

Millersville University
Department of Industry and Technology

COMPETENCIES
ASSOCIATE OF TECHNOLOGY IN INDUSTRIAL TECHNOLOGY

The Associate of Technology degree program provides broad-based liberal arts and technical preparation for technical careers in business and industry. Emphasis is on the development of transferable knowledge, skills and values that are needed for current and future success in employment. Overall competencies, competencies for the technological literacy core, and competencies for each of the six specialized technical options have been developed for the Industrial Technology A.T. degree and validated by the Industrial Technology Advisory Committee, which is comprised of representatives for each of the six technical options.

Overall Degree Competencies

Upon the completion of the Associate of Technology in Industrial Technology program, the student will be able to perform the following overall competencies:

- Demonstrate a broad-based general education, with particular strengths in oral and written technical communications, science and math.
- Display knowledge and skills related to the contemporary technological systems of production, communications and energy/power/transportation.
- Demonstrate knowledge and skills in entry-level technical careers.
- Exhibit competencies in applying and using technology within a selected technical specialization.
- Apply technological concepts and practices in solving problems related to industry, within both individual and cooperative team environments.
- Access, evaluate and manage technical information.

Technological Literacy Core Competencies

Upon the completion of the Industrial Technology program, the student will be able to perform the following technical competencies:

- Demonstrate a general understanding of technology – its structure, organization, systems, terminology, career opportunities and related professional organizations.
- Apply mathematics and science principles in production, communications, and energy/power/transportation systems.
- Describe typical applications and their impact on society of processes used in production, communications, and energy/power/transportation systems.
- Demonstrate knowledge of basic computer systems, including identity of typical microcomputer system components as well as potential applications, benefits and limitations.
- Communicate information electronically by encoding, transmitting, channeling, receiving and decoding processes.
- Design and produce effective two-dimensional and three-dimensional messages that use a variety of graphic reproduction processes.

- Describe major characteristics, including advantages and disadvantages, of various types of radiant and potential energy, and demonstrate methods of measuring, controlling and converting these forms of energy.
- Demonstrate knowledge of major characteristics of electrical, fluid and mechanical systems, and utilize selected devices to measure and control these forms of power.
- Describe, compare and contrast a variety of transportation systems.
- Perform safely common manufacturing techniques used to cast, form, separate, condition, assemble and finish a variety of production materials.

Technical Option Competencies

Computer-Aided Drafting and Design (CADD) Technology Option

The Computer-Aided Drafting and Design option is designed to provide students with theoretical and practical skill in drafting/design. This option provides survey experiences in drafting/design and advanced work in the areas of technical freehand drawing, design methodology, model building, residential architectural design and detailing, descriptive geometry, and technical illustration and rendering using computer-aided drafting systems. Technical electives allow students to choose advanced concentration or to explore areas of interest such as CNC or robotics. Students are also encouraged to seek an industrial internship position to gain practical experience with industrial production procedures. All courses feature practical laboratory experiences allowing students to work with equipment, materials, and processes that will lead to successful careers in the drafting/design field. Graduates of this option typically work as technicians in industrial design, CADD systems management, mechanical design, industrial sales and support, technical illustration, and residential design; they often work in technical and supervisory positions.

Upon the completion of the CADD option, the student will be able to

- Use a wide variety of drafting/design equipment and materials to solve problems in the drafting or design environment.
- Apply drafting standards to engineering or architecture.
- Use computer-aided drafting/design systems for producing 2D mechanical and architectural drawings, as well as for solids modeling and design applications.
- Demonstrate a high level of problem-solving ability in the practical application of theoretical principles.
- Apply theories of product design for developing and refining products for human use.
- Identify the technical specifications for computer-aided drafting/design systems and for selecting and configuring appropriate CADD workstations.
- Utilize presentation drawings and models in the development of products for both mechanical and architectural applications.

Construction Technology Option

The Construction Technology A.T. option provides students with both the theoretical knowledge and practical skills that are essential for careers in the construction technology. Courses included in this option provide experiences in computer-aided drafting and design (CAD/D), architectural design, blueprint reading, materials and processes, and construction methods. All courses in this option include practical laboratory experiences and problem solving activities with the tools, materials, equipment and software that are fundamental to understanding the principles of construction technology.

Upon completion of the Construction Technology A.T. option, students will be able to perform the following competencies:

- Demonstrate proficiency in reading and interpreting working drawings and blueprints
- Use computer-aided drafting/design systems for producing 2D mechanical, architectural drawings as well as design applications
- Analyze and evaluate construction materials to determine the advantages, benefits, and suitability for selected applications
- Demonstrate safe and appropriate use of tools, materials and processes employed in construction technologies
- Apply knowledge of construction methods to practical applications.

Electronics/Control Systems Option

The Electronics/Control Systems option is designed to provide students with both theoretical knowledge and practical skills in power, control and electronic systems that are essential for careers in today's manufacturing sector. Courses included in this option provide survey experiences in both power and electronics and require advanced study of either advanced electronics or control systems. Advanced electronics courses for the Electronics Specialization include analog electronics, instrumentation and control circuitry, and electronic communication systems. Advanced control courses for the Control Systems Specialization include fluid power, robotic systems, and designing industrial control systems. Technical electives included in this option permit student exposure to other related technical areas that are of special interest to students enrolled. All courses feature practical laboratory experiences that enable students to work with the components, tools, equipment and test instruments needed to design, test, maintain and troubleshoot modern electronic and control systems. Typical entry-level professions include electronics technicians, control/field technicians, and application engineers.

Upon the completion of the Electronics/Control Systems option, the student will be able to

- Use a variety of electronic test equipment such as analog and digital meters, oscilloscopes, frequency counters, power supplies, logic pulsers and probes in order to verify proper circuit operation or to troubleshoot and solve electrical and electronic problems.
- Demonstrate knowledge related to DC/AC, digital, power conversion and control, and microprocessor circuits.
- Design, create and integrate programmed solutions via PLC and PC for problems associated with process control.
- Utilize electromechanical and microprocessor-based systems in order to implement designed solutions associated with process control.
- Retrieve and assess electronics and control information from journals, periodicals, technical manuals, component substitution manuals, Internet, and other technical sources.
- Describe the impact of various electronic and control systems on society today.
- Demonstrate the systematic research and development process in learning and applying current contemporary electronics and control systems technologies.
- Demonstrate advanced technical knowledge in either electronics or control systems through the selection of a specialization within the option. Advanced electronics knowledge will include analog, instrumentation and communication circuits, while advanced control systems knowledge will include fluid power, robotics, and control system design.

Graphic Communications Technology Option

The Graphic Communications Technology option provides students with both theoretical knowledge and practical skills that are relevant for careers in the graphic communication industry. Courses in this option provide an overview of communication systems, graphic communication, principles of photography, contemporary printing technology, desktop publishing, digital imaging, color separation and reproduction, and design principles involved in producing various forms of graphic communication.

All courses feature practical laboratory experiences and problem solving activities with the tools, materials, and equipment that are fundamental to understanding the principles of graphic communication. Graduates of this option typically find employment in all technical phases of the industry, from pre-press through post-press operations, including design and layout, desktop publishing, planning and estimating, customer relations, production, sales, and quality control.

Upon completion of the Graphic Communications Technology option, the student will be able to

- Identify the major developments, characteristics, applications, and impacts of contemporary graphic communication technology.
- Design and communicate information using the communication systems model.
- Demonstrate technical skills related to graphic design, digital imaging, continuous tone photography, process photography, pre-press production, image transfer, and finishing operations.
- Demonstrate a working knowledge of the tools, materials, and processes related to the graphic communication industry.
- Demonstrate the ability to communicate ideas visually, orally, and in written form according to graphic communication standards.
- Apply mathematical and scientific principles to analyze and solve graphic communication problems.
- Develop relationships between computer applications and graphic production.

Manufacturing Technology Option

The Manufacturing Technology option is designed to provide students with both theoretical knowledge and practical skills that are essential for careers in today's manufacturing industries. Courses included in this option provide introductory and advanced experiences in computer-aided drafting and design (CADD) and polymer, ceramic, metal, wood and composite materials and processes for manufacturing. Computer numerical control (CNC) programming and machining of a variety of industrial materials is featured. Technical electives included in this option permit student exposure to materials testing, machine tool design, power conversion and control, and robotics. All courses include practical laboratory experiences that enable students to work with industrial materials, tools and equipment for product development. Graduates typically work in technical sales, industrial training and technical support services.

Upon the completion of the Manufacturing Technology option, the student will be able to

- Design products utilizing (CADD).
- Analyze, select and use industrial materials for production including polymers, ceramics, metals, woods and composites.
- Demonstrate proficiency in the manufacturing processes of casting, forming, separating, conditioning, assembling and finishing.
- Program and operate computer numerically controlled (CNC) machine tools utilized in manufacturing.
- Employ computer-aided design and computer-aided manufacturing (CAD/CAM) for the design, development and production of manufactured goods.
- Organize and control a manufacturing environment.
- Demonstrate behavioral patterns that include communication skills, safe and efficient individual and group work habits, leadership within groups, and an attitude of cooperation and tolerance.
- Describe the impact of various manufacturing systems on society today.

Mechanical Technology Option

The Mechanical Technology option is designed to provide students with practical skills that are essential for industrial careers with an emphasis in electromechanical and fluid systems as applied to production.

The Mechanical Technology option focuses on the design and production of tools, machines, and products. This option requires course work in industrial design, materials and processes and the control of electrical, fluid and mechanical power. Emphasis is also given to computer applications in the design of products and control of power circuitry. Providing hands-on laboratory experiences is a key component of this option. Mechanical Technology graduates are typically employed as technicians in mechanical, fluid power and electromechanical technologies, industrial design, product development, technical sales, and project coordination.

Upon completion of the Mechanical Technology option, the student will be able to

- Safely and efficiently utilize electrical, fluid and mechanical test equipment to analyze power circuitry.
- Demonstrate a working knowledge of hydraulic and pneumatic components and circuitry.
- Utilize electromechanical, pneumatic and microprocessor based systems in order to perform industrial process control functions.
- Visualize, create and edit engineering graphics and transfer this information to appropriate storage and retrieval media.
- Apply design and production skills in the techniques used to create geometric models.
- Demonstrate knowledge in the selection, testing and evaluation of materials for use in the manufacture of products.
- Demonstrate knowledge of the applications and limitations of major processes for forming, shaping and processing industrial materials.
- Program and operate computer numerically controlled (CNC) machine tools utilized in the manufacturing process.
- Design and produce tooling and products via CAD/CAM.

Nanofabrication Manufacturing Technology (NFMT) Option

The Nanofabrication Manufacturing Technology (NFMT) option for the AT degree provides students with both the theoretical knowledge and practical skills for careers in designing and fabricating materials and devices through machining at the atomic level. Nanofabrication technology cuts across many technological systems and industries, including microelectronic chip manufacturing, power semiconductors, micro-electromechanical devices, information storage, computer displays, optoelectronics, pharmaceuticals, sensors, and biomedicine. General education, the technological literacy core, and an introductory course in electricity and electronics are completed at MU. An 18-credit capstone semester of hands-on experiences in nanofabrication is then completed in the Nanofabrication Facility at Penn State's University Park campus. A graduate of this option is prepared as a technician who works on a team with an equipment operator, and an engineer or a technologist in micro- and nanotechnology high-tech manufacturing industries.

Upon the completion of the NFMT option, the student will be able to perform the following technical competencies:

- Demonstrate knowledge related to DC/AC circuits, electronic and magnetic fields, and active and passive electrical devices.
- Interpret safety and health issues, basic processes, materials modification, and quality assurance techniques for micro- and nanofabrication.
- Use a variety of tools for machining at the atomic level that deposit films, remove films, and lay out the film deposition and removal areas, including physical vapor and chemical vapor deposition equipment, plasma deposition and etching tools, and electron beam and optical lithography.
- Apply scientific and mathematical principles to analyze and solve nanofabrication manufacturing problems.
- Retrieve and assess nanotechnology information from journals, periodicals, technical manuals, component substitution manuals, Internet, and other technical sources.

- Describe the impact of microelectronics and nanotechnology on society.

Occupational Safety & Hygiene Option

The Occupational Safety and Hygiene option is designed to provide students with both basic theoretical knowledge and practical skills in occupational safety. The courses in this option allow students to have a broad experience in key issues. These courses provide an overview of legal aspects of safety; industrial fire prevention, protection and control; safety engineering; environmental and industrial hygiene; ergonomics; and general, organic and biochemistry. Courses in this option feature a variety of lecture and integrated laboratory-type activities. Graduates are typically employed as technicians who work under the direction of safety professionals on industry-based projects involving safety, environmental health, inspection of safety systems, technical sales, industrial training, technical support, and operations.

Upon completion of the Occupational Safety and Hygiene option, the student will be able to

- Identify major legal issues and developments regarding occupational safety and environmental health.
- Identify systems, procedures and practices involved with industrial fire prevention, protection and control.
- Demonstrate the ability to understand safety engineering principles.
- Apply knowledge related to general, organic and biochemistry in relation to health issues in an industrial situation.
- Describe procedures, practices and systems used in relationship to environmental and industrial hygiene.
- Identify human factors and ergonomic design principles.

8/2005