Mechanical Engineering Technology

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Mechanical Engineering Technology Department
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School of Engineering Technology

Bachelor of Science Degree

The Bachelor of Science degree program in Mechanical Engineering Technology is designed to provide students with a foundation of knowledge and hands-on experience that are required and utilized by the industry. The program offers 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 solid foundation of the field. The program also offers numerous technology-based and practical courses such as Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), Computer Aided Engineering (CAE), Computer Numeric Control (CNC) Machining, Quality Control, Electronic Packaging Applications, Electromechanical Control Systems, Robotics, and HVAC Systems providing students with a well-balanced and needed background in Mechanical Engineering Technology. These technology based courses are delivered through our state-of-the-art laboratories and the Institute for Research and Technology Transfer (IRTT). Students also benefit from the required senior project that provides the students with valuable integrating capstone experience.

This program is ideal for high school graduates and Mechanical Engineering Technology associate degree graduates who wish to enter careers in the design, installation, manufacturing, testing, technical sales, maintenance, HVAC, and other endeavors typically associated with mechanical components and systems.

This is a four-year program. Students may matriculate on a full-time or part-time basis. This program is accredited by the Engineering Technology Accreditation Commission of ABET, www.abet.org.

Typical Employment Opportunities

Mechanical Engineer
Product Design Engineer
Mechanical System Engineer
Process Design Engineer
HVAC System Engineer
Technical Writer
Field Service Engineer
Manufacturing Engineer
Project Engineer
Equipment Testing Engineer

Mechanical Engineering Technology (BS) Program Educational Objectives:
• Graduates will have the knowledge and skills to enter careers in the design, installation, manufacturing, testing, technical sales, maintenance, and other endeavors typically associated with mechanical components and systems.
• Graduates will have the ability to provide solutions and solve mechanical engineering technology related problems.
• Graduates will have the technical background to advance in their careers with an understanding and necessity for personal integrity, ethical behavior, cultural awareness, lifelong learning, and continuous improvement.

Student Learning Outcomes

• an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline;
• an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;
• an ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature;
• an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and
• an ability to function effectively as a member as well as a leader on technical teams.

ABET Data

Fall 2019 - 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 (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.

Support Courses  
IND 405 HVAC Systems 3  

(3 credits)  
Mechanical/Manufacturing Courses

MET 105L Technical Drawing and CAD 1  
MET 109 Computer Programming and Applications 2  
MET 117 Manufacturing Processes 2  
MET 127 Advanced Manufacturing Processes 2  
MET 150 Solid Modeling 2  
MET 201 Statics 3  
MET 205 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 302 Dynamics 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 400 Computer Aided Engineering 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, IND, MET courses or RAM 303 in consultation with department chair.
Total Credits: 126

Degree Type: BS
Total Required Credits: 126

Please refer to the General Education, Applied Learning, and Writing Intensive requirement sections of the College Catalog and consult with your advisor to ensure that graduation requirements are satisfied.

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.

**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

**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

**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

**MTH 129 Precalculus (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

**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
**MTH 136 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

**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): MTH 130 or MTH 150

**MET 105L Technical Drawing and CAD**
This is a laboratory course designed to provide students with hands-on experience in technical drawing and computer aided design (CAD). Students will apply traditional drafting techniques, such as ortho-graphic projection, dimensioning, and tolerancing, through 2D CAD software. Note: Students who have received credits for MET104 cannot receive credit for this course.

**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

**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

**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

**MET 150 Solid Modeling**
This course introduces advanced topics in computer graphics. Students will learn 3D solid modeling based on parametric constraints, dimensions, and features such as extrude, revolve, sweep, loft, hole, fillet, and shell. The course also teaches students how to create assemblies and 2D technical drawings from 3D models. In the required laboratory course MET 150L, exercises will be assigned to the students for hands-on experience with related topics. Note: Students who have received credits for MET104 cannot receive credit for this course. Prerequisite(s): MET 105L Corequisite(s): MET 150L

**MET 201 Statics**
This is a basic course in statics. The main objective of this course is to provide student 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

MET 205 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. Prerequisite(s): EGL 101 Minimum Grade: C Corequisite(s): MET 205L

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 normal and shear stress and the corresponding strains under normal, torsional and bending loadings. This course also covers shear and moment diagrams, deformations, modes of failure, and thermal and combined stresses. Laboratory demonstration of experiments and testing equipment are emphasized. Prerequisite(s): MET 201 or CON 106 with a grade of C or higher Corequisite(s): MET 206L

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

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

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
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

MET 302 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

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

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

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

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

MET 400 Computer Aided Engineering
Students in this course are required to apply their knowledge of many foundational courses such as MET15X Solid modeling, MET308 Machine and product design, MET302 Dynamics, MET212 Applied fluid mechanics, and other foundation courses in
computer aided engineering software programs. By having it at 300 level, students will not have the basic knowledge and will not fully understand the real world applications of their knowledge. Therefore, we want the students to have prerequisites of MET150 Solid modeling, MET212 Applied fluid mechanics, and MET308 Machine and product design. The change will better prepare students for this advanced level course. Prerequisite(s): MET 150, MET 212 and MET 308 Corequisite(s): MET 400L

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

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.

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

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

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.