MECHANICAL ENGINEERING/ MANUFACTURING INDUSTRIAL TECHNOLOGY (MET)

MET-1041 Foundations of Manufacturing
3 Credits

Introduction to print reading and part visualization from drawings, including analyzing and interpreting multi-view drawings and three-dimensional models, location of key features and dimensioning specifications. Also covers beginning concepts in geometric dimensioning and tolerancing. Instruction in using precision measurement tools including, but not limited to scales, calipers, micrometers, dial indicators, coordinate measurement machines. Students will incorporate the use of computer interfaces in metrology and basic statistical process control and topics in lean manufacturing.
Lecture: 2 hours. Laboratory: 2 hours
Prerequisite(s): None.

MET-1050 Applied Mathematics for Engineering Technology
1 Credit

Application of applied quantitative procedures to typical manufacturing, warehouse, and construction situations. Covers use of decimals, fractions, geometric properties, right angle trigonometry and vectors, and common unit conversions. Concepts are applied to reading engineering drawings, use in various warehouse operations, dimensioning parts, and solving systems of equations.
Laboratory: 3 hours
Prerequisite(s): MATH-0915 Basic Arithmetic and Pre-Algebra, or qualified Math placement to place into MATH-0955 Beginning Algebra, or MET-1041 Foundations of Manufacturing.

MET-1060 Semiconductor Manufacturing Processes and Cleanrooms
3 Credits

Exploration of career opportunities within the semiconductor industry. Learn how people effectively work in a cleanroom environment and adhere to chemical safety best practices. Covers how semiconductor wafers are manufactured and processed to become an integrated circuit used in a variety of industries. Students will demonstrate problem-solving, critical thinking and communication skills while learning how the microelectronic manufacturing environment focuses on punctual delivery of products and tasks, according to the Standard Operating Procedure (SOP)/checklist.
Lecture: 3 hours. Laboratory: 3 hours
Prerequisite(s): None

MET-1070 Vacuum Systems Technology
3 Credits

Introduction to the operational mechanisms and process use of vacuum pumps used in the semiconductor industry. Students will explain the operational methodology and process use of equipment that require vacuum pumps used in the semiconductor industry. Students will demonstrate problem-solving, critical thinking and communication skills while learning how to perform maintenance on a vacuum system in a cleanroom environment.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MET-1060 Semiconductor Manufacturing Processes and Cleanrooms.

MET-1100 Technology Orientation
2 Credits

Orientation and exploration of Engineer's/technician's role as part of industrial team including careers, opportunities and job-hunting skills. Topics include Engineering ethics, use of the computer, basic measurement and calculation skills and engineering drawing concepts. Introduction to oral, technical writing and graphic methods of communication. Introduction to professional organizations, journals and tools for professional enhancement to provide a path for lifelong learning.
Lecture: 1 hour. Laboratory: 2 hours
Prerequisite(s): MATH-0965 Intermediate Algebra or qualified Math placement to place into MATH-1530 College Algebra.

MET-1120 Computer Applications and Programming
2 Credits

Design and debug windows-based application software in Microsoft Visual Basic and C Programming languages. Apply designed software and spreadsheets in technological problem solving. Applying programming concepts to customize spreadsheets and chosen engineering specific application software.
Lecture: 1 hour. Laboratory: 3 hours
Prerequisite(s): MATH-0955 Beginning Algebra, or qualified Math placement to place into MATH-0965 Intermediate Algebra.

MET-1230 Drawing & AutoCAD
3 Credits

Apply visualization skills in the interpretation of orthographic projections and pictorial drawings. Applied geometry, use of scales, sections, and auxiliary views are studied. Dimensioning standards and conventions as applied to detail and assembly drawings in manual drafting as well as use of CAD system to accomplish drafting tasks are emphasized. Includes overviews of computer terms and functions of the Windows Operating System. Covers special terms and definitions used in computer-assisted drafting, the roles technical drawings play in production, manufacturing and products design process.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MATH-0955 Beginning Algebra or qualified Math placement to place into MATH-0965 Intermediate Algebra.

MET-123A Engineering Drawing
1 Credit

Apply visualization skills in the interpretation of orthographic projections and pictorial drawings. Applied geometry, use of scales, sections, and auxiliary views are studied. Dimensioning standards and conventions as applied to detail and assembly drawings in manual drafting.
Laboratory: 3 hours
Prerequisite(s): MATH-0955 Beginning Algebra or qualified Math placement to place into MATH-0965 Intermediate Algebra.

MET-123B 2D AutoCAD
2 Credits

Dimensioning standards and conventions as applied to detail and assembly drawings in manual drafting as well as use of CAD system to accomplish drafting tasks are emphasized. Includes overviews of computer terms and functions of the Windows Operating System. Covers special terms and definitions used in computer-assisted drafting and the roles technical drawings play in production, manufacturing and product design process.
Lecture: 2 hours
Prerequisite(s): MATH-0955 Beginning Algebra or qualified Math placement to place into MATH-0965 Intermediate Algebra.

MET-1240 Machine Tools and Manufacturing Processes
3 Credits

Application of traditional and contemporary machine tools processes to accomplish the mechanical parts production or the maintenance and/or repairs of mechanical parts or equipment. Laboratory experiences include measuring and inspection, layout and fundamentals of machine tool setup and techniques for drilling, turning, milling and grinding. Manufacturing processes including the production of metals and alloys, polymers and plastics, forming, machining, fabrication, conditioning and finishing of metallic, plastic and composite engineering parts.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MATH-0955 Beginning Algebra or qualified Math placement to place into MATH-0965 Intermediate Algebra.
OAN Approved: Transfer Assurance Guide OET010 and Career Technical Assurance Guide CTMET004.

MET-1250 Introduction to Additive Manufacturing
3 Credits

Principles of the applications of Additive Manufacturing. Advantages of using Additive Manufacturing over traditional Subtractive Manufacturing processes are studied.
Lecture: 3 hours
Prerequisite(s): MATH-0955 Beginning Algebra I or qualified Math placement to placement into 1000-level Mathematics.

MET-1261 Product Ideation & Design I
3 Credits

Introduction to product ideation and design process from development to production. Covers critical thinking, project planning, iterative processes, teamwork, and hand sketching. Additionally, learn contemporary design and development processes, identify customer needs, and design for manufacturing and production prototypes. Course emphasizes critical thinking skills and problem solving; students will transfer basic ideas to 2D representations and 3D prototype models.
Lecture: 3 hours
Prerequisite(s): MATH-0955 Beginning Algebra or qualified Math placement.

MET-1270 Additive Manufacturing Processes
3 Credits

Fundamental principles and workflow for additive manufacturing production and how it applies to additive manufacturing processes. Product life cycle from cradle to grave, value assessment, materials selection, current market trends, and emerging markets as applied to additive manufacturing.
Lecture: 2 hours. Laboratory: 2 hours
Prerequisite(s): MET-1250 Introduction to Additive Manufacturing; and MATH-0955 Beginning Algebra, or qualified Math placement.

MET-1300 Engineering Materials and Metallurgy
3 Credits

Analysis of the behavior and characteristics of metals and other materials used in manufacturing including polymers, ceramics, and composites: their structure, physical and mechanical properties. Examining and interpreting phase diagrams and crystallized microstructures of metals and alloys; heat treatment of ferrous and nonferrous metals; hardness, tensile, and charpy impact tests.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MATH-0955 Beginning Algebra or qualified Math Placement to enroll in MATH-0965 Intermediate Algebra.
OAN Approved: Transfer Assurance Guide OET013.

MET-1340 Introduction to Industry 4.0 and Vision Systems
4 Credits

The students learn the concepts of Smart manufacturing, (Industry 4.0) ; theories behind the factory of future, lean concepts, maximizing efficiency, recognizing and eliminating waste. Vision system components, programming, error recovery, and inspection process; introduction to Human-Machine Interface (HMI), manufacturing execution system (MES), RFID, barcoding, vision inspection. Prepares students for Fanuc Vision System Certification.
Lecture: 2 hours. Laboratory: 6 hours
Prerequisite(s): MET-1120 Computer Applications and Programming.

MET-1410 Computer Aided Manufacturing Processes
3 Credits

Manual and application of CAD/CAM technology to program CNC machines to produce mechanical parts. Covers manually writing paths programs; 2D and 3D parts graphics designs; generating CNC programs from graphics; verifying toolpaths by simulation and post-processing path programs to work on given CNC controllers; set-up CNC lathes and milling machines to perform machining operations; operate CNC machines to produce parts.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MET-1240 Machine Tools and Manufacturing Processes, or concurrent enrollment; or MET-123B 2D AutoCAD, or MET-1230 Drawing and AutoCAD, and MET-1340 Introduction to Industry 4.0 Vision System for students in Smart Manufacturing program; or departmental approval: relevant work experience.

MET-1601 Technical Statics
3 Credits

Study of forces on structures and machines at rest. Topics include composition and resolution of forces, moments, freebody diagrams, trusses, frames, simple machines, friction, centers of gravity, centroids, and plane and polar moments of intertia.
Lecture: 3 hours
Prerequisite(s): MATH-1530 College Algebra; and PHYS-1210 College Physics I, or concurrent enrollment.
OAN Approved: Transfer Assurance Guide OET007.

MET-1621 Technical Dynamics
3 Credits

Study of motion and forces on rigid members. Includes plane and curvilinear motion, kinetics, work, energy, power, efficiency, impact and momentum. Introduction to balancing and vibrations.
Lecture: 3 hours
Prerequisite(s): MET-1601 Technical Statics.

MET-1631 Industrial Supply Logistics
2 Credits

An introduction to supply chain logistics and warehouse operations for manufacturing processes. Fundamentals of supply chains, transportation modes, inventory control, documentation required in warehouses, types of warehouse equipment, workplace safety, proper handling of material, quality control systems, inspection methods, specifications, ISO 9001, product handling, and print reading. Designed to prepare students to take the MSSC CLA examination.
Lecture: 1 hour. Laboratory: 2 hours
Prerequisite(s): None.

MET-1640 Robotics and Programmable Logic Controllers in Process Automation
5 Credits

Introduction to automation concepts in the industry, AC/DC drives, PLC configuration, programming, and troubleshooting. Covers Industrial robots programming, operations, and set up. Includes handling tool applications, testing, and refining the program to interface with other production equipment. Prepares students for Rockwell PLC certification and Fanuc Robotic Tool Handling C-certification.
Lecture: 2 hours. Laboratory: 9 hours
Prerequisite(s): MATH-0910 Basic Arithmetic and Pre-Algebra, or sufficient score on placement exam; or departmental approval; and MET-1120 Computer Applications and Programming or concurrent enrollment.

MET-1801 Special Topics: Applied Mathematics for Engineering Technology
1 Credit

Application of applied quantitative procedures to typical manufacturing, warehouse, and construction situations. Us of common fractions as applied to engineering drawings, decimal and fractions as applied to warehouse operations, geometric properties when dimensioning parts, right triangle trigonometry and vectors as applied to study of motion, solving complex systems of equations, and units and unit conversions between measurement units common in applied settings.
Laboratory: 3 hours
Prerequisite(s): MATH-0910 Basic Arithmetic and Pre-Algebra, or appropriate Math placement score to place into MATH-0955 Beginning Algebra, or MET-1040 Foundations of Manufacturing.

MET-1806 Special topics in Foundations of Manufacturing
2 Credits

Application of manufacturing and allied industries success models. Application of applied quantitative procedures to typical manufacturing, warehouse, construction, logistics, and allied industries situations. Concepts of numbers, exponential and logarithmic functions, algebraic word problems, right triangle trigonometry and basic trigonometric identities, foundational geometry, vectors and vector algebra, matrices, and solving systems of linear equations as applied to warehouse, logistics, manufacturing, and construction. Students will review learning styles, studying techniques, exam techniques, stress management, and time management as applied to manufacturing skills.
Lecture: 2 hours
Prerequisite(s): None

MET-1815 Special Topics: Digital Fabrication I
3 Credits

The course provides knowledge and skills to operate modern equipment as seen in corporate maker space to accomplish digital fabrication.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): None.

MET-2000 CAD/CAM Processes
3 Credits

Using Mastercam and other Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) software to graphically model parts; graphic display manipulation; geometrical analysis; graphic and data files management; exchange and conversion of graphic files to formats readable by Mastercam or given CAD/CAM software; generating codes, post processing to G-codes interpretable by given computer numerical controller; verification and validation of tool-paths by graphical simulation; downloading path programs to machine; tooling and setting up parts on CNC lathe and milling machines; operating CNC machines to produce parts.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MET-1400 CNC Programming and Operation or concurrent enrollment.

MET-2041 CAD II & GD&T
3 Credits

Advanced engineering drawing concepts used with computer-aided drafting software. Drawing applications include size tolerancing, geometric dimensioning, thread and fastener specifications, detail and assembly drawings, weldments, external references, bill of materials and standardized drawing formats. Introduction to solid modeling.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MET-1230 Drawing & AutoCAD, and MET-1120 Computer Applications and Programming, or departmental approval.
OAN Approved: Transfer Assurance Guide OET012. CTAN Approved: Career Technical Assurance Guide CTMET005 and Industry-Recognized Transfer Assurance Guide ITMET005.

MET-2060 Product Ideation & Design II
3 Credits

Build upon critical thinking and product development concepts introduced in Product Ideation & Design I. Develop solutions for real-world product design problems using hand sketching, 3D modeling, additive manufacturing, and other techniques. Also covers engineering principles as they apply to product design, development and manufacture.
Lecture: 3 hours
Prerequisite(s): MET-1261 Product Ideation & Design I; and MATH-0955 Beginning Algebra, or qualified Math placement.

MET-2070 Introduction to Industrial Warehousing
2 Credits

A continuation of industrial supply logistics and go into further detail of warehouse management and operations. Fundamentals of receiving product, storage of production output, processing orders, packaging and shipping, inventory control, handling of hazardous materials, transportation modal evaluation, customs, and dispatch and tracking operations. Designed to prepare students to take the MSSC CLT examination.
Lecture: 1 hour. Laboratory: 2 hours
Prerequisite(s): MET-1631 Industrial Supply Logistics, and MET-1100 Technology Orientation.

MET-2140 Manufacturing Automation and Control
3 Credits

Automation and control of manufacturing machines and their auxiliary equipment to enable manufacturing systems integration, applying fundamental concepts of Programmable Logic Controllers (PLC's) with emphasis on ControlLogix-LOGIX5000 System. Basic programming and interface of robots to facilitate materials transfer in an integrated manufacturing environment.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MET-1120 Computer Applications and Programming or concurrent enrollment.

MET-2151 3D Digital Design & Printing
3 Credits

Covers the major technology shifts in human history that have transitioned into 3D printing and explore emerging trends of the technology. Includes fundamentals of preparing CAD files for 3D printing , comparison of various 3D printing technologies in terms of advantages, relative precision, applications, advantages, and material use, engineering processes employing 3D printing, using applicable software to produce 3D models, and an emphasis on advance digital design using Solidworks for 3D printing.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MET 1250 Introduction to Additive Manufacturing and MET-1270 Additive Manufacturing Processes and MET 2601 3D Solid Modeling, or departmental approval.

MET-2160 3D Scanning, Reverse Engineering, and Quality Inspection
3 Credits

Covers the principles of engineering parts inspection and reverse engineering processes through the applications of 3D scanning, blueprint reading, hand tools measuring and Coordinate Measuring (CMM technologies.) Emphasis on performing laser scanning to generate 3D images; converting scanned images into 2D/3D models utilizing applicable software; employing CMM technologies for parts inspection and generating points cloud for 3D modeling; and interfacing generated models with reverse engineering methods.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MET-2601 3D Solid Modeling

MET-2191 Additive Manufacturing Project Capstone
2 Credits

Examines the key elements of product development from the concept through design to production. Application technologies learned in the Additive Manufacturing curricula to complete individual and team projects involving product development and production.
Lecture: 1 hour. Laboratory: 3 hours
Prerequisite(s): MET-2151 3D Digital Design & Printing.

MET-2200 Strength of Materials
3 Credits

Study of stress, strain and deformation of mechanical bodies due to static tensile, compressive, torsional, bending and combined loading. Deflection of beams and columns, design of beam for strength and structural connections.
Lecture: 2 hours. Laboratory: 2 hours
Prerequisite(s): MET-1601 Technical Statics.
OAN Approved: Transfer Assurance Guide OET008.

MET-2220 Advanced CAD/CAM Processes
3 Credits

Applying Mastercam for advanced CAD/CAM operations; creating wireframe, surface and solid models; generating, editing, verifying, and post-processing codes interpretable by given CNC controllers, with emphasis on FANUC controller; downloading path programs to CNC machines; tooling and setting up parts; operating CNC machines to produce parts.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MET-1240 Machine Tools and Manufacturing Processes, and MET-1400 CNC Programming Operations, and MET-2000 CAD/CAM Processes.

MET-2240 Mechanical Engineering Lab
1 Credit

Introduction to fundamental laboratory measurement techniques, data acquisition and analysis, and technical report writing in the form of engineering reports and executive summaries. Troubleshoot and correct hydraulic/electromechanical equipment and digital data acquisition hardware. Experiments are drawn from thermal sciences, dynamics, solid mechanics and materials science.
Laboratory: 2 hours
Prerequisite(s): MET-1601 Technical Statics.

MET-2250 Robotics Operations Certification
3 Credits

This course is intended for an operator, technician, engineer or programmer who must setup and record programs on a robot for industrial applications. The course covers the Robot Operations outline intermixed with the tasks required to program robot instruction, set up the Handling Tool application, test, run and refine the program and production setup. It prepares students to take Robotics Operations Certification, Tests for FANUC robots and other systems.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): None.

MET-2260 Infrared Robotic Vision
3 Credits

Course provides preparation to sit for the robotic infrared vision industry certification test. Covers vision system components, programming, error recovery, and inspection process. Also includes setup of a 2D or 3D Single view process a vision system.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MET-2250 Robotics Operations Certification or departmental approval.

MET-2300 Fluid Power
3 Credits

Concepts and practices related to modern hydraulic and pneumatic systems. Includes basics of fluid flow, fluid dynamics, properties of hydraulic fluid, components of hydraulic system, hydraulic circuit, design, operation and control of hydraulic/pneumatic system.
Lecture: 2 hours. Laboratory: 2 hours
Prerequisite(s): PHYS-1210 College Physics I or PHYS-2310 General Physics I, or concurrent enrollment; or students in Integrated Systems Engineering Technology program may fulfill prerequisite requirements with ISET-1320 Fundamentals of Fluid power; or departmental approval.
OAN Approved: Transfer Assurance Guide OET009.

MET-2320 Thermal Dynamics
3 Credits

Heat, work, kinetic theory of gases, equation of state, thermodynamics system, control volume, first and second laws of thermodynamics, reversible and irreversible processes, and introduction to basic thermodynamic cycles.
Lecture: 3 hours
Prerequisite(s): MATH-1620 Calculus II and PHYS-2310 General Physics I.

MET-2410 Quality Control and Lean Manufacturing
3 Credits

Introduction to quality control fundamentals, probability and statistics, process capability, control chart applications. Also covers principles and practices of lean manufacturing.
Lecture: 3 hours
*Prerequisite(s): MATH-1530 College Algebra; and MET-1240 Machine Tools and Manufacturing Processes or concurrent enrollment; or departmental approval: work experience. *Note: MATH-1521 College Algebra completed with "C" or higher prior to Fall 2016 will also be accepted to meet prerequisite requirements for this course.*

MET-2422 Fundamentals of Engineering Economics
3 Credits

Analysis of cost elements in engineering projects and operations. Topics include: comparison of project alternatives; selecting an alternative by applying Benefit/Cost Analysis, Present Worth Method, Annual Worth Method, and Internal Rate of Return; introduction to risk analysis, accounting fundamentals, financial statements, and capital financing and allocation. Ethical and social responsibilities as applied to engineering project decisions. Practical applications of cost concepts and the application towards the different phases of manufacturing or project implementation. Use of Microsoft Excel in performing analysis.
Lecture: 3 hours
Prerequisite(s): MATH-1530 College Algebra or higher.
OAN Approved: Transfer Assurance Guide OES005.

MET-2430 Engineering Probability and Statistics
3 Credits

Course covers probability and statistics for engineers. Course topics include: measures of central tendency and dispersion, probability axioms and rules, standard discrete distributions, standard continuous distributions, point and confidence interval parametric values, central limit theorem, sampling distributions, hypothesis testing for one-sample and two-sample means and proportions, relationships between two random variables, correlation analysis, and simple linear regressions. Examples, problems, and case studies can be from manufacturing, mechanical, civil, electrical, and construction engineering.
Lecture: 3 hours
Prerequisite(s): MATH-1610 Calculus I.
OAN Approved: Transfer Assurance Guide OES004.

MET-2450 Robotics and Automation in Smart Manufacturing
4 Credits

Introduces the students to the foundations of Smart Manufacturing and Industry 4.0. The practical application includes automation, process control, quality principles, and big manufacturing/service data analytic. The CSM line is an intelligent manufacturing system using the latest industry 4.0 connected advanced manufacturing equipment and training problem-solving and integration skills.
Lecture: 2 hours. Laboratory: 6 hours
Prerequisite(s): MET-1120 Computer Applications and Programming.

MET-2460 Applied Programmable Logic Controllers and Mechatronic Systems
5 Credits

Provides the knowledge and skills for the efficient operation and troubleshooting of complex mechatronic systems. Students in this program confront a complete system and learn about its various parts by examining their own role within it. They explore each of the system's individual components and discover how they interrelate. Using their knowledge of the system, students learn how to pinpoint where and why malfunctions might occur within each component.
Lecture: 2 hours. Laboratory: 9 hours
Prerequisite(s): MET-1640 Robotics and Programmable Logic Controllers in Process Automation, EET-1220 Circuits and Electronics for Automation, and ISET-2200 Industrial Motor Controls or departmental approval.

MET-2500 Fundamentals of Products Development and Manufacture
3 Credits

Capstone Course. This course examines the fundamentals of new product development (NPD) including: preparing for product innovation, success factors of product innovation, ideation and concept creation, customers input, market analysis, use of social media, strategies for developing products, product launches and supply chain, post launch product management, and intellectual property implications.
Lecture: 3 hours
Prerequisite(s): MET-1240 Machine Tools and Manufacturing Process; or MET-2060 Product Ideation & Design II or concurrent enrollment.

MET-2550 Engineering Analysis Using MATLAB
3 Credits

Provide basic programming concepts and apply computational methodologies to solve engineering problems by emphasizing MATLAB interactive environment software. Particularly focused on matrix/vector computation, built-in MATLAB functions, numerical analysis, scientific and engineering graphics, m-files (source code), and introduction to visualization tools. Designed for people who may not have any previous MATLAB, computer or programming experience.
Lecture: 2 hours. Laboratory: 2 hours
Prerequisite(s): MATH-1610 Calculus I, and highly recommend concurrent enrollment in MATH-1620 Calculus II.

MET-2601 3D Solid Modeling
3 Credits

Covers 3D modeling, design of mechanical component and system using computer-aided design technique, solid and surface model for product development, designs optimization and documentation. Includes completion of a set of production drawings created in 3D modeling environments. Emphasis on the application of geometric dimensioning and tolerancing in mechanical design and 3D modeling for enhanced part description. Students work on individual design projects that simulate real-world applications. Prepares students for SolidWorks Certification.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MET-1230 Drawing & AutoCAD or MET-123B 2D AutoCAD for students in Smart Manufacturing program.

MET-2610 Statics
3 Credits

Course designed for students planning to transfer to a 4-year engineering program. Covers mechanics of forces and loads in static equilibrium. Includes fundamentals of particle statics in 2D and 3D. Emphasis on rigid bodies equivalent force systems, equilibrium of rigid bodies in 2D and 3D, centroids and centers of gravity, friction, and analysis of trusses, frames, and beams; Also covers moments of inertia and radii of gyration; and method of virtual work.
Lecture: 3 hours
Prerequisite(s): MATH-1610 Calculus I and PHYS-2310 General Physics I, or concurrent enrollment.
OAN Approved: Transfer Assurance Guide OES002.

MET-2620 Dynamics
3 Credits

Covers mechanics of forces and torques and the effects on motion. Emphasis on kinematics of particles and rigid bodies, Newton's Laws of Motion, Work and Kinetic Energy, Kinetics of rigid bodies, and 3D dynamics of rigid bodies. Also includes vibration and time response.
Lecture: 3 hours
Prerequisite(s): MET-2610 Statics.
OAN Approved: Transfer Assurance Guide OES003.

MET-2630 Engineering Strength of Materials
3 Credits

Course designed for students planning to transfer to a 4-year engineering program. Focused on fundamental principles and methods of solid mechanics and their applications. Topics covered include normal, shear, torsional, and thermal stress-strain analysis; generalized Hook's law; bending moment and shear force diagrams; transformation of stress-strain and principle stresses; Mohr's circle for plane stress; state of stress in three-dimension; stress due to combined loading; deflection of beams; plane stress in thin-walled members; strain measurements; analysis of columns; and design principles based on mechanics of solids.
Lecture: 3 hours
Prerequisite(s): MET-2610 Statics and PHYS-2310 General Physics I.

MET-2700 Machine Design
4 Credits

Capstone course in Mechanical Engineering Technology. Study of mechanical motion and design of machine elements. Includes displacement, velocity and acceleration in linkages, cams and power transmission devices. Design of machine elements include checking of assembled machines, fasteners, weldments, springs, bearings, belts, chains, shafts, clutches and brakes. Laboratory consists of using CAD, computer programming and manufacturer`s catalogs, and professional journals to aid in design. Proper completion of the project depends on the team as a whole.
Lecture: 3 hours. Laboratory: 2 hours
Prerequisite(s): MET-1621 Technical Dynamics or MET-2620 Dynamics; and MET-2041 CAD II & GD&T, or concurrent enrollment; and MET-2200 Strength of Materials or MET-2630 Engineering Strength of Materials.

MET-2730 Lean Manufacturing
3 Credits

Application of Lean manufacturing concepts and Lean tools in structuring industrial manufacturing processes in efforts to minimize manufacturing costs, enhance workplace safety, improve work flow, eliminate process variations, and to shorten products delivery time.
Lecture: 2 hours. Laboratory: 2 hours
Prerequisite(s): MET-1230 Drawing & AutoCAD, and MET-1120 Computer Applications and Programming, and MATH-1530 College Algebra or higher; or departmental approval.

MET-2740 Quality Manufacturing
3 Credits

Practical application of quality principles to process improvement and reduction of variation. Application of statistical techniques and concepts used in quality control; acceptance sampling; quality cost; reliability; applications of computers, software to other quality control tools to quality improvement.
Lecture: 3 hours
Prerequisite(s): MET-2400 Statistical Quality Control; and MATH-1530 College Algebra, or departmental approval: work experience.

MET-2750 Technical Operations Management
3 Credits

Introduction to the design and management of manufacturing operations. Emphasis is focused on identifying appropriate management processes and potential management models used to efficiently manage industrial resources. Various techniques and methodologies for solving industrial operations management problems will be explored including statistical models, linear programming, and Microsoft Excel.
Lecture: 2 hours. Laboratory: 2 hours
Prerequisite(s): MET-2430 Engineering Probability and Statistics or MET-2400 Statistical Quality Control.

MET-2815 Special Topics: Digital Fabrication II
3 Credits

This course provides knowledge and skill requisite for utilizing modern sophisticated digital equipment to fabricate engineering parts.
Lecture: 2 hours. Laboratory: 2 hours
Prerequisite(s): MET 1815 Digital Fabrication I

MET-2830 Cooperative Field Experience
1-3 Credits

Limited to students eligible for the Cooperative Education Program. Employment in an approved training facility under College supervision. Requirement for one credit is 180 hours of approved work. Students may earn up to three credits in one semester. May be repeated for an accrued maximum of nine credits.
Other Required Hours: 180 clock hours of approved work per credit hour
Prerequisite(s): Formal application into the Cooperative Education Program.

MET-2941 Additive Manufacturing Internship
1-4 Credits

Explore career interest in additive manufacturing careers while applying knowledge and skills learned in the classroom in a work environment. Internship experience will provide practical, hands-on job training in additive manufacturing providing students with an opportunity to gain experience and build professional networks. May be repeated for up to 4 credits total. Requirement for each credit hour is 180 hours of approved work.
Other Required Hours: 12 hours per week of internship/field experience per credit (total of 180 hours per credit hour).
Prerequisite(s): MET 1250 Introduction to Additive Manufacturing, and MET 1230 Drawing & AutoCAD, and MET 2601 3D Solid Modeling, or concurrent enrollment; and MET 2151 3D Digital Design & Printing, or concurrent enrollment; or departmental approval.

MET-2990 Product Development and Manufacture
3 Credits

Capstone Course. This course provides the opportunity of applying learned concepts and principles of mechanical products development, design, manufacture, and management, to accomplish production of parts, employing traditional subtractive manufacturing principles and or modern manufacturing principles, including additive manufacturing. Products development principles taught includes strategies for product development, product launches, supply chain and post launch product management.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MET-1410 Computer Aided Manufacturing (required prerequisite for students pursuing Associates Degree in Manufacturing Industrial Technology) or MET-2151 3D Digital Design & Printing (required prerequisite for students pursing Certificate in 3D Design and Manufacturing); or departmental approval.

MET-3100 Applied Smart Manufacturing Processes
3 Credits

Explore smart manufacturing systems and the implementation of their enabling technologies in fundamental manufacturing processes. Covers smart technology implementations in various areas, including industrial combustion control, forging operations, industrial vacuum systems, and surface finishing operations. Field Trips to relevant manufacturing enterprises are required.
Lecture: 2 hours. Laboratory: 3 hours
Prerequisite(s): MET-2450 Robotics and Automation in Smart Manufacturing.

MET-3830 Smart Manufacturing Internship I
1 Credit

Provides student with supervised, paid professional experience in a modern manufacturing setting with an approved employer. Student will apply knowledge and skills learned in the classroom through practical, hands-on job training in smart manufacturing. 180 hours of approved work is required.
Other Required Hours: 12 hours per week of internship (total of 180 hours).
Prerequisite(s): Department approval: Satisfactory completion of MET-2460 Applied Programmable Logic Controllers and Mechatronic Systems, and approval of internship position and location.

MET-3840 Smart Manufacturing Internship II
1 Credit

Introduces concepts of entrepreneurship and entrepreneurial thinking applied to Industry 4.0. Using a hands-on learning approach coupled with a paid internship, this course teaches key skills in entrepreneurship that students can utilize in launching startup technology businesses or executing new product development ventures. 180 hours of approved work is required.
Lecture: 1 hour
Prerequisite(s): Department approval: Satisfactory completion of MET-3830 and approval of internship position and location.

MET-4210 Smart Manufacturing ERP Systems
4 Credits

Examines how companies manage processes to produce the product or services to satisfy customer requirements. Includes overview of Enterprise Resource Planning (ERP) software systems and their role within an organization with technology integration in smart production. Also covers cross-enterprise integration of the physical and virtual systems among various functions including operation strategy, process design, capacity planning, facility location and design, forecasting, production scheduling, inventory control and supply chain management. Hands-on lab activities will guide students through various business processes in specific ERP software products.
Lecture: 2 hours. Laboratory: 4 hours
Prerequisite(s): MET-2450 Robotics and Automation in Smart Manufacturing.

MET-4990 Integrated Digital Manufacturing Project
3 Credits

Capstone course with project for IDM (Integrated Digital Manufacturing). Designed to allow students the opportunity to demonstrate and apply capabilities and skills acquired during their previous coursework. Students will choose an approved project compatible with their interest and background. The project includes electrical and mechanical systems, computer networking, Internet-of-Things (IoT), cybersecurity, manufacturing industrial software applications, data protocols, and data analytics. Project will include research, documentation, construction and testing, and conclude with a report and presentation of results.
Lecture: 1 hour. Laboratory: 6 hours
Prerequisite(s): MET-2450 Robotics and Automation in Smart Manufacturing and EET-3100 Manufacturing Network Devices and concurrent enrollment in EET-4100 Network Security for Manufacturing.