet technologies, will be discussed.
Prerequisites: Grade of C or better in ESET 359 and ESET 369; junior or senior classification in electronic systems engineering technology.

ESET 469 Embedded Real Time Software Development
Credits 3. 3 Lecture Hours.
Survey of the operation and use of Real Time Kernels as the basis for embedded system firmware development; includes task operation, inter-task communications, synchronization, dynamic memory, multitask system design and defensive programming techniques; embedded RTOS applications.
Prerequisites: Grade of C or better in ESET 369; junior or senior classification in electronic systems engineering technology.

Industrial Distribution Courses

IDIS 240 Introduction to Industrial Distribution
Credits 3. 3 Lecture Hours.
Definition, history, types of industrial distribution; range of products; line of distribution; function of and services provided by distributors; distributor operational and financial analyses; measures of organizational effectiveness; employment and advancement opportunities in the field of industrial distribution.

IDIS 300 Industrial Electricity
Credits 4. 3 Lecture Hours. 2 Lab Hours.
Industrial applications of electrical theory, codes, circuitry, wiring devices, motors and controllers, switch gear and solid state controls.
Prerequisite: PHYS 207; grade of C or better in ENGR 217/PHYS 217 or PHYS 217/ENGR 217; junior or senior classification in industrial distribution or engineering technology.

IDIS 330 Sales Engineering
Credits 4. 3 Lecture Hours. 2 Lab Hours.
Sales and sales management techniques for analyzing distribution challenges and providing solutions through effective communication; establishing credibility, effective questioning techniques, developing solutions, presenting solutions, anticipating objections and gaining a commitment, plus techniques for building, developing and compensating an effective sales organization.
Prerequisites: Grade of C or better in IDIS 240 or concurrent enrollment; industrial distribution major.
IDIS 340 Manufacturer Distributor Relations
Credits 3.3 Lecture Hours.
Approaches and procedures for developing and maintaining effective manufacturer distributor relations: marketing channel design, channel roles, managing uncertainty, legal and ethical imperatives, conflict resolution, decision support and strategic marketing.
Prerequisites: Grade of C or better in IDIS 240 or concurrent enrollment; industrial distribution major.

IDIS 343 Distribution Logistics
Credits 3.3 Lecture Hours.
Study of concepts, issues and techniques used to plan, analyze and control the logistics network; examination of three key logistical decision-making areas: inventories, facilities and transportation; techniques and technologies for managing and optimizing the logistical (supply) chain.
Prerequisites: Grade of C or better in IDIS 240; STAT 201, STAT 211 or STAT 303; industrial distribution major.

IDIS 344 Distributor Information and Control Systems
Credits 4.3 Lecture Hours. 3 Lab Hours.
Industrial distribution systems including hardware and software operations; inventory management, vendor evaluation; physical distribution systems; use of bar codes, radio frequency and other automated data entry techniques; purchasing operations.
Prerequisites: Grade of C or better in IDIS 343; industrial distribution major, junior or senior classification.

IDIS 400 Industrial Automation
Credits 4.3 Lecture Hours. 2 Lab Hours.
Industrial applications of electronic devices; instrumentation; AC and DC drives; local area networks; cell and area controllers and advanced applications of programmable controllers.
Prerequisites: Grade of C or better in IDIS 300; junior or senior classification in industrial distribution.

IDIS 420 Contemporary Topics in Electronics Distribution: Going Green
Credits 3.3 Lecture Hours.
Study of concepts, issues, and techniques used to plan and analyze supply chain for new generation of green products; utilize interdisciplinary approach combining team projects, individual research, case study analysis, and interaction with industry executives; creation of marketing and distribution roadmaps for growth opportunities.
Prerequisites: IDIS 300; IDIS 343; industrial distribution major, junior or senior classification; completion of ENGL 104, MATH 151, MATH 152, CHEM 107 and CHEM 117, and PHYS 218 with a grade of C or better.

IDIS 421 Healthcare Distribution Networks
Credits 3.3 Lecture Hours.
Examination of the value chain in the health care supply chain; emphasis on distributors in terms of competitive strategy, market power, distinctive capabilities and strategic alliances.
Prerequisites: IDIS 343; industrial distribution major, junior or senior classification; completion of ENGL 104, MATH 151, MATH 152, CHEM 107 and CHEM 117, and PHYS 218 with a grade of C or better.

IDIS 424 Purchasing Applications in Distribution
Credits 3.3 Lecture Hours.
Applications of purchasing systems, specifically for the distribution industry; emphasis on supplier relations, strategic purchase planning, supplier evaluation, global purchasing techniques, cost analysis, life cycle costing, value analysis; case studies and procurement modeling for distributors.
Prerequisites: Grade of C or better in IDIS 340; grade of C or better in IDIS 343 or concurrent enrollment; junior or senior classification in industrial distribution major.

IDIS 433 Industrial Sales Force Development
Credits 3.3 Lecture Hours.
Techniques and processes for developing, maintaining and leading high performing industrial sales organizations; organization planning and forecasting processes, processes and procedures for identifying and developing talented sales professionals who can operate within a sales process and provide solutions to customers while growing profitable accounts.
Prerequisite: Grade of C or better in IDIS 330; senior classification in industrial distribution.

IDIS 434 The Quality Process in Distribution
Credits 3.3 Lecture Hours.
Application of the Deming principles specifically for distributors, including customer needs analysis, research and data collection methodology, employee involvement techniques, team building, statistical methods and data analysis; solutions to quality problems for distributors, lean and six-sigma principles.
Prerequisites: Grade of C or better in IDIS 343; senior classification in industrial distribution.

IDIS 444 Ethics and Leadership in Distribution
Credits 3.2 Lecture Hours. 3 Lab Hours.
Second semester course in capstone design sequence; addresses the importance of leadership to distribution firms, role of culture, leadership theories, human capital development and management, change management and the importance of ethics.
Prerequisites: Grade of C or better in IDIS 464; grade of C or better in IDIS 433, IDIS 434, and IDIS 450, or concurrent enrollment; must be taken in the last semester of coursework; senior classification in industrial distribution.

IDIS 445 International Sales and Marketing
Credits 3.3 Lecture Hours.
Principles, cultural aspects of selling in the Latin American market, business-to-business selling environment, and marketing products, services and solutions in Latin America; local/country market analysis, strategic marketing, sales planning, alliances and partnerships, and operational support.
Prerequisite: Junior or senior classification.

IDIS 450 Analytics for Distribution Operation
Credits 3.3 Lecture Hours.
Fundamental concepts in data analytics in distribution operations; using data management tools to process transaction data into useful information; various statistical and analytical models to make strategic decision making; predictive analytics, simulation and risk analysis, linear optimization, and data mining.
Prerequisites: Grade of C or better in IDIS 343 and IDIS 344; senior classification in industrial distribution.

IDIS 454 New Directions in Distributor Competitiveness
Credits 3.3 Lecture Hours.
Investigation of new research in distributor competitiveness; focus on defining distribution strategy in changing market places; exploration of the latest applied findings and how companies are successfully implementing initiatives; project management approach to demonstrate the development of competitive advantage and design strategies for implementation.
Prerequisites: Junior or senior classification; completion of ENGL 104, MATH 151, MATH 152, CHEM 107 and CHEM 117, and PHYS 218 with a grade of C or better.
IDIS 455 Humanitarian Distribution Networks  
Credits 3. 3 Lecture Hours.  
Humanitarian logistics; essential knowledge to model distribution systems in humanitarian environments; supplemented by case studies and a project.  
**Prerequisites:** IDIS 343; junior or senior classification; completion of ENGL 104, MATH 151, MATH 152, CHEM 107 and CHEM 117, and PHYS 218 with a grade of C or better.

IDIS 464 Distributor Operations and Financial Management  
Credits 3. 3 Lecture Hours.  
First course in a two-semester capstone project course sequence; assessment of firm performance utilizing financial statement analysis and industry studies; methods for planning, implementing and monitoring profitability from distributor operations; procedures for controlling cash flow; credit, receivables, inventory, personnel and productivity; and related financial operations.  
**Prerequisites:** Grade of C or better in IDIS 343; ACCT 209; must be taken the long semester immediately prior to IDIS 444; senior classification in industrial distribution major.

IDIS 481 Seminar - Internship Preparation  
Credit 1. 1 Lecture Hour.  
Develop an understanding of the distribution industry and its opportunities; prepare students for summer internships; provide students with opportunities to network with industry and companies that will be hiring summer interns.  
**Prerequisite:** Minimum of 60 credit hours.

IDIS 484 Professional Internship  
Credits 2. 2 Other Hours.  
Independent study and on-the-job supervised experience related to a professional area of interest in industrial distribution.  
**Prerequisites:** IDIS 481; junior or senior classification.

IDIS 485 Directed Studies  
Credits 1 to 6. 1 to 6 Other Hours.  
Permits work in a special problem area on an individual basis with the intent of promoting independent reading, research and study; to supplement existing course offerings or subjects not presently covered.  
**Prerequisites:** Senior classification and approval of instructor.

IDIS 489 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours.  
Selected topics in an identified area of industrial distribution.  
**Prerequisite:** Approval of instructor.

**Manufacturing and Mechanical Engineering Technology Courses**

**MMET 105 Engineering Graphics**  
Credits 2. 1 Lecture Hour. 3 Lab Hours.  
(ENGR 1204, ENGR 1304) Engineering Graphics. Graphical approach to the engineering design process as applied to products; methods of graphical communications, three-dimensional geometry, working drawings, data analysis, computer graphics, introduction to team dynamics and creative problem solving.

**MMET 181 Manufacturing and Assembly Processes I**  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
A survey of metal manufacturing processes; traditional machining, non-traditional machining, welding, fabrication, casting and assembly.  
**Prerequisite:** Grade of C or better in MMET 105, ENGR 102, or ENGR 111, or concurrent enrollment.

**MMET 201 Manufacturing and Materials**  
Credits 4. 3 Lecture Hours. 2 Lab Hours.  
Survey of metallic and non-metallic materials; selection and applications of materials; introduction to traditional and non-traditional manufacturing processes, assembly processes, and metrology.  
**Prerequisite:** Grade of C or better in ENGR 102 or ENGR 111, CHEM 107, and CHEM 117; industrial distribution major.

**MMET 206 Nonmetallic Materials**  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Introduction to structure, properties, processing and application of forest products, plastics, ceramics and composites; laboratory includes processing, physical and mechanical testing, applications, surface treatment and material identification.  
**Prerequisite:** CHEM 102 or CHEM 107 with a grade of C or better; manufacturing and mechanical engineering technology or industrial distribution major or approval of department.

**MMET 207 Metallic Materials**  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Introduction to structure, properties and engineering application of ferrous and nonferrous materials; beneficiation, production of ferrous and nonferrous metals, destructive and nondestructive testing, protective coatings, strengthening and heat treatment; laboratory includes metallographic procedures, mechanical testing, heat treatment, surface treatment, corrosion testing, recrystallization and failure analysis.  
**Prerequisite:** CHEM 102 or CHEM 107 with a grade of C or better; manufacturing and mechanical engineering technology or industrial distribution major or approval of department.

**MMET 257 Mechanics for Technologists**  
Credits 3. 3 Lecture Hours.  
Forces, moments and couples in 2-D and 3-D systems; equilibrium of rigid bodies; friction and applications; centroids and moments of inertia; review of particle dynamic principles; kinematics and kinetics of rigid bodies; principles of impulse-momentum and work-energy; computer use in selected areas.  
**Prerequisites:** Grade of C or better in MATH 152 and PHYS 206 or PHYS 218; manufacturing and mechanical engineering technology major.

**MMET 281 Manufacturing and Assembly Processes II**  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Continuation of MMET 181, polymer manufacturing processes, additive manufacturing, advance manufacturing.  
**Prerequisites:** Grade of C or better in MMET 181 and MMET 206; manufacturing and mechanical engineering technology major or approval of department.

**MMET 301 Mechanical Power Transmission**  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
Overview of the engineering concepts of mechanical power and the components within a system to provide transmission of that power into useful work; experimental application of the related theory as it relates to the industrial distributor; “real world” knowledge learned for application in industry.  
**Prerequisites:** Grade of C or better in ENGL 103 or ENGL 104; grade of C or better in MATH 151, MATH 152, CHEM 107, CHEM 117, PHYS 206, and ENGR 216/PHYS 216 or PHYS 216/ENGR 216; junior or senior classification in industrial distribution.
MMET 303 Fluid Mechanics and Power
Credits 4. 3 Lecture Hours. 2 Lab Hours.
Fluid mechanics and fluid power applications for technologists; fluid properties; conservation of energy and momentum; incompressible flow in pipes; standard symbols: components and control of hydraulic systems and pneumatic systems.  
Prerequisites: Grade of C or better in MMET 275; manufacturing and mechanical engineering technology major.

MMET 307 Computer Design Graphics
Credits 3. 3 Lecture Hours.
Use of microcomputers with currently available CAD software as an aid in the design process and as a means of increasing engineering productivity; review of ANSI standards and an introduction to a variety of computer graphics applications encountered in industry; user-oriented.  
Prerequisites: Grade of C or better in MMET 105 or MMET 181.

MMET 313 Industrial Welding Processes
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Theory and practical applications of industrial welding and cutting processes; experience in operation of various machines and processes.  
Prerequisites: Grade of C or better in MMET 181, MMET 207 and MMET 376; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 320 Quality Assurance
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Applied statistical process control and design-of-experiment techniques for quality improvement and process characterization; emphasis on organizations operating in a continuous-improvement, customer-driven environment; statistical thinking; control charts; capability analysis of product, process and measurement system; experimental process characterization, prediction models and input variable control.  
Prerequisites: Grade of C or better in MMET 105 or MMET 181.  

MMET 361 Product Design and Solid Modeling
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Design processes and methodologies including quality function deployment, materials and process selection, and design for manufacturing and assembly; fundamentals of modeling part geometry and mechanical assembly using parametric CAD software.  
Prerequisites: Grade of C or better in ENGR 216/PHYS 216 or PHYS 216/MMET 201, MMET 206, MMET 207, and MMET 275; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 363 Mechanical Design Applications I
Credits 3. 3 Lecture Hours.
Principles of design of mechanical components; theories of failure; Soderberg and Goodman diagrams; fatigue and fracture design criteria; materials and their selection to engineering applications; component assembly aspects; design of fasteners and springs as examples.  
Prerequisites: Grade of C or better in ENGL 103 or ENGL 104; grade of C or better in MMET 376, MATH 151, MATH 152, CHEM 107, CHEM 117, PHYS 206, and ENGR 216/PHYS 216 or PHYS 216/MMET 201, MMET 376; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 370 Thermodynamics for Technologists
Credits 4. 3 Lecture Hours. 2 Lab Hours.
Thermal and mechanical energy transformations; relationships applied to flow and non-flow processes in power and refrigeration cycles; devices include compressors, turbines, heat exchangers, nozzles, diffusers, pumps and piston-cylinder models; computer modeling.  
Prerequisites: Grade of C or better in PHYS 206, and ENGR 216/PHYS 216 or PHYS 216/MMET 201, MMET 376; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 376 Strength of Materials
Credits 4. 3 Lecture Hours. 2 Lab Hours.
Stress and strain; elastic moduli Poisson's ratio; torsion, bending, unsymmetrical bending; design of beams and shafts; deflection of beams; buckling of columns; material and strength characterization laboratory tests.  
Prerequisites: Grade of C or better in ENGL 103 or ENGL 104; grade of C or better in PHYS 206, and ENGR 216/PHYS 216 or PHYS 216/MMET 201, MMET 376; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 380 Computer-Aided Manufacturing
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Basic concepts in computer-aided manufacturing with emphasis on a system approach to manufacturing activities; use of numerical control machine tools and other computer based software as applied to different industries.  
Prerequisites: Grade of C or better in MMET 181 and MATH 152; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 383 Manufacturing Information Systems
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Use of information technology for manufacturing enterprise applications, including computer-integrated manufacturing, database, computer networking, web-technology and enterprise resource planning.  
Prerequisites: Grade of C or better in MMET 380; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 401 Fluid Power Transmission
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Engineering concepts of hydraulics and pneumatic power and its components within a system to provide transmission of that power into useful work; experimental application of the related theory as it relates to the industrial distributor; real world knowledge learned for application in industry.  
Prerequisites: Grade of C or better in ENGL 103 or ENGL 104; grade of C or better in MMET 201, MMET 301, PHYS 207, MATH 151, MATH 152, CHEM 107, CHEM 117, PHYS 206, ENGR 216/PHYS 216 or PHYS 216/MMET 201, MMET 376; junior or senior classification in industrial distribution.

MMET 402 Inspection Methods and Procedures
Credits 3. 3 Lecture Hours. 2 Lab Hours.
Methods and procedures in nondestructive inspection of materials and industrial products; ultrasonics, dye penetrants, magnetic particle, radiography and supportive evaluation methods such as weld sectioning, polishing, etching and macroscopic analysis.  
Prerequisites: Grade of C or better in MMET 281 and MMET 376; junior or senior classification in manufacturing and mechanical engineering technology.
MMET 405 Weldability of Ferrous Metals  
Credits 3. 3 Lecture Hours.  
Applied principles of metallurgy with reference to weldability of ferrous metals.  
**Prerequisites:** Grade of C or better in MMET 207 and MMET 313; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 410 Manufacturing Automation and Robotics  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Hardware for automated work handling, conveyors, loaders, robots, storage devices; power sources and methods of control, electric motors, controllers, program logic controllers, robot programming; interfacing of equipment controls; and manufacturing work cells.  
**Prerequisites:** Grade of C or better in MMET 361, MMET 376, MMET 383 and IDIS 300; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 412 Production and Inventory Planning  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
An introductory treatment of models and techniques for the planning of production and inventory systems.  
**Prerequisites:** Grade of C or better in MMET 320, MMET 383 and ISEN 302; senior classification in manufacturing and mechanical engineering technology.

MMET 414 Micro/Nano Manufacturing  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Product miniaturization and impact; review of atomic structure, electrical and physical properties of materials; ultraprecision machining; microlithography; dry and wet etching/sputtering techniques; isotropic and anisotropic processes; pattern transfer with additive processes; surface micromachining; microreplication processes; introduction to packaging technology and nanometrology; manufacturing of selected microsystems (MEMS) and their applications.  
**Prerequisites:** Grade of C or better in CHEM 107, PHYS 207, and ENGR 217/PHYS 217 or PHYS 217/ENGR 217; grade of C or better in ESET 359 and ESET 369 or concurrent enrollment.

MMET 418 Medical Manufacturing  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Surveys relevant regulations, biocompatibility of engineering materials, and emphasizes suitable techniques for medical device manufacturing.  
**Prerequisites:** Grade of C or better in MMET 181; junior or senior classification in manufacturing and mechanical engineering technology.

MMET 422 Manufacturing Technology Projects  
Credits 2. 1 Lecture Hour. 3 Lab Hours.  
A capstone projects course utilizing a team approach to an analysis and solutions of manufacturing problems.  
**Prerequisites:** Grade of C or better in MMET 429; grade of C or better in MMET 410, MMET 412 and MMET 463, or concurrent enrollment; must be taken in fall or spring semester; senior classification in manufacturing and mechanical engineering technology.

MMET 429 Managing People and Projects in a Technological Society  
Credits 3. 3 Lecture Hours.  
Supervisory and project management duties and responsibilities in technology based organizations and the methods required to fulfill these functions.  
**Prerequisites:** Grade of C or better in ISEN 302 and MMET 361; grade of C or better in MMET 363, or concurrent enrollment; must be taken in the fall or spring semester immediately prior to MMET 422; senior classification in manufacturing and mechanical engineering technology.

MMET 463 Mechanical Design Applications II  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
Applications of principles of analysis and design of machines and machine elements including linkages, robots, cam and follower systems, shafts, gears, clutches, belt and chain drives; introduction to the mathematical tools for the analysis and design of these machines and machine elements.  
**Prerequisites:** Grade of C or better in MMET 361 and MMET 363; senior classification in manufacturing and mechanical engineering technology.

**Multidisciplinary Engineering Technology Courses**

MXET 300 Mechatronics I – Mobile Robotic Systems  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Mechanical, electronic, software, control and communications aspects of embedded intelligence-based electromechanical systems with a focus on mobile robotic platforms.  
**Prerequisites:** Grade of C or better in MXET 375, PHYS 207, and ENGR 217/PHYS 217 or PHYS 217/ENGR 217; grade of C or better in ESET 359 and ESET 369 or concurrent enrollment.

MXET 375 Applied Dynamic Systems  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Study of translational mechanical system dynamics, rotational mechanical system dynamics, electrical system dynamics modeling, electro-mechanical/mechatronics system dynamics, fluid power dynamics and 2 dimensional rigid body dynamics.  
**Prerequisites:** Grade of C or better in MXET 275; junior or senior classification in an engineering technology major.

MXET 400 Mechatronics II – Industrial Robotic Systems  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Study and analysis of industrial robotics and automation processes necessary for robot-centric work cell design and operation.  
**Prerequisites:** Grade of C or better in MXET 300; grade of C or better in ESET 462 or concurrent enrollment, junior or senior classification in multidisciplinary engineering technology.