

Mechanical Engineering Technology

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PROGRAMS:

Mechanical Engineering Technology/AAS
Industrial Design Technology/AAS

FACULTY:

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Associate in Applied Science in MECHANICAL ENGINEERING TECHNOLOGY

The Mechanical Engineering Technology program, accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET), provides the fundamental knowledge and skills necessary for success in a broad range of technical careers. A balanced curriculum provides a solid foundation in the scientific and mathematical principles on which mechanical design is based, as well as ample hands-on experience in our well-equipped laboratories. Since no design can succeed in today's competitive environment unless it can be manufactured economically, studies in machine design, advanced solids modeling, applied mechanics, production methods and CNC/rapid prototyping (CAD/CAM) are integrated into the program. To prepare students for the rapid pace of technological change in the workplace, the program seeks to develop the kinds of creative design and problem-solving capabilities, which never become obsolete.

Mechanical engineering technology graduates find employment in industrial product design, implementation and operation; aerospace; mass-transit or marine vehicle design and production; design and construction of power generating stations; or public utility system planning and operation. Graduates may be employed as mechanical designers, engineering aides, robotics applications and service technicians, plant layout and production planning assistants, metallurgical technicians and materials testing technicians or in other similar capacities. Employers of graduates of this program include Con Edison Company, Public Service Gas & Electric Company, Eastman Kodak, Research laboratories, CADD companies and NYC Department of Environmental Protection.

Graduates of the curriculum may proceed directly into a bachelor's degree program in engineering technology, such as the program offered by SUNY Farmingdale in manufacturing engineering technology and by City Tech's Computer Engineering

Technology department, formerly called electromechanical engineering technology.

Alternatively, graduates may wish to pursue a bachelor's degree in engineering or engineering science available at a number of senior colleges around the metropolitan area. Transfer credits granted will depend on the policies and requirements of the individual institution.

REQUIRED COURSES IN THE MAJOR		Credits
MECH 1101/MT 101	Manufacturing Processes Laboratory	1
MECH 1201/MT 201	Computer-Aided Manufacturing Systems	3
MECH 1222/MT 222	Computer-Aided Engineering Graphics	2
MECH 1233/MT 233	Statics and Strength of Materials	3
MECH 1240/MT 240	Computer Applications in Mechanical Engineering Technology	2
MECH 2322/MT 322	Engineering Materials	3
MECH 2333/MT 333	Strength of Materials II	3
MECH 2335/MT 335	Kinematics and Dynamics of Machines	3
MECH 2410/MT 410	Machine Design	4
	or	
MECH 2900/MT 900.1	Internship to Mechanical Engineering Technology	4
MECH 2426/MT 426	Materials Testing Laboratory	1
MECH 2430/MT 430	Thermodynamics	3
IND 1112/DD 112	Engineering Drawing I	2
IND 2304/DD 304	Advanced Solids Modeling	2
	Subtotal	32
OTHER REQUIRED COURSES		
ENG 1101/EG 101	English Composition I (core)	3
EET 1122/ET 1621	Networks I	4
MAT 1375/MA 375 ²	Mathematical Analysis (core)	4
MAT 1475/MA 475	Calculus I	4
PHYS 1433/SC 433 ²	Physics 1.2 (core)	4
PHYS 1434/SC 434	Physics 2.2	4
COMM ²	ENG 1121/EG 121 or ENG 1133/EG 133	3
LAP ²	Literature/Aesthetics/Philosophy	3
BS/SS ²	Behavioral Science/Social Science	3
	Subtotal	32
TOTAL CREDITS REQUIRED FOR THE DEGREE		64

¹ May require preparatory course work. Students without requisite mathematics preparation will be required to take up to 8 credits of additional math course-work. Students without prerequisites for EET 1122/ET 162 may need up to 8 additional credits.

² See page 34 for detailed explanation of core required courses and categories.

Associate in Applied Science in MECHANICAL ENGINEERING TECHNOLOGY

Curriculum by Semester

The College will grant an associate in applied science degree (AAS) with a major in mechanical engineering technology upon satisfactory completion of the required 64 credits listed.

FIRST SEMESTER		Credits
MECH 1101/MT 101	Manufacturing Processes Laboratory	1
IND 1112/DD 112	Engineering Drawing I	2
MAT 1375/MA 375	Mathematical Analysis (core)	4
ENG 1101/EG 101	English Composition I (core)	3
PHYS 1433/SC 433	Physics 1.2 (core)	4
Subtotal		14
SECOND SEMESTER		
MECH 1201/MT 201	Computer-Aided Manufacturing Systems	3
MECH 1222/MT 222	Computer-Aided Engineering Graphics	2
MECH 1233/MT 233	Statics and Strength of Materials	3
MECH 1240/MT 240	Computer Applications in Mechanical Engineering Technology	2
MAT 1475/MA 475	Calculus I	4
COMM	ENG 1121/EG 121 or ENG 1133/EG 133 (core)	3
Subtotal		17
THIRD SEMESTER		
IND 2304/DD 304	Advanced Solids Modeling	2
MECH 2322/MT 322	Engineering Materials	3
MECH 2333/MT 333	Strength of Materials II	3
MECH 2335/MT 335	Kinematics and Dynamics of machines	3
PHYS 1434/SC 434	Physics 2.2	4
Subtotal		15
FOURTH SEMESTER		
MECH 2410/MT 410	Machine Design or	4
MECH 2900/MT 900.1	Internship to Mechanical Engineering Technology	4
MECH 2426/MT 426	Materials Testing Laboratory	1
MECH 2430/MT 430	Thermodynamics	3
EET 1122/ET 162	Networks I	4
LAP ²	Literature/Aesthetics/Philosophy	3
BS/SS ²	Behavioral Science/Social Science	3
Subtotal		18
TOTAL CREDITS REQUIRED FOR THE DEGREE		64

¹ May require preparatory course work. Students without requisite mathematics preparation will be required to take up to 8 credits of additional math course-work. Students without prerequisites for EET 1122/ET 162 may need up to 8 additional credits.

² See page 34 for detailed explanation of core required courses and categories.

Associate in Applied Science in INDUSTRIAL DESIGN TECHNOLOGY

The Industrial Design Technology (IND) program is designed to provide students with a wide variety of valuable skills enabling them to utilize a number of 2D, 3D, and animation/simulation software packages in several diverse fields. Job titles for graduates of this program include Design manager, animation developer, industrial design systems manager, industrial product designer, project manager, CAD/CAM programmer, and mechanical designer.

The core of the program is a sequence of courses in CAD, beginning with the fundamental concepts of orthographic projection. Students begin to utilize CAD in the first and second semesters of a sequence with an emphasis on three-dimensional design. In the third semester, students learn industrial design processes and animation. They also learn to utilize CAD and other design software to produce technical illustrations, which can be integrated into conventional computer-based publications. In the final semester, students learn to utilize one or more additional CAD software packages appropriate to industrial product design and to transfer CAD data to computer-aided manufacturing (CAM) systems. They learn to apply engineering design methodologies to real-world engineering problems using computer simulation and animation.

Building on the fundamental concepts of mathematics and physics, the program also develops the student's creative problem-solving capabilities with courses in strength of materials and computer programming. In addition, a course in engineering materials gives the student a storehouse of practical knowledge about the behavior of materials. Finally, a course in industrial design processes provides students with an opportunity to utilize all of these capabilities to carry out original design projects, similar to those encountered in industry.

Employers of graduates of this program include CAD companies, IBM Corporation, Con Edison Company, Brooklyn Union Gas and the New York City Department of Environmental Protection.

While the primary purpose of this program is to prepare students for employment, graduates may transfer to a variety of four-year degree programs in technology, industrial design or other fields. Program graduates are eligible for the bachelor of technology in computer engineering technology (formerly called electromechanical engineering technology) offered at City Tech. Students considering transfer to other colleges are urged to consult with the program coordinator or other faculty members as soon as possible, in order to select courses which will provide the maximum possible number of potential transfer credits. In all cases, actual transfer of credit depends on the policies of the receiving institution.

REQUIRED COURSES IN THE MAJOR:		Credits
IND 1112/DD 112	Engineering Drawing I	2
IND 2313/DD 213	Industrial Design I	2
IND 2304/DD 304	Advanced Solids Modeling	2
IND 2305/DD 305	Industrial Management	2
IND 2340/DD 340	Engineering Structures	2
IND 2401/DD 401	Design for Product Manufacturing	2
IND 2406/DD 406	CAD Plant Layout	2
IND 2410/DD 410	Industrial Design II	3
IND 2420/DD 420	Engineering Animation and Presentation	2
MECH 1101/MT 101	Manufacturing Processes Laboratory	1
MECH 1201/MT 201	Computer-Aided Manufacturing Systems	3
MECH 1222/MT 222	Computer-Aided Engineering Graphics	2
MECH 1233/MT 233	Statics and Strength of Materials	3
MECH 1240/MT 240	Computer Applications in Mechanical Engineering Technology	2
MECH 2322/MT 322	Materials Science	3
Subtotal		33
OTHER REQUIRED COURSES		
ENG 1101/EG 101	English Composition I	3
MAT 1275/MA 275	Introduction to Mathematical Analysis	4
MAT 1375/MA 375	Math Analysis	4
PHYS 1433/SC 433	Physics 1.2	4
COMM ¹	Communications	3
LAP ¹	Literature/Aesthetics/Philosophy	3
BS/SS ¹	Behavioral Science/Social Science	6
Subtotal		27
TOTAL CREDITS REQUIRED FOR THE DEGREE		60

¹ See page 34 for detailed explanation of core required courses and categories.

COURSES:

**IND 1112/DD 112
Engineering Drawing I***
1 cl hr, 3 lab hrs, 2 cr
Introduction to CAD working environment, basic 2-D geometric construction and orthographic projections utilizing CAD systems.
Prerequisite: None
* Credit by examination, for those with appropriate experience, available for this course with department approval required

**IND 2313/DD 213
Industrial Design I**
2 cl hrs, 3 lab hrs, 2 cr (fall only)
This course introduces students to the field of industrial design. It provides a framework for the

development of design methodology. Students will use computers to create visual features of forms, configurations, patterns, and ornaments involved in the product design. Emphases will be placed on the multidisciplinary approach and the integration of design and engineering. Students are required to utilize the knowledge they learned to produce various design projects.
Prerequisites: MAT 1175/MA 175, IND 1112/DD 112

**IND 2304/DD 304
Advanced Solids Modeling**
1 cl hr, 3 lab hrs, 2 cr
Advanced modeling-applications of

design software in product design. Creation of 3-D surfaces and solids from primitive shapes. Mass and surface areas are computed. Products designed by the student are rendered and shaded using CAD software. Data file conversions are developed for CNC application.
Prerequisite: MECH 1222/MT 222

**IND 2305/DD 305
Industrial Management**
2 cl hrs, 2 cr (fall only)
Management of modern industrial establishments; costing, product development, research and design for manufacturing as components of the industrial enterprise as a whole. Introduction to computer-managed production systems.
Prerequisite: None

**IND 2340/DD 340
Engineering Structures**
1 cl hr, 2 lab hrs, 2 cr (fall only)
This course will introduce students to the engineering structures used in building, roadway and bridge constructions as well as those used in mechanical systems. First, students will be exposed to different types of structures and the corresponding loadings that they carry. Then, students will perform basic analysis on key structural components. Emphasis will be placed on the practical applications of the structures in each engineering field. Finally, students will produce design drawings using CAD software in major areas of engineering structures.
Prerequisites: MECH 1222/MT 222, MECH 1233/MT 233

**IND 2401/DD 401
Design For Product Manufacturing**
1 cl hr, 3 lab hrs, 2 cr (spring only)
A course on the methods and tooling required for modern product manufacturing. Computer-aided design of cutting tools, jigs, fixtures, dies and specialized tooling will be explored. Computer-aided manufacturing CAM/Computer-integrated manufacturing CIM will be introduced.
Prerequisites: MECH 1222/MT 222, MECH 1233/MT 233, MECH 2322/MT 322

**IND 2406/DD 406
CAD Plant Layout**
1 cl hr, 3 lab hrs, 2 cr (spring only)
Applications of CAD software in industrial plant design. Creation of 2-D floor layouts with consideration

given to production quantities, material flow, inventory control, personnel requirements, environmental conditions and restraints, heating and lighting, equipment specifications. Alternate equipment placement configurations are developed to meet changing production needs. The student utilizes CAD software to develop the concepts and completes the term project with a 2-D plant layout and a 3-D rendering of the required facility.
Prerequisites: MECH 1201/MT 201, MECH 1222/MT 222

**IND 2410/DD 410
Industrial Design II**
2 cl hrs, 2 lab hrs, 3 cr (spring only)
Continuation of IND 2313 Industrial Design I. This course adopts a hands-on approach to design problems. Students will use CAD/CAE programs to solve industrial design problems. Students will use rendering, shading, texture mapping and animation techniques to simulate effects of materials, finishes, and moving parts related to machine design, civil architectural structures, and product development. Students will be introduced to the advanced design features in solid modeling and will utilize the knowledge they learned from statics, strength of materials, material science, and structural designs in various design projects.
Prerequisites: IND 2313/DD 213, MECH 1233/MT 233, pre- or corequisite: IND 2304/DD 304 and MECH 1240/MT 240

**IND 2420/DD 420
Engineering Animation and Presentation**
1 cl hr, 2 lab hrs, 2 cr (fall only)
The goal of the course is to apply engineering design methodologies to real-world engineering problems using the computer as the central design tool, with emphasis on how to effectively test design concepts using computer simulation and animation. Student will learn techniques to present their design ideas through proper rendering of the 3D models. Students shall demonstrate the abilities to design and animate common motions used in mechanical systems as well as in architectural fly-around.
Prerequisites: MECH 1233/MT 233, IND 2304/DD 304

**MECH 1101/MT 101
Manufacturing Processes
Laboratory***4 lab hrs, 1 cr*

The lathe, horizontal and vertical milling machines, drill press and grinder (surface and pedestal). Basic operations performed on these different machine tools provide hands-on experience in basic manufacturing techniques and gives students a better understanding of the processes they may eventually be called upon to recommend, design or update.

*Prerequisite: None***MECH 1201/MT 201
Computer-Aided
Manufacturing Systems***2 cl hrs, 2 lab hrs, 3 cr*

A continuation of Industrial Processes with emphasis on semi-production and the function of the methods engineer. Medium run production equipment setup, economy, tolerance, fixtures, CNC programming using CAD/CAM and related planning are covered. Also covered are press work, time and motion, machinability, feeds, speeds, and job cost estimating. Students' end of term reports include completion of a finished product incorporating modern manufacturing methods.

*Prerequisite: IND 1112/IDD 112, MECH 1101/MT 101; pre- or corequisite: MAT 1275/IMA 275***MECH 1222/MT 222
Computer-Aided
Engineering Graphics***1 cl hrs, 3 lab hrs, 2 cr*

The application of the principles developed in IND 1112 to more complex detail and assembly drawings. Subject areas covered are: tolerancing for interchangeable manufacturing, design and layout of gears, gear trains, linkages and double auxiliary views. Laboratory work utilizes computer-aided drafting (CAD) systems.

*Prerequisite: IND 1112/IDD 112; pre- or corequisite: MAT 1275/IMA 275***MECH 1233/MT 233
Statics and Strength
of Materials***3 cl hrs, 1 lab hr, 3 cr*

The foundation for most of the courses in the mechanical engineering technology curriculum and the basis of machine and structural design. Included are the basics in problem solving, significant

figures, dimensional analysis and engineering graphs. In addition, the following are covered in depth: statics, stress and strain, properties of materials, joints, thin-walled pressure vessels, centroid and center of gravity, moment of inertia and beam analysis and design.

*Prerequisites: IND 1112/IDD 112, MAT 1275/IMA 275***MECH 1240/MT 240
Computer Applications in
Mechanical Engineering
Technology***1 cl hr, 3 lab hrs, 2 cr*

Computer applications in mechanical engineering technology that give the student a working knowledge in using the computer as a tool. The student develops programming skills in a modern high-level programming language and applies these skills in performing engineering and technical calculations, data entry and data retrieval. The computer is also applied as a design tool. The student is introduced to computer graphics and to using the computer as a machine controller.

*Prerequisites: IND 1112/IDD 112, MAT 1275/IMA 275***MECH 2322/MT 322
Engineering Materials***2 cl hrs, 2 lab hrs, 3 cr*

An introduction to physical metallurgy, and engineering materials. Structure of materials and their applications. Properties of materials, ferrous and non-ferrous metals, alloys, polymers, ceramics composites, adhesives and lubricants. Heat treatment, cold and hot working, phase diagrams and microstructure. Experiments are performed on hardness, plastic deformation, annealing, nondestructive testing, metallurgy and computer problem solving.

*Pre- or corequisite: PHYS 1433/SC 433 or equivalent***MECH 2333/MT 333
Strength of Materials II***3 cl hrs, 3 cr*

A continuation of MT 233 - Statics and Strength of Materials. Topics covered (with computer applications) are review of beam design, torsion, combined stresses, columns, working stresses, sharing and screw fasteners.

*Prerequisites: IND 1112/IDD 112, MECH 1233/MT 233; corequisite: MAT 1375/IMA 375***MECH 2335/MT 335
Kinematics and Dynamics
of Machines***2 cl hrs, 2 lab hrs, 3 cr*

Introduce students to the concepts of planar mechanisms such as linkages and cams. Students learn the basic knowledge of velocity, acceleration, and force analysis of mechanisms using analytical, experimental, and computer methods. They learn Newton's laws, work, energy, impulse, momentum, conservative force fields and impact. Rotation and plane motion of rigid bodies is introduced.

*Prerequisites: MECH 1222/MT 222, MECH 1233/MT 233, MECH 1240/MT 240; corequisite: MAT 1375/IMA 375***MECH 2410/MT 410
Machine Design***3 cl hrs, 2 lab hrs, 4 cr*

Application of basic principles of design and analysis of selected machine elements such as: brakes, clutches, springs, screws, shafts, bearings, cams, gears and gear trains. Students learn how to design simple and complex mechanical components and systems. The student should be able to synthesize a reasonable solution to a given design problem, analyze the proposed solution, judge its suitability, and produce engineering drawings. End of term project with computer-aided oral presentation.

*Prerequisites: MAT 1375/IMA 375, IND 2304/IDD 304; corequisites: MECH 2335/MT 335, MECH 2333/MT 333***MECH 2426/MT 426
Materials Testing Laboratory***2 lab hrs, 1 cr*

Physical properties of steel, cast iron, concrete, timber and non-ferrous materials are determined using standard tension, compression, shear, torsion, ductility, bending and hardness tests which are performed in accordance with ASTM standards. Utilization of strain gauges is introduced.

*Prerequisites: MECH 1233/MT 233, MECH 1240/MT 240; pre- or corequisites: MAT 1475/IMA 475, MECH 2333/MT 333***MECH 2430/MT 430
Thermodynamics***3 cl hrs, 3 cr*

Basic concepts of thermal energy conversion. Dual use of S.I. and English engineering units, gas laws, fluid processes, first and second laws

of thermodynamics, theoretical cycles, internal combustion engines, gas turbines and jet engines, refrigeration cycles and the heat pump. Heat transfer through radiation, conduction and convection. Computer problem solving.

*Prerequisites: MECH 1233/MT 233, MAT 1375/IMA 375, PHYS 1433/SC 433; corequisites: MAT 1475/IMA 475, PHYS 1434/SC 434***MECH 2900/MT 900.1
Internship in Mechanical
Engineering Technology***1 cl hr, 8 field hrs, 4 cr*

An alternative course to MT 410.

Assignment to field work/study situations of approximately nine hours per week at one of the following; a local manufacturer, an engineering research company, or an engineering laboratory. Each student keeps a log/journal to be shared in group seminars and also completes a term report. Supervision by faculty and job supervisors.

Prerequisites: MECH 1201/MT 201, MECH 1222/MT 222, MECH 1240/MT 240