Mechanical Engineering Technology

Dr. Jeff Hung, Chair
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Mechanical Engineering Technology Department
631-420-2046
School of Engineering Technology

Bachelor of Science Degree

This is a four-year program offered by the Mechanical Engineering Technology Department. Students may matriculate on a full-time or part-time basis.

Students receive hands-on experience using industrial equipment in the department’s well-equipped computer, strength, design, materials, manufacturing, quality control, electromechanical control systems, and robotics laboratories. The department is particularly proud of its Institute for Research and Technology Transfer (IRTT), which contains automated commercial CNC Turning Center, CNC Milling Center, Coordinate Measuring Machine (CMM), Vision Controlled Pick and Place Robot, Laser Cutting Machine, Thermal Spray (HVOF) Machine, Rapid Prototyping Machine Hydrogen-Fuel Cell and Biomass Energy Research. Advanced design and manufacturing computer programs such as Finite Element Analysis (FEA) and Computer Aided Manufacturing (CAM) are run on the latest PC’s. Up-to-date courses in Electronic Packaging Applications, Robotics, Electromechanical Control Systems and HVAC System Design complement traditional courses such as Statics, Dynamics, Strength of Materials, Material Science, Machine & Product Design, Applied Fluid Mechanics, Applied Thermodynamics, and Applied Heat Transfer providing graduates with a well-balanced and needed background. Students also benefit from the close relationship between the College and local industry through a required senior project that provides the students with valuable integrating capstone experience. This program is accredited by the ETAC/ABET, www.abet.org

Graduates will be prepared for a wide range of opportunities in industry, including computer-aided analysis, design, and manufacturing; heating, ventilating and air conditioning system design; and materials and equipment performance testing.

Typical Employment Opportunities

Facility Designer
Mech. Equip. Designer
Process Designer
Junior Designer
HVAC System Designer
Technical Writer
Field Service Rep
Power Plant Supervision
Equipment Testing

Mechanical Engineering Technology (BS) Program Outcomes:

- Graduates will have the technical skills and will assume leadership positions in the design, installation, manufacturing, testing, evaluation, technical sales, or maintenance of mechanical systems.
• Graduates will have the technical background in the analysis, applied design, development, implementation, and oversight of advanced mechanical systems and processes.
• Graduates will exhibit an understanding of the necessity for personal integrity, ethical behavior, cultural awareness and lifelong learning.

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Fall 2018- Subject to Revision

Liberal Arts and Sciences (60 credits)

EGL 101 Composition I: College Writing (GE) 3
EGL 102 Composition II: Writing About Literature 3
Basic Communication (GE) 3
The Arts (GE) 3
Foreign Language (GE) 3
Social and Behavioral Science (GE) 3
American/Other World/Western Civilization History (GE) 3
Humanities (GE) 3
Natural Science* 8
PHY 135 College Physics I (GE) 4
PHY 136 College Physics II (GE) 4
Math Elective 6
MTH 129 Precalculus with Applications (GE) 4
MTH 130 Calculus with Applications 4
MTH 236 Calculus II with Applications 3
Liberal Arts and Sciences Elective 3

* For Natural Science Elective, at least one chemistry course.

Please refer to the General Education and Writing-Intensive Requirement Sections of the College catalog and consult with your advisor to ensure that graduation requirements are satisfied.

Support Courses (3 credits)
IND 405 HVAC Systems 3
Mechanical/Manufacturing Courses (63 credits)
MET 104 Computer Aided Drafting and Design (CADD) 3
MET 109 Computer Programming and Applications 2
MET 117 Manufacturing Processes 2
MET 127 Advanced Manufacturing Processes 2
MET 201 Statics 3
MET 205W Material Science 3
MET 206 Strength of Materials 3
MET 207 Tool Design 3
MET 212 Applied Fluid Mechanics 3
MET 230 Electrical Principles 3
MET 252 Quality Control (Metrology) 3
MET 300 Computer Aided Engineering (CAE) 3
MET 307 Electromechanical Control Systems 3
MET 308 Machine and Product Design 3
MET 314 Applied Thermodynamics 3
MET 351 Computer Aided Manufacturing (CAM) 3
MET 405 Dynamics 3
MET 406 Electronic Packaging Applications 3
MET 410W Senior Project-Writing Intensive 3
MET 411 Applied Heat Transfer 3
MET 415 Robotics 3
Technical Elective* 3

* Technical Electives must be selected from AET, MET, or IND courses in consultation with department chair.

Total Credits: **126**

Degree Type: BS
Total Required Credits: 126

## Course Descriptions

**EGL 101 Composition I: College Writing (GE)**
This is the first part of a required sequence in college essay writing. Students learn to view writing as a process that involves generating ideas, formulating and developing a thesis, structuring paragraphs and essays, as well as revising and editing drafts. The focus is on the development of critical and analytical thinking. Students also learn the correct and ethical use of print and electronic sources. At least one research paper is required. A grade of C or higher is a graduation requirement.

Note: Students passing a departmental diagnostic exam given on the first day of class will remain in EGL 101; all others will be placed in EGL 097. Prerequisite is any of the following: successful completion of EGL 097; an SAT essay score (taken
prior to March 1, 2016) of 7 or higher; an SAT essay score (taken after March 1, 2016) of 5 or higher; on-campus placement testing. Credits: 3

EGL 102 Composition II: Writing About Literature
This is the second part of the required introductory English composition sequence. This course builds on writing skills developed in EGL 101, specifically the ability to write analytical and persuasive essays and to use research materials correctly and effectively. Students read selections from different literary genres (poetry, drama, and narrative fiction). Selections from the literature provide the basis for analytical and critical essays that explore the ways writers use works of the imagination to explore human experience. Grade of C or higher is a graduation requirement. Prerequisite(s): EGL 101 Credits: 3

PHY 135 College Physics I (GE)
An integrated theory/laboratory general college physics course without calculus. Topics will include fundamental concepts of units, vectors, equilibrium, velocity and acceleration in linear and rotational motion, force, energy, momentum, fluids at rest and in motion, and oscillatory motion. Laboratory problems, experiments and report writing associated with the topics studied in the theory are performed. Prerequisite(s): MTH 129 Corequisite(s): PHY 135L Credits: 4

PHY 136 College Physics II (GE)
A continuation of PHY 135. Topics will include heat, electricity, magnetism, light and optics. Prerequisite(s): PHY 135 Corequisite(s): PHY 136L Credits: 4

MTH 129 Precalculus with Applications (GE)
In this course, the topics introduced in College Algebra course will be extended. The course will provide a comprehensive study of functions, which are the basis of calculus and other higher-level mathematics courses. The students will study the properties, graphs, and some applications of polynomial, rational, inverse, exponential, logarithmic, and trigonometric functions. Note: Students completing this course may not receive credit for MTH 117. Prerequisite(s): MP3 or MTH 116 Credits: 4

MTH 130 Calculus with Applications
This is a calculus course for those not majoring in Mathematics, Engineering Science or Computer Science. Topics include the derivative, differentiation of algebraic, trigonometric, exponential and logarithmic functions, applications of the derivative and the definite integral. Applications are taken from technology, science, and business. Problem solving is stressed. A graphing calculator is required. Note: Students completing this course will not receive credit for MTH 150. Prerequisite(s): MP4 or MTH 117 or 129 Credits: 4

MTH 236 Calculus II with Applications
A continuation of Calculus I with Applications. Topics include techniques of integration, applications of the definite integral, multivariable calculus, and an introduction to Differential Equations. Applications are taken from technology, science and business. Problem solving is emphasized. A graphing calculator is required. Prerequisite(s): MTH 130 or MTH 150 Credits: 3

IND 405 HVAC Systems
This course covers design aspects of heating, ventilation and air conditioning systems, hydronic systems for commercial and residential applications. Design and selection of heating and cooling system components, boilers, air handling units, refrigeration systems, hydronic system components, terminal equipment, fans, pumps, compressed air properties and indoor air quality are also covered. Students are required to prepare term projects on heating and cooling load calculations for commercial and residential buildings. Prerequisite(s): MET 212, MET 230 and MET 314 Credits: 3

MET 104 Computer Aided Drafting and Design (CADD)
This course introduces computer aided drafting and design (CADD) in 2D drafting and 3D solid modeling. Students will learn traditional drafting techniques, such as orthographic projection, dimensioning, and tolerancing, and apply their drafting skill through 2D CAD software. Students will also learn 3D solid modeling based on parametric constraints, dimensions and features such as extrude, revolve, sweep, loft, hole, fillet and shell. In addition, the course teaches students how to create assemblies and 2D engineering drawings from the existing 3D solids. Laboratory exercises will be assigned to the students for hands-on experience with the related topics. This course is equivalent to the combination of GPH103, GPH104, and MET211. Corequisite(s): MET 104L Credits: 3

MET 109 Computer Programming and Applications
This is an introductory course in a computer programming language. Programs are specifically written to be used in the areas of statics, strength of materials, machine design, heat transfer, and fluid mechanics. Applications of the theoretical concepts are covered in the required laboratory. Corequisite(s): MET 109L Credits: 2

MET 117 Manufacturing Processes
The main purpose of this course is to introduce the mechanical engineering technology student to the principles and operation of mechanical equipment such as lathes, drill press, milling machines and measuring requirements and measuring instruments. Several manufacturing processes such as welding, powder metallurgy, sheet metal forming, extrusion, etc. are also covered. Individual laboratory projects will be assigned to each student to reinforce the topics covered in the theory. NOTE: Students completing this course may not receive credit for AET 218T. Corequisite(s): MET 117L Credits: 2

MET 127 Advanced Manufacturing Processes
This course is a continuation of MET 117. Topics emphasize the theory and operation of manual and numerically controlled milling machines and machining centers. Additional topics covered are the gear shaper, indexing head, point-to-point drilling and milling, and three axis measurement. Laboratory projects will be assigned to reinforce the topics covered in theory. Prerequisite(s): MET 117 Corequisite(s): MET 127L Credits: 2

MET 201 Statics
This is a basic course in statics. The main objective of this course is to provide students with a basic understanding of the principles of statics. Topics such as resultant of a force, equilibrium of forces, moments, couples, analysis of simple trusses, centroids, center of gravity, moments of inertia and friction are covered in this course. Applications of the theoretical concepts are covered in the required laboratory. Prerequisite(s): MTH 130 and PHY 135 Corequisite(s): MET 201L Credits: 3

MET 205W Material Science
This is a theory and laboratory course designed to give students a basic understanding of crystal structures, effects of cold work and annealing on metal structures and properties, phase diagrams, heat treatment of steel, corrosion of materials, failure analysis of ferrous and non-ferrous alloys, ceramics, plastics and composite materials. Laboratory experiments are associated with the topics covered in the theory. Students will write technical reports throughout the semester as well as final presentations to help them communicate effectively in specific writing related to their fields. This is a writing-intensive course. Prerequisite(s): EGL 101 with a grade of C or higher Corequisite(s): MET 205L Note: Students cannot get credit for MET 205 and 205W; MET 205W can be used to fulfill the writing intensive requirement, which is offered at the discretion of the Automotive & Mechanical Engineering Technology Department. Credits: 3

MET 206 Strength of Materials
This is a basic course in Strength of Materials. The main objective of this course is to introduce the concepts of stress, strain, torsion, bending and shear stresses. It also covers shear moment diagrams, deformations and modes of failure, Mohr's Circle; also included are topics in thermal and combined stresses. Laboratory demonstration of experiments and testing equipment are emphasized. Prerequisite(s): MET 201 or CON 106 Corequisite(s): MET 206L Credits: 3
MET 207 Tool Design
This course covers the fundamentals of tool design, with main focus on the principles of jigs and fixtures design. Topics covered include: General tool design, economics of tool design, materials used for tooling, work holding principles, jig design, fixture design, die design and operation, power presses, metal cutting, forming and drawing. Students will be using Computer Aided Design (CAD) software packages in designing different jigs and fixtures. Applications of the theoretical concepts and hands-on 3D CAD modeling are covered in the required laboratory. Prerequisite(s): MET104, MET127 Corequisite(s): MET 207L Credits: 3

MET 212 Applied Fluid Mechanics
The objective of this course is to represent the basic principles of fluid mechanics and the application of those principles to practical, applied problems. Primary emphasis is on the topics of fluid statics, flow of fluids in piping systems, flow measurement, and forces developed by fluids in motion. The course is directed to anyone in a technical field where the ability to apply the principles of fluid mechanics is desirable. Prerequisite(s): MTH 130, PHY 136 Credits: 3

MET 230 Electrical Principles
This hands-on and theory course introduces electrical principles to Mechanical and Manufacturing Engineering Technology and Facility Management Technology students. Emphasis will be on power systems that utilize alternating current. Course topics include resistive and R-L-C series and parallel circuits, instrumentation, single and three-phase circuits that contain motors, transformers, starters and low voltage controls, and an overview of electronic applications to mechanical systems. Electrical logic (ladder) diagrams will be stressed throughout the semester. Laboratory assignments will reinforce the topics covered by theory through relevant experiments performed by the student and will include the writing of laboratory reports. Prerequisite(s): MTH 130 and PHY 136 Corequisite(s): MET 230L Credits: 3

MET 252 Quality Control (Metrology)
This course covers different aspects of dimensional metrology principles, calibrations, and practices. Common measurement tools and methods used in the industry will be introduced. Topics covered include: Gage Blocks, Fixed Gages, Height Gages, Plug Gages, Dial Gages, Angle Measurements, Pneumatic Gages, Surface Metrology, Optical Metrology, Load Cells Calibration, Introduction to GD&T, and Gage R&R Analysis. Laboratory exercises covered include: Gage Blocks Stacking and Calibration, Dial Gages & Plug Gages in Inspection, Micrometer Calibration, Transducers & Load Cell Calibration, Surface Roughness measurements and analysis, Angle measurements using Sign Bar, Gear Inspection, Air Gage Inspection, Inspection of Flatness, Straightness, Perpendicularity. Prerequisite(s): MET 104, MET 127 Corequisite(s): MET 252L Credits: 3

MET 300 Computer Aided Engineering (CAE)
This course will introduce the technology students to the important subject of engineering design and finite element analysis. The course material builds on the students? previous experience in computer graphics and strength of materials and introduces them to the modern concepts of concurrent engineering and design for manufacturability. The students will learn how to import their graphic drawings from the Computer Aided Design (CAD) to the Computer Aided Engineering (CAE) software and apply the loads and appropriate boundary condition. The application of CAE in linear stress and deformation analysis of mechanical systems and fluid mechanics will be the essential part of this course. Computer simulations will be performed during the required laboratory section using the CAD and finite element simulation software. Prerequisite(s): MET 206 and MET 104 and MET 109 Corequisite(s): MET 300L Credits: 3

MET 307 Electromechanical Control Systems
This course covers the fundamentals and physical principles of electro-pneumatic and hydraulic control circuits. Pneumatic and hydraulic components such as directional control valves, flow control valves, and pressure control valves will be covered. The course also covers programmable logic controller (PLC) using Allen-Bradley MicroLogix controller. Students will be
designing and troubleshooting PLC controlled hydraulic and electro-pneumatic circuits in the laboratory. Automation Studio software will be used in designing and simulation of control circuits. Prerequisite: MET 230 Corequisite: MET 307L Credits: 3

MET 308 Machine and Product Design
This course introduces students to the fundamentals of machine component design. Subjects covered include safety factors, theories of failure, shaft design, roller bearings, gear design, spring design, pressure vessels, and fasteners. The laboratory section includes analysis of stresses (principal stresses and maximum shear stresses), applications of plane stress (combined loadings, pressure vessels, and beams), design of shafts and shaft components, and design of springs. Prerequisite(s): MET 206 Corequisite(s): MET 308L Credits: 3

MET 314 Applied Thermodynamics
This course lays the groundwork for the student’s future studies in the area of thermal design, encompassing the fields of power, heating, air conditioning and refrigeration. Topics covered include basics such as the first and second laws of thermodynamics, equations of state for gases and vapors, and psychometrics. Building on this foundation, thermodynamic processes and cycles will be introduced, including the Carnot, and Vapor Compression refrigeration cycles. Thermal equipment such as boilers, turbines, evaporators, condensers, compressors and heat exchangers will be analyzed. Prerequisite(s): PHY 136 and MTH 130 Credits: 3

MET 351 Computer Aided Manufacturing (CAM)
This course provides the student with experience in computer graphics NC programming techniques. Students will generate 2-D and 3-D parts on CAM software and analyze the tool paths required for various types of machining operations. Programs will be processed to produce EIA-NC code which will then be loaded into a CNC machine to manufacture a part. Students will also create 2-D and 3-D files on CAD software and learn how to export the CAD files to CAM software. Prerequisite(s): MET 127 Credits: 3

MET 405 Dynamics
This course covers rectilinear motion of particles (position, velocity, and acceleration), such as uniform rectilinear motion, uniformly accelerated rectilinear motion, and introduction to motion of several particles. In addition, an introduction to curvilinear motion of particles, as well as kinetics of particles: Newton’s second law of motion, principles of work and energy and applications, impulse and momentum theory, and applications of the above topics to engineering problems will be covered in this course. Prerequisite(s): MET 201 and MTH 236 Credits: 3

MET 406 Electronic Packaging Applications
This is a theory and laboratory course covering an introduction to electronic packaging application with the printed circuit board design of analog and digital schematics. Also included in the course is application of thermal, radio frequency, electromagnetic, shock and vibration effects. Laboratory will reinforce the topics covered in theory through projects using the College’s computer graphics equipment. Prerequisite(s): MET 207 Corequisite(s): MET 406L Credits: 3

MET 410W Senior Project-Writing Intensive
This is a capstone course required for Manufacturing and Mechanical Engineering Technology BS programs. This course is offered as an independent investigation of a technical problem by the student under the supervision of a faculty member. The selected project topic utilizes skills and knowledge acquired earlier in the Mechanical Engineering Technology or Manufacturing Engineering Technology programs to solve a wide range of engineering problems. At the completion of the project, an oral presentation and a written report are required. This is a writing-intensive course. Note: Students cannot get credit for MET410 and 410W; MET 410W can be used to fulfill the writing intensive requirement. Note: Offered at the discretion of the Automotive & Mechanical Engineering Technology Department. Prerequisite(s): Senior Status and Approval of Department Chair and EGL 101 with a grade of C or better. Credits: 3
MET 411 Applied Heat Transfer
This course will provide students with a basic understanding of problems of heat transfer. The fundamental laws of conduction, convection, and radiation are studied using analytical and graphical methods. Graphical and empirical solutions and applications to industrial problems will also be covered plus special topics in heat exchangers, heat pipes, and industrial furnaces. Prerequisite(s): MET 212, MTH 236 or MTH 151 Credits: 3

MET 415 Robotics
Students will be introduced to robotics from both a theoretical and practical aspect. Different types of robots and their applications in industry will be covered. Financial management and return on investment of the robotics applications will be discussed. Additional topics included are motion transmission and control of robot mechanisms, robot programming, the use of robots in an integrated manufacturing cell, and practical uses of the robot vision system. Hands-on experience on actual working robots and the application of the theory will be provided in the laboratory. Prerequisite: MET 307 Corequisite(s): MET 415L Credits: 3

Admission to Farmingdale State College - State University of New York is based on the qualifications of the applicant without regard to age, sex, marital or military status, race, color, creed, religion, national origin, disability or sexual orientation.