Academic Catalog

2026 - 2027

Thaddeus Stevens
College of Technology

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Thaddeus Stevens College of Technology (TSCT) Overview

Thaddeus Stevens College of Technology ("College") is a two-year technical college and has operated at its original site, 750 East King Street, Lancaster, Pennsylvania, since 1905. It was initially established as a trade school for indigent orphans.

Today, the College serves around 1,500 students across five locations and offers 24 two-year degrees and five certificate programs. Its mission and focus is on removing barriers for underserved or under resourced students. The College's exclusive Stevens Grant, which 44 percent of its students qualify for, assists with tuition, housing, food, books, and tools.

Thaddeus Stevens College of Technology is Pennsylvania's sole state-owned technical college and is governed by a Board of Trustees consisting of nine members that are appointed by the governor.

History of the College

The history of Thaddeus Stevens College of Technology began with one man's vision—a vision of a world where all children, regardless of race or socioeconomic status, would be provided an education that would help them earn a living and succeed in society. Thaddeus Stevens did not live to see his vision come true, but the school he willed into being with the money he left at his death has given thousands of young people exactly what he intended—a chance. The school began almost three decades after Thaddeus Stevens died—it took that long for the claims on his estate to be settled and for the money to be sufficient to build a school. Starting in 1905, the school grew and grew... and has never stopped growing. From its first graduating class of 24 young men in 1913 to this year's parade of several hundred graduates, the school dreamed up by its founder has changed and evolved during those years. It has had five different names and has gone from four programs to well over 20, and from 6 buildings to 20. During all those years and all that growth, the founder's vision, and the mission to carry that out has never changed. Today, Thaddeus Stevens College of Technology maintains a strong connection to its founder's values and to its original mission—giving young people a chance to succeed by providing an education.

Mission

Thaddeus Stevens College of Technology educates Pennsylvania's economically and socially disadvantaged as well as other qualified students for skilled employment in a diverse, ever-changing workforce and for full effective participation as citizens.

Vision

Thaddeus Stevens College of Technology will be a leading provider of post-secondary technical Education that transforms lives by graduating students equipped to meet the demands of a global, competitive society.

Overview of Programs

As part of our commitment to equipping students with the skills and knowledge needed in today's workforce, Thaddeus Stevens College of Technology offers a wide range of technical programs, along with a focused selection of academic programs that enhance and support our hands-on, career-oriented education. Each program aligns with our Institutional Learning Outcomes and supports our mission to provide high-quality education to all qualified students.

Accreditation and Approvals

Middle States Commission on Higher Education (MSCHE)

Accreditation is a means of maintaining accountability through self-regulation and peer review. The Middle States Commission on Higher Education (MSCHE) reviews institutions in their entirety rather than evaluating individual programs of study. Accreditation means that certain standards of quality and excellence have been met by an institution in areas including, but not limited to, the faculty and academic programs, fiscal planning and processes, and the assessment of students' total educational experience. Simply put the accreditation process provides assurance that an institution is worthy of the public's trust in production an educational experience that leads to its stated goals as post-secondary education provider.

Effectively meeting the MSCHE's standards for accreditation safeguards the College's Ability to participate in Title IV Federal Student Aid, which allows our students to access loans and grants issued by the federal government. Further, MSCHE accreditation is a contributing factor in how employers' view credentials earned from an institution, which serves as an endorsement of the quality of education and training students receive in our programs of study.

Since 1991, Thaddeus Stevens College of Technology has been an accredited institution and a member of the Middle States Commission on Higher Education (MSCHE) www.msche.org.

Following a rigorous two-year review completed in 2026, the College met six of seven accreditation standards, with a warning issued for Standard VI: Planning, Resources, and Institutional Improvement. Thaddeus Stevens College of Technology's accreditation status is Non-Compliance Warning related to Standard VI. The Commission's most recent action on the institution's accreditation status on June 25, 2026, was to warn the institution.

The College remains fully accredited. The warning reflects the need for additional documentation demonstrating financial planning, resource allocation, infrastructure support, and ongoing assessment practices. The College has already advanced significant system and operational improvements and will continue working closely with MSCHE to strengthen evidence, demonstrate maturity, and fulfill its mission to create opportunity and access while supporting strong, future-focused outcomes for students.

MSCHE is an institutional accrediting agency recognized by the U.S. Secretary of Education.

Pennsylvania Department of Education (PDE)

Since 1998, Thaddeus Stevens College of Technology has been approved by the Pennsylvania Department of Education to award the Associate of Applied Science Degree.

Programmatic Accreditation

Since 2026, Thaddeus Stevens College of Technology's Business Administration, AAS program is accredited by the Accreditation Council for Business Schools and Programs (ACBSP) based on standards that require our school to demonstrate teaching and program excellence.

Institutional Effectiveness

Thaddeus Stevens College of Technology strives for institutional effectiveness through systematic, ongoing assessment. All assessment is grounded in the mission and institutional learning outcomes.

Institutional Effectiveness Institutional effectiveness refers to an institution's ability to fulfill its mission and achieve its stated goals through coordinated planning, assessment, and continuous improvement. At Thaddeus Stevens College of Technology, institutional effectiveness is achieved through a systematic and ongoing assessment process grounded in the College's mission, strategic plan, and institutional learning outcomes. Assessment takes place at multiple levels—including courses, academic programs, administrative units, and the institution as a whole—and incorporates input from stakeholders across campus. Assessment results are used to inform decision-making and drive improvements in teaching, learning, and student services. These efforts are guided by the Comprehensive Assessment Plan (CAP), which aligns with the MSCHE Standards for Accreditation and supports accountability, sustainability, and continuous improvement.

Institutional Learning Outcomes (ILOs)

Mastery of Content: Graduates will exhibit career readiness by demonstrating the critical knowledge and skills required in professional and/or collegiate endeavors.

Effective Communication: Graduates will communicate effectively in verbal and written language, through technology.

Quantitative and Scientific Reasoning: Graduates will apply mathematical and scientific methods and concepts to solve problems and make informed decisions.

Critical Thinking: Graduates will apply prior knowledge to question current situations, pose alternatives, objectively resolve problems, and develop new processes.

Community Engagement: Graduates will develop the skills to work collaboratively and respectfully as members and leaders of diverse teams and communities.

Technological Competency: Graduates will demonstrate technical knowledge and practical application.

Academic Catalog Overview

The Academic Catalog ("Catalog") serves as the College's official source for academic information, including degree and certificate requirements, course descriptions, academic policies, academic procedures, and graduation requirements.

This Catalog should be used in conjunction with the Student Handbook, which provides important information related to student services, campus resources, student expectations, safety procedures, student life, and College policies. Students are responsible for understanding and complying with the information contained in both publications.

Students are encouraged to review this Catalog regularly and refer to it throughout the academic year, as academic policies, procedures, and program information may be updated as needed.

Advanced Welding Fabrication Technology

What is Advanced Welding Fabrication Technology?

Advanced Welding Fabrication Technology provides the student with a working knowledge of the various tools, equipment, and modern techniques used in the metals fabrication, mechanical installation, and welding industries. The proper application of various layout, fabrication, and assembly techniques for specific designs in sheet metal, plate, structural metals and pipe will be stressed. Students will design, estimate, fabricate, and install projects relative to air handling systems and structural and miscellaneous fabricated systems. Proper and safe work habits must be developed due to the nature of the equipment necessary to be successful in the industry.

The understanding and mastery of layout techniques is an essential component for success in the metals fabrication and welding fields. Therefore, disciplines in the basic, parallel line, radial line, and triangulation methods of layout are covered. Also, instruction in blueprint reading relative to the manufacturing and construction industries will be required. Included are components in the drafting, orthographic projection, and symbol interpretation. Gas metal arc, shielded metal arc, gas tungsten arc, oxy-acetylene, and flux core arc welding will be studied and practiced to allow students to obtain skills for a total understanding of fabricated projects from design through the final assembly processes.

Graduates of Advanced Welding Fabrication Technology program are prepared to work in businesses and industries that design, build, and install products that have been fabricated from sheet, plate, and structural metals. Areas of employment include the following:

- HVAC sheet metal duct systems fabrication & installation Precision sheet metal layout and fabrication
- Welding
- Industrial maintenance/millwright
  - Plate layout/fitter for industrial fabrication
  - Mechanical systems estimator/project manager
  - Fabrication machinery operator
  - Equipment manufacturing and installation
  - Structural steel and miscellaneous iron fabrication
  - Automated cutting systems operation programming
  - Sales - industrial equipment or contractor
  - Shop/installation foreperson
  - Fabrication of sanitary stainless-steel products
  - Food and pharmaceutical processing applications
  - Industrial ventilation fabrication and installation

A Graduate of this Program will be able to:

- Perform technical work in welding, structural steel, sheet metal, and plate fabrication, adhering to OSHA and safety standards.
- Mathematical and Scientific Application: Apply geometry, trigonometry, and physics concepts to develop, layout, fit, and weld various metal structures and systems.
- Use hand and power tools correctly and interpret blueprints using orthographic projection practices.
- Project Management and Ethical Business Practices: Maintain accurate project records, estimate costs, and understand ethical business practices in the metals fabrication industry.
- Communication and Leadership: Demonstrate effective oral and written communication skills to foster good business relationships and leadership.
- Quality and Industry Standards: Choose appropriate materials and procedures, understand industry quality standards, and be prepared for the challenges and responsibilities in the metals fabrication industry.

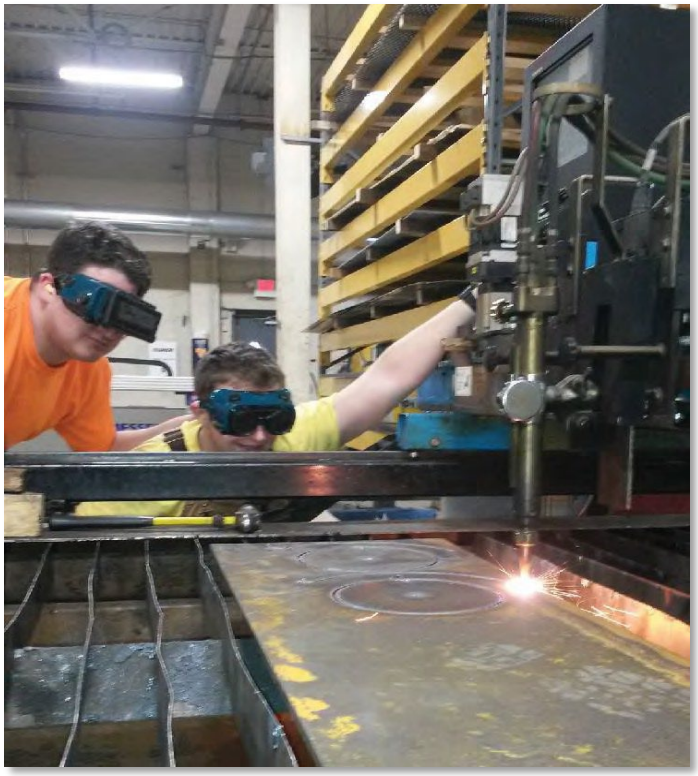
Joseph Battle, Instructor
BS: Southern New Hampshire University
AAS: Thaddeus Stevens College of Technology

Joshua Miller, Instructor
Voc 1 Certification – Penn State University
OCA Certification

Jim Stewart, Ed.D, Instructor
Ed.D.: American College of Education
BS: Franklin University
AAS: Harrisburg Area Community College

Christopher Unruh, Assistant Professor
BS: Franklin University
AAS: Thaddeus Stevens College of Technology

The Metals Fabrication and Welding Technology (MFWT) program has undergone a name change to Advanced Welding Fabrication Technology (AWFT), effective Fall 2025.



Model Schedule for
Advanced Welding and Fabrication Technology

Semester 1	
AWFT 106: Gas Metal Arc Welding/Plasma Arc Cutting	**3**
AWFT 111: Metals Fab I: Intro to Hand & Machine Processes	**3**
AWFT 121: HVAC Duct Design and Fabrication*	**3**
AWFT 126: Drafting Fundamentals	**3**
MATH 137: Intermediate Algebra (or higher)†	**3**
CIS 105: Drawing with AutoCAD* (must take before AWFT 222)	**3**
Semester 2	
AWFT 154: Flux Corded Arc Welding/ Oxy-Acetylene Cutting and Welding*	**4**
AWFT 162: Metals Fabrication II: Parallel Line Development Machine Processes*	**4**
AWFT 167: Industrial Applications I/ Fabrication Blueprint Reading*	**2**
AWFT 171: Materials of the Trade and Applied Metallurgy	**2**
MATH 132: Elementary Geometry (or higher)* *See Physics Elective for Math Requirement*	**3**
CIS 111: Intro to Computer Applications OR FIN 102 Personal Finance	**3**
Semester 3	
AWFT 207: Shielded Metal Arc Welding*	**4**
AWFT 212: Metals Fabrication III*: Triangulation Pattern Machine Processes	**4**
AWFT 222: Industrial Applications II: CNC Applications and Estimating*	**4**
Physics Elective: PHYS 101, PHYS 106, PHYS 207, OR PHYS 213* *(must take MATH 141 for PHYS 207 or PHYS 213)*	
ENG 106: English Composition	**3**
Semester 4	
AWFT 257: Gas Tungsten Arc Welding*	**4**
AWFT 262: Metals Fabrication IV: Radial Design Development & Machine Processes*	**4**
AWFT 267: Industrial Applications III: Print Reading for Welding*	**4**
ENG 216: Technical Writing*	**3**
Humanities Elective	**3**
Additional General Education Requirements	
Health and Physical Education Elective	**1**
TOTAL CREDITS	**73**

** Prerequisite or Co-requisite Required. See Course Description.*

†Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 132, must take an additional Gen-Ed elective in order to meet their Gen-Ed requirements.

Advanced Welding Fabrication Technology (AWFT)

AWFT 106 (3 credits) Gas Metal Arc Welding/Plasma Arc Cutting

Provides a thorough technical understanding of welding safety, gas metal arc welding fundamentals, gas metal arc equipment adjustments, metal transfer, and shielding gases. Provides training to develop the manual skill necessary to make high-quality gas metal arc welds in all positions on mild steel from 1/16" to 3/8" thickness with single and multiple passes, using short circuit transfer, spray transfer, and pulsed spray transfer. Includes learning how to safely operate and program a collaborative robotic welder.

AWFT 111 (3 credits) Metals Fabrication I: Introduction to Hand and Machine Processes

Introduction to tools, materials, and equipment required to fabricate basic sheet metal projects. Students develop an understanding of seaming, hemming, and fastening techniques. Safety standards according to OSHA are covered.

AWFT 121 (3 credits) HVAC Duct Design and Fabrication

Introduction to designing and fabricating duct systems relative to low-pressure HVAC systems. Machinery, seaming, connecting, and basic layout techniques will be covered. The course includes the interpretation of applicable SMACNA codes for duct construction.

AWFT 126 (3 credits) Drafting Fundamentals

Introduction to drafting and sketching techniques. Major topics include geometric construction, drafting equipment, and Orthographic projections. Mechanical drawing required.

AWFT 154 (4 credits) Flux Corded Arc Welding/ Oxy-Acetylene Cutting and Welding

Offers a technical understanding of Flux-cored arc welding and oxy-acetylene welding, flame cutting, brazing fundamentals, and welding safety. Training for manual skills necessary to produce high-quality welds on mild steel in all positions. Manual and mechanized flame cutting and brazing mild steel are also included.

AWFT 162 (4 credits) Metals Fabrication II: Parallel Line Development and Machine Processes

Introduction to the parallel line method of pattern development for fabricating round elbows, tees, and offsets using sheet metal, pipe, and plate materials is covered.
Prerequisite: AWFT 111

AWFT 167 (2 credits) Industrial Applications I / Fabrication Blueprint Reading

Discusses the equipment used in the various fabrication and welding trades, such as sheet and plate products plus structures, tubing, pipe, and the various alloys of steel, aluminum and stainless steel. The application of metals for industrial, commercial, and manufacturing design will be included.

AWFT 171 (2 credits) Materials of the Trade and Applied Metallurgy

Covers the common materials, designations, and methods of measurement used in the various fabrication and welding trades. Sheet and plate products plus structures, tubing, pipe, and the various alloys of steel, aluminum, and stainless steel are discussed.

AWFT 207 (4 credits) Shielded Metal Arc Welding

Provides students with a thorough technical understanding of shielded metal arc welding fundamentals, welding safety, welding machines, and electrode classifications and selections. It also provides training to develop the manual skill necessary to produce high quality shielded metal arc welds in all positions on mild steel from 16 gage to 1" plate with single and multiple passes. The welding process using mild steel electrodes with low hydrogen and iron powder flux coatings while using AC and DC power sources is covered.
Prerequisite: AWFT 154

AWFT 212 (4 credits) Metals Fabrication III: Triangulation Pattern

Developmental and advanced machine processes designed to introduce students to the triangulation method of pattern development. Using this discipline of pattern development, students design, lay out, and fabricate transitions, Y-branches and other irregular fittings related to sheet metal, piping, and miscellaneous plate fabrication according to job specifications. Students also learn advanced machinery set-up techniques relative to the fabrication of components designed using this layout process. Instruction in the use of precision measuring tools, iron workers, press brakes, and saws are also major topics covered.

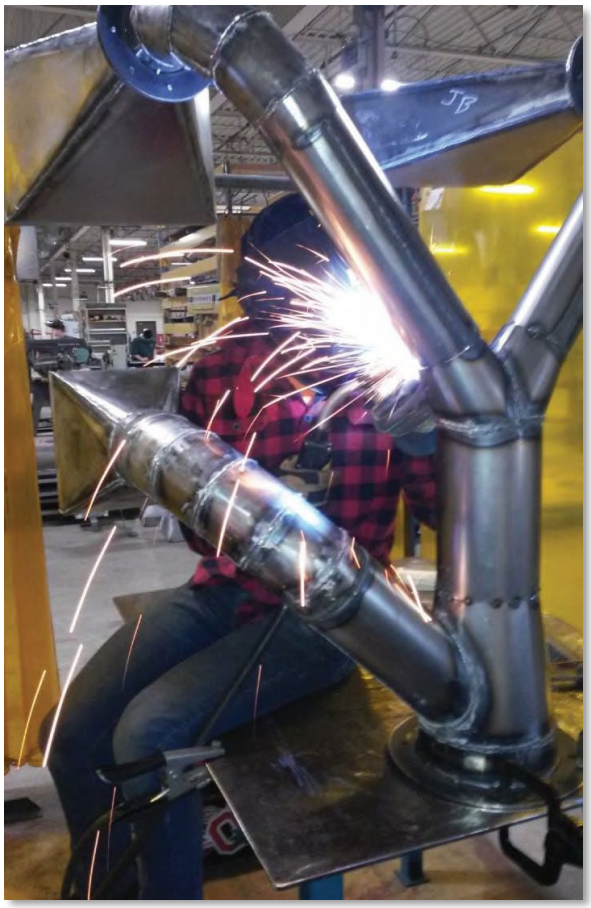
Prerequisites: AWFT 162

AWFT 222 (4 credits) Industrial Applications II: CNC Applications and Estimating

The major objective of this course is to introduce students to aspects of programming and utilizing computer-controlled plasma and oxy-fuel cutting systems. Students use AutoCAD® and MTC ProNest software packages to produce duct, weldment, and miscellaneous profile parts from blueprints, sketches, and field measurements. Programmed parts are then nested and cut on given sheet or plate sizes using state-of-the-art computer numerical control (CNC) systems or plasma cutting system. Layout techniques previously learned for profile programming jobs are utilized. Other topics covered in this course are project management and estimating.
Prerequisites: AWFT 162 and CIS 105

AWFT 257 (4 credits) Gas Tungsten Arc Welding

Provides students with a thorough understanding of gas tungsten arc welding fundamentals, arc characteristics, and welding safety. It provides training to develop the manual skill necessary to make high quality gas tungsten arc welds in all positions on 16- and 11-gage mild steel, 16- and 11-gage aluminum, also 16-gage stainless steel using both alternating and direct current. In addition, material is presented on the weld characteristics of carbon steel, stainless steel, and aluminum. The use of abrasives and other clean-up techniques to produce quality USDA and FDA finishes is covered. Instruction on the use of purging is also given.
Prerequisite: AWFT 106



AWFT 262 (4 credits) Metals Fabrication IV: Radial Design Development and Machine Processes

This course is designed to instruct students in the use of the radial line method of pattern development. Students lay out and fabricate various sheet metal and plate fittings such as cones, reducers, and take-off branches using this technique. Fittings are then welded using processes previously learned. *Prerequisite: AWFT 111*

AWFT 267 (4 credits) Industrial Applications III: Print Reading for Welding/ Field Equipment and Rigging

Selected on- and off-campus projects are utilized to reinforce previous instruction. Opportunity to study and to evaluate projects to learn various aspects of industry. Applicable codes and standards are used to ensure proper design and applications of materials and processes are covered. Also included are the interpretation of welding blueprints and applications in field equipment and rigging.
Prerequisite: AWFT 167

Architectural Technology

What is Architectural Technology?

The profession of architecture touches everyone's life and is central to solving problems in the creation of a built environment. Architectural technicians are problem solvers who work with clients on the design of buildings. They also create plans and specifications that direct the construction of a building and coordinate the work of other professional consultants and engineers.

Managing information and responding to the many diverse requirements of governments, building conditions, and society is increasingly important in the construction industry. The architectural profession is rapidly integrating the technology of computers and automation to assist in the management of information and to free up time for creative work.

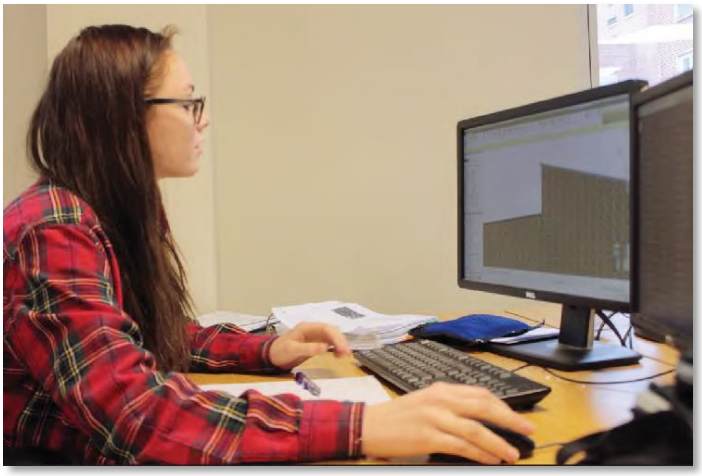
The instruction in Architectural Technology at Thaddeus Stevens College prepares students to become qualified for employment in the profession and to transfer into architectural programs at accredited colleges and universities. The instruction also provides retraining in technological applications for people currently employed in or reentering the profession.

A Graduate of this Program will be able to:

- Demonstrate technical proficiency in utilizing industry-standard software and tools for architectural design.
- Apply architectural design principles and methodologies efficiently to create innovative and functional solutions.
- Understand fundamental construction materials, methods, building systems, and structural principles applicable to architectural projects.
- Interpret and apply relevant building codes, zoning regulations, and accessibility standards within the architectural design processes.
- Develop communication skills through visual, written, and oral means, producing comprehensive architectural documentation and presentations suitable for various stakeholders.
- Collaborate effectively within multidisciplinary teams, demonstrating the ability to contribute constructively to project planning, design, and implementation.
- Apply problem-solving, critical-thinking, and mathematical reasoning to analyze architectural challenges, propose creative solutions, and make informed design decisions efficiently.
- Understand ethical responsibilities, professional standards, and the societal impact of architectural decisions.
- Demonstrate the ability to manage projects effectively, optimizing time allocation from conceptualization to execution, considering scheduling and regulatory constraints.
- Engage in lifelong learning, keeping pace with technological advancements, industry trends, and sustainable practices to enhance productivity within the field of architectural technology.

Jana Belack, Asst Professor
M. Arch: Boston Architectural College
BS: Boston Architectural College
AAS: Thaddeus Stevens College of Technology
Registered Architect, The Commonwealth of Massachusetts
Registered Architect, The Commonwealth of Pennsylvania
American Institute of Architects Member
NCARB Certified LEED AP BD+C

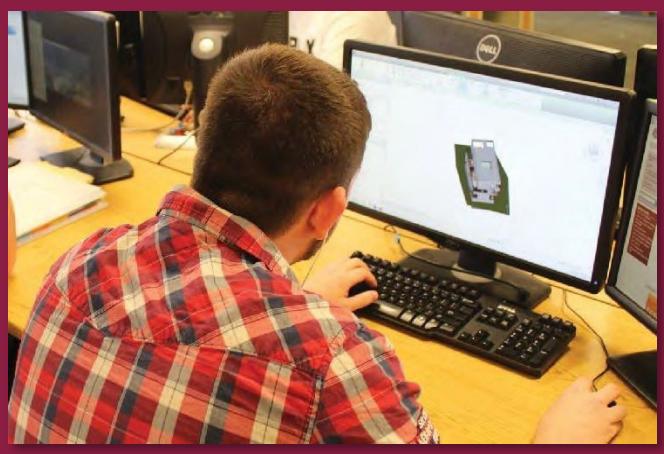
Tedd R. Williams, Associate Professor
BS: Eastern Mennonite University
AAS: Thaddeus Stevens College of Technology PA
L&I: Uniform Construction Code Certification
ICC: Accessibility Inspector/Plans Examiner
Autodesk: AutoCAD Certified Professional



Schedule for Architectural Technology

Semester 1	
ARCH 106: Fundamentals of Architectural Technology	**3**
ARCH 111: Material of Construction	**3**
ARCH 124: CAD in Architecture	**3**
ARCH 157: Construction Specifications	**3**
MATH 137: Intermediate Algebra (or higher) +^	**3**
CIS 111: Intro to Computer Applications	**3**
Semester 2	
ARCH 116: Residential Details	**3**
ARCH 162: Working Drawings	**3**
ARCH 167: Rendering and Illustrations	**3**
ARCH 172: Advanced CAD in Architecture*	**3**
MATH 141: Trigonometry (or higher) *	**3**
ENG 106: English Composition	**3**
Semester 3	
ARCH 207: Advanced Methods and Materials of Construction*	**3**
ARCH 212: Structural Systems	**3**
ARCH 216: Site and Microclimate Design	**3**
ARCH 262: Life Safety and Building Codes	**3**
PHYS 207: Statics and Strength of Materials*	**3**
ENG 216: Technical Writing*	**3**
Semester 4	
ARCH 257: Environmental Systems	**3**
ARCH 267: Architectural History and Theories of Design	**3**
ARCH 272: Individual Design Studio	**3**
ARCH 277: Group Design Studio	**3**
Humanities Elective	**3**
Additional General Education Requirements	
Health and Physical Education Elective	**1**
General Studies Elective	**3**
TOTAL CREDITS	**73**

** Prerequisite or Co-requisite Required. See Course Description.*
+Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 141, must take an additional Gen-Ed elective to meet their Gen-Ed requirements.
^ Minimum Grade Required. See Course Description.



Architectural Technology (ARCH)

ARCH 106 (3 credits)
Fundamentals of Architectural Technology
Serves as an introduction to architectural technology, which is the application and study of construction technologies, specific to the design of residential building structures.
Focuses on the effective and efficient communication of design concepts to all invested stakeholders. In-depth analysis, exploration, and development of individuals' thoughts, through means of graphic representation, to satisfy performance, production, and procurement criteria.

ARCH 111 (3 credits) Materials of Construction
Presents fundamental aspects of the design profession. Involves the application and technology of materials. An appreciation of the limits and the potential of materials is fundamental to well-executed designs. Investigation and analysis of actual materials and their application to give form and substance to creative ideas.

ARCH 116 (3 credits) Residential Details
Research of specific building elements necessary for construction. Application of knowledge and creativity in the development of details. Typical and standard details applicable to residential construction. Learning how to communicate with the construction crew. Involves sketch details and drafted details. Also requires drawings and exercises showing typical details and drafting skills.

ARCH 124 (3 credits) CAD in Architecture
Intensive introduction to Computer-Aided Drafting (CAD) including computer literacy, hardware, software, input, output, printing, introductory computer drafting skills, and completion of specific drawing exercises. Instruction is based on current industry standard software/applications. Use of CAD to draw architectural elements such as floor plans, building sections, exterior elevations, lighting, furniture, and other related elements.

ARCH 157 (3 credits) Construction Specifications
This course offers an in-depth exploration into the critical role of construction specifications in architectural technology. Students delve into the creation, interpretation, and implementation of detailed construction specifications pivotal in translating design concepts into tangible structures. Students examine the fundamental principles of construction specifications, encompassing materials, methods, and standards utilized in residential construction. Emphasis is placed on industry standards, regulatory compliance, and ethical considerations embedded within construction documentation.

ARCH 162 (3 credits) Working Drawings
Students design their own houses in this capstone course, creating a complete set of working drawings including site plans, floor plans, elevations, building sections, wall sections, details, and schedules. Students prepare preliminary presentation drawings; create a presentation model and a structural model; and prepare a full set of working drawings. CAD is used to prepare all drawings.

ARCH 167 (3 credits) Rendering and Illustration
Students learn how to use perspective, color, shadow, and computer-aided animation and rendering to illustrate architectural design. Work in this course builds on skills explored in previous courses.

ARCH 172 (3 credits) Advanced CAD in Architecture
An intensive follow-up to ARCH 122, this course uses Computer-Aided Drafting (CAD) for efficient production of architectural drawings. Completes the development of a solid foundation of CAD skills, designed to give students an appropriate entry-level skill set.
Pre-requisite ARCH 122

ARCH 207 (3 credits)
Advanced Methods and Materials of Construction
Detailed investigation of commercial construction systems with a more in-depth review of construction materials
than introduced in the first year. Materials considered in a systems approach, including floor, wall, roof, glazing, and finish systems. Selected criteria of cost, installation, long- term material performance, limitations, and whole-building integration are identified for individual materials.

ARCH 212 (3 credits) Structural Systems
Historical development of structures. Includes the loads and stability of structures. Identifies various stresses, including tension, compression, sheer, and bending. Looks at design requirements, characteristics, limitations, and rules of thumb utilizing wood, steel, and concrete systems; analyzes beams, columns, frames, trusses, and connection components and details in structural design.

ARCH 216 (3 credits) Site and Microclimate Design
Specifies site parameters and impact on building design from site investigation to finished project. Reviews initial design concerns, site vegetation, terrain, winds, waterways, solar access, and seasonal effects. Building design issues are landscaping, grading and drainage, site utilities, paving and roadways, and site amenities.

ARCH 257 (3 credits) Environmental Systems
Theory, history, design, and explanation of systems affecting building environmental quality. Includes review of plumbing, water, and sanitary systems; the options available in the selection of heating, ventilating, and air conditioning systems; and an energy overview (thermal control, heat load analysis, utilization of solar alternatives, and understanding of indoor air quality concerns). Electrical equipment requirements and loads, artificial and natural lighting and illumination criteria and fixtures are covered, as well as acoustical control construction practices and vertical transportation impact on building design.

ARCH 262 (3 credits) Life Safety and Building Codes
Philosophy and approaches to life safety, including fire protection systems and the impact of various types of construction on life safety. Traces evolution of building codes and analyzes the building code compliance of various hypothetical case studies. Covers means of egress and construction system assemblies. Reviews barrier-free design requirements and implication on project design.

ARCH 267 (3 credits) Architectural History and Theories of Design
Overview of architecture, from prehistoric to the 20th century and beyond, including Ancient, Middle Ages, Renaissance, Eastern, Colonial, and Modern. Stylistic characteristics of historical architecture reviewed and analyzed with specific concentration on American architecture. Includes history of urban design and the current changing face of the building environment, from city and suburb to farm.

ARCH 272 (3 credits) Individual Design Studio
Utilization of material learned throughout the previous three semesters. Students select commercial/institutional building type and design the entire building, from initial design concept to completion of construction documents. Students are responsible for building programming, square footage requirements, design concept, and integration of site, architectural, structural, mechanical, and electrical considerations. Finished project includes a written building program, construction drawings, outline specification, and presentation graphics.

ARCH 277 (3 credits) Group Design Studio
Project simulates a real-world approach to professional practice by involving the design of a hypothetical renovation and addition to an existing campus building. Small student teams are responsible for delegating all project tasks and monitoring project deadlines and completion dates. At the end, a group effort includes initial design concept, construction budget estimates, construction drawings, outline specifications, and presentation graphics.

ARCH 320 (3 credits) Understanding Greece: Art, Architecture History, Mythology
A twelve-day guided tour of architectural sites in Greece. The focus is on understanding the contribution of Greece to Western architecture. Studying architecture exposes students to the social, political, economic, and technological history of Greece. Introductory lectures prepare students before the course, which is offered at the end of the spring term.

ARCH 340 (3 credits) Understanding Italy's History through Its Art and Architecture
A ten-day guided tour of architectural sites in Italy. The focus is on understanding the contribution of Italy to Renaissance art and architecture. Studying art and architecture exposes students to the social, political, economic, and technological history of Italy. Introductory lectures prepare students before the course, which is offered during the spring break of the spring term.

ARCH 360 (3 credits) Understanding Spain's History through Its Art and Architecture
A ten-day guided tour of architectural and cultural sites of Spain. The focus is on understanding the contribution of Spain to world of art and architecture. Studying art and architecture exposes students to the social, political, religious, economic, and technological history of Spain. Introductory lectures prepare students before the course, which is offered during the spring break of the spring semester.

Automotive Technology

What is Automotive Technology?

Automotive Technology is designed to give students a basic understanding of automotive construction, theory of operation, and standard industry service and repair procedures. This instruction gives them not only the knowledge to perform vehicle service but to develop the skills necessary to diagnose unit malfunctions. Two of the most important skills that will be developed are problem solving and critical thinking.

A Graduate of this Program will be able to:

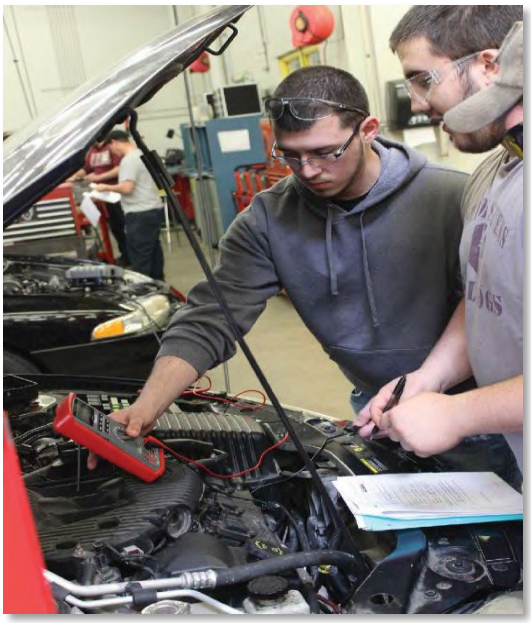
- Diagnose and repair common malfunctions of the following automotive systems: engine lubrication and cooling; brake, suspension, steering, wheels and tires, electrical (including wiring, batteries, starting, charging, and ignition), fuel, onboard electronics/computers, and engine assemblies; and power train components including manual and automatic transmissions and transaxles.
- Develop the knowledge and skills to operate the latest generation of computerized test and diagnostic equipment, including digital storage lab scopes, onboard scan tools, and a chassis dynamometer, as well as develop skills in the safe operation of a chassis dynamometer.
- Develop good basic shop habits, including demonstrating a good attendance record, punctuality, a willingness to work, and an ability to work with others as a team.
- Develop sound, basic, and safe automotive shop practice skills, including environmental protection.
- Apply basic laws of physics/scientific principles to automotive systems and components when performing in-shop testing exercises and diagnosing problems. This includes exam questions containing diagnostic questions.
- Record diagnostic testing data and reports using necessary mathematics; solve basic problems using elementary algebra.
- Locate and interpret technical data represented in shop repair manuals, diagnostic charts, and wiring diagrams. This data will be in hard print and/or various electronic media sources.
- Demonstrate good automotive shop management practices, including student management, customer relations, shop procedures, and writing repair orders.
- Prepare to take and pass the ASE automotive tests series after successful completion of this program and having at least one additional year of on-the-job experience in the particular area or areas that will be tested.
- Prepare to accept the challenge of continuous training in the automotive field, that is, learning to learn, which will be necessary to adapt to new technologies and to become a problem solver and a critical thinker.
- Obtain the Pennsylvania Auto Safety Inspection Certificate and the Pennsylvania Emissions tester certificate.

Martin Christian, Associate Professor
AAS: Thaddeus Stevens College of Technology
PA Vocational Certificate in Automotive Technology: Penn State University
Certificate of State Inspection Instructor
PA Certificate of Emission Inspection Instructor
PA Certified Emission Repair Technician
ASE Certified Master Technician, A1-A8
ASE Certified Advanced Engine Performance Specialist L1
ASE Certified Master Engine Machinist
ASE Certified Heavy Truck Technician T2 and T6
ASE Certified Under Car Specialist
GM Certified Technician

Allen Fry, Instructor
Certificate in Automotive Technology: Penn State University
PA certificate of state inspection
ASE certified A4R Suspension and Steering
ASE certified A5R Brakes
ASE certified A6R Electrical/Electronic System G1R
Automotive Maintenance and Light Repair
GM Certified Technician

Jeffrey Gieniec, Instructor
BS: Eastern Mennonite University
AAS: Reading Area Community College
Ford Senior Master Technician
General Motors World Class Technician
PA Safety Inspector Class 1-4
PA Emissions Inspector
PA Emission Repair Technician
ASE G1, A1-A-8 and L1 Master Technician
ASE ETL Program Evaluator

Naaman Hedge, Instructor
AAS: Thaddeus Stevens College of Technology



Model Schedule for Automotive Technology

Semester 1	
AUTO 107: Automotive Service Fundamentals	2
AUTO 111: Internal Combustion Engine Service*	4
AUTO 117: Chassis Service/Steering & Suspension	3
MATH 126: Technical Math I (or higher)	3
CIS 111: Intro to Computer Applications	3
Semester 2	
AUTO 157: Automotive Brake Systems	3
AUTO 161: Automotive Electrical/Electronic Principles	4
AUTO 166: Engine Electrical/Electronic Principles*	4
PHYS 106: Physics for Everyday Life (or higher)	3
ENG 106: English Composition	3
Semester 3	
AUTO 206: Advanced Engine Diagnosis*	3
AUTO 211: Advanced Chassis Service*	3
AUTO 216: Independent Diagnosis and Repair	3
AUTO 223: Pennsylvania Safety Inspection/Enhanced Emissions Inspection Certification	3
ENG 221: Public Speaking OR ENG 216: Technical Writing*	3
Humanities Elective	3
Semester 4	
AUTO 256: Heating and Air Conditioning	2
AUTO 261: Drive Train and Manual Transaxle Service	3
AUTO 271: Automatic Transaxle Service	4
AUTO 277: Advanced Powertrain and Computer Controlled Systems	3
General Studies Elective	3
General Studies Elective	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**76**

**** Prerequisite or Co-requisite Required. See Course Description.***
Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 141, must take an additional Gen-Ed elective to meet their Gen-Ed requirements.

Automotive Technology (AUTO)

AUTO 107 (4 credits) Automotive Service Fundamentals

This course presents an overview of the automotive industry, including an introduction to the automobile and its systems. Jobs in the automotive service field are covered, as are shop work and service information and how to find it. Online service manuals will be used. Safety in the auto shop, including the proper use of basic hand and common power tools is demonstrated. Environmental protection is taught, including recycling and the proper use and approved disposal methods of common automotive shop chemicals are discussed. Demonstrations and hands-on training in common automotive spot practices, such as tube flaring and thread construction and repair. Fasteners, including torque to yield are thoroughly covered. Measurement systems, USC and metric, are discussed, including hands-on training using all common automotive measurement tools like micrometers, dial indicators, and torque wrenches.

AUTO 111 (4 credits) Internal Combustion Engine Service

This course covers the basic theory, design, and operating fundamentals of spark ignition piston engines. Extensive mechanical testing and diagnostic procedures are demonstrated, including compression and vacuum testing utilizing wave form analysis with lab scopes. Power balance, including both intrusive and non-intrusive are demonstrated. Running and snap-throttle compression testing are featured. Methods to check valve timing on pushrod and overhead cam engines are demonstrated. Engine lubrication systems and automotive lubricants are studied; diagnostic and test procedures are performed. Engine cooling systems, theory, and standard service procedures are also included. Machining of engine components and restoring of all tolerances are covered. Cylinder head servicing is performed, and the three-angle cut method is used. Complete disassembly, all precession measurements, component servicing, resealing and reassembly on actual engines takes place.

Prerequisite: AUTO 107

AUTO 117 (4 credits) Chassis Service/Steering and Suspension

The basic theory and operating principles of automotive suspension and steering systems are studied; service, repair, and diagnostic procedures are featured. Tire and wheel service and computer balancing are performed by students. The safe and proper method of airbag module handling is taught. Wheel alignment principles are covered, including both the simple basic maintenance wheel alignment and the more complicated diagnostic wheel alignment. Complex alignment factors such as tire scrub radius, included angle and steering axis inclination, is covered in depth. Hands-on tire and wheel servicing, pre-alignment inspections, and wheel alignment measurements are taken on live vehicles.

AUTO 157 (4 credits) Automotive Brake Systems

Modern automotive brake systems and their operating principles are studied and standard repair and service procedures are performed. Drum, disc/drum, and four-wheel disk systems are featured. Power-assist system and parking brake systems are included. An introduction to the theory and servicing of antilock brake systems, including first generation Bosch type ad the newest non-integral systems, are covered. Trouble code retrieval and onboard diagnostics using scan tools are featured.

AUTO 161 (4 credits) Automotive Electrical/Electronic Principles

The theory of electricity—including Ohm's Law, Kirchhoff's Law, series and parallel circuits, AC and DC current flow— is studied. Basic test meter procedures are featured, and solid state devices, integrated circuits, and on-board microcomputers are explained. Automotive wiring and common automotive accessory systems are studied, and servicing and repair procedures are performed. Automotive batteries, their construction, theory of operation, and standard service procedures are also included.

Hands-on extensive electrical system service is performed using digital volt ohm meters and automotive lab scopes. The PDI DVOM, the Fluke 98 Series II, Vetronix Master Tech, and the cutting- edge Vetronix MTS 5100/5200 lab/ignition scopes are all featured. Low resolution amp clamps from Fluke and Vetronix allows students to experience the latest diagnostics using the latest amp-ramping diagnostic procedures. New material has been incorporated into the electrical and fuel and emissions courses after the instructors attended drive ability training/ seminars hosted by such nationally recognized gurus as Jim Linder, Linder Technical Services, Indianapolis; Bill Fulton, Ohio; Jerry Truglia, New York; Dan Marrinucci, Motor Magazine; and Mac Vanden Brink, Michigan.

AUTO 166 (4 credits) Engine Electrical/Electronic Principles

Cranking circuits and starter motors, charging systems, alternators and voltage regulators, and ignition systems (DIS & EI, including C.O.P./coil on plug) are studied. Simulators are featured to help students better understand system operation. Construction, theory of operation, standard service procedures, and system malfunction diagnosis are covered using the latest test equipment; the new Vetronix MTS 5100/5200 lab scope/engine analyzers, and the Fluke 98 series II is featured. Hands-on comprehensive testing procedures are performed on live vehicles. One of the major goals of this course is for students to gain skills in problem solving through the use of on-car testing and diagnostic procedures. This course culminates with each student performing comprehensive tests on the engine mechanical condition, battery, cranking system, charging system, and the complete ignition system. This is followed by a report analyzing good/bad results.

Prerequisite: AUTO 111

AUTO 206 (3 credits) Advanced Engine Diagnosis

Covers the use of the Vetronix MTS 5100/5200 Engine Analyzer, Vacutec Leak Detector, and the Mustang Chassis Dynomometer. Theory-related instruction is given on 5-gas analysis and interpreting the results of the analyzer tests with special emphasis on how they relate to advanced diagnosis of ignition, carburetion, fuel injection, charging, cranking, and engine and emission control systems. Demonstrations on hookup and operation are followed by student practice on shop vehicles, and when possible, by repair of client vehicles.
Prerequisite: AUTO 166

AUTO 211 (3 credits) Advanced Chassis Service

The Hunter P611 four-wheel aligner featuring the DSP400 Series Sensors (cameras) and the DSP300 Series Sensors are used in this course. Theory-related instruction is given on alignment with special emphasis on 4-wheel alignment. Disc and drum brake machining along with applying non-directional finishes on the AMMCO brake lathe are covered. On-the-car rotor truing is covered featuring the Pro-Cut PFM-900 Smart Lathe. Demonstrations on hook-up and operation are followed by student practice on shop vehicles, and when possible, by repair of client vehicles.
Prerequisites: AUTO 117 and AUTO 157

AUTO 216 (3 credits) Independent Diagnosis and Repair

Opportunity to diagnose and make repairs on client vehicles in a simulated dealership atmosphere. Experience acting as shop forepersons, using and writing repair orders, ordering parts, and keeping track of hours on the job and using materials. All repairs relate to the courses taken.

AUTO 223 (3 credits) Pennsylvania Safety Inspection/Enhanced Emissions Inspection Certification

Pennsylvania Department of Transportation Vehicle Equipment and Inspection Regulation/Enhanced Emissions Inspector manuals are covered, as per state requirements. A demonstration of the proper procedure for performing a safety inspection on a vehicle is given. Students practice on shop vehicles. Each student is given the opportunity to take the Pennsylvania Safety Inspection written and performance tests along with the Enhanced Emissions written test and computer-based training/tactile test. The Commonwealth, upon satisfactory completion of these tests, will grant a license for each.

AUTO 256 (2 credits) Heating and Air Conditioning

Covers the theory of refrigeration and the operating principles of manual and automatic temperature control systems, with special emphasis on diagnosis, service, and repair. Refrigerant recovery, recycling, identification, and recharging techniques on R-12 and R-134a systems are covered in accordance with federal law. The Sun Air-Kare charging station, Everco EREC Recovery/Recycle station, and the Robinair Enivro Charge Combination are featured. Demonstrations given on hookup, operation, and servicing, followed by student practice on shop vehicles, training aids (clutch and seal replacement) and repair of client vehicles.

AUTO 261 (3 credits) Drive Train and Manual Transaxle Service

Basic operating principles of manual transaxles, differentials, clutches, and universal joints. C-V joints, drive axles, and drive shafts, along with diagnosis and basic service techniques. Demonstrations given on differential set-up, replacing universal and C-V joints, also clutch replacement and adjustment. Students practice disassembly, precision measurements, adjustments and assembly techniques on training aids and work on client vehicles when possible.

AUTO 266 (3 credits) Advanced Engine Computer Control Analysis

Sensor-related theory, testing procedures, and waveform analysis are studied. OBD-II theory and the related testing procedures are covered. How to use shop manuals to follow manufacturers' procedures for troubleshooting engine drivability problems on computer-controlled cars, along with lab scopes (Fluke 98 Series II), break out boxes, and the Master Tech 3100 hand-held scanner are used to recover trouble codes from the computer's memory and reading sensor stream data. Emphasis is placed on the diagnosis and the interpretation of the results. Students practice on shop vehicles and repair client vehicles when possible.

AUTO 271 (4 credits) Automatic Transaxle Service

Basic principles of automatic transmissions, including lock-up torque converters, diagnosis, and basic service techniques. Chrysler 40TE electronic transaxle theory is covered. Demonstrations given on pressure checks and shift points, using gauges and a chassis dynamometer. Students practice disassembly, precision measurements, testing, adjustments, and assembly techniques on training aids. Where possible, repair on client vehicles is included.

AUTO 276 (3 credits) Fuel Injection Systems

The basic operating principles of the Bosch mechanical fuel injection system along with Chrysler and G.M. throttle body and port systems are covered in this course. Special emphasis is placed on diagnosis and service techniques. The EMI-TECH fuel system analyzer is featured. Cleaning a fuel injection system on the vehicle is covered featuring the Bilstein EFI-800 fuel system service center. Students practice on shop vehicles and work on client vehicles when possible.
Prerequisite: AUTO 171

AUTO 277 (3 credits) Advanced Powertrain and Computer Controlled Systems

This course covers fuel injection and advanced fuel injection systems, advanced communication, safety, hybrid, and electric powertrains. Students will learn basic safety protocols and explore advanced networking, operation, diagnosis, and repair of current and newer technology vehicles. *Prerequisite: AUTO 206*

Business Administration

What is Business Administration?

All employers need highly skilled business personnel to keep their operations running smoothly and successfully. Dynamic careers in business are available in virtually every sector of the economy. Job openings are plentiful, working conditions are comfortable, and opportunities for advancement are within reach for those with a two-year degree.

The Business Administration program at Thaddeus Stevens College provides students with the marketable skills, academic background, and experience required to meet the needs of the workforce or transfer to a four-year university. The broad-based curriculum is designed to prepare recent high school graduates or those re-entering the workforce to reach their full potential in many varied business fields. Faculty are focused on training students to manage rapidly changing technology, to lead and motivate others, to prepare and analyze financial information, and to succeed in the global marketplace. Entry-level job titles for recent graduates include sales and service account manager, accounts payable and receivable clerk, administrative assistant, public relations coordinator, operations coordinator, small business owner, human resources assistant/specialist, and facility supervisor.

A Graduate of this Program will be able to:

- Demonstrate excellent communication skills, including the ability to speak and write clearly and effectively, especially for the business setting.
- Demonstrate an understanding of emerging online technologies and trends and their influence on the electronic commerce marketplace.
- Use critical thinking and mathematical skills to analyze and solve accounting and business math problems.
- Demonstrate advanced keyboarding skills as well as spreadsheet, database management, word processing, and presentation applications.
- Assess and influence behavior among peers, subordinates, and managers; work well as an individual, in groups, and on teams.
- Demonstrate an understanding of the marketer's tasks and knowledge in the principles of how those tasks can be accomplished.
- Investigate the basic practices and principles involved in the administration of a modern business, and evaluate various career paths that may be pursued.
- Predict managerial success by studying the primary theories, principles, and processes of management.
- Demonstrate an understanding of the judicial process and business law in areas such as leases, contracts, and employment law, and how they impact various forms of business organizations.
- Display a general knowledge of the social sciences and understand their effect on the workforce and society.

Danielle Fox, Associate Professor
BBA: Temple University
MBA: LaSalle University

Bronwyn Laughner, Ph.D, Instructor
BA: Lycoming College
MBA: Bloomsburg University of Pennsylvania
Ph.D: Robert Morris University (Pittsburgh)

Model Schedule for Business Administration

Semester 1	
BUAD 117: Introduction to Business	3
BUAD 157: Principles of Marketing	3
BUAD 160: Principles of Management	3
BUAD 166: Business Computer Applications I	3
MATH 137: Intermediate Algebra (or higher)	3
ENG 106: Composition	3
Semester 2	
BUAD 180: Intro to Corporate Finance	3
BUAD 190: Intro to Supply Chain Management	3
BUAD 257: Electronic Commerce	3
BUAD 266: Business Computer Applications II - Data Analytics*	3
MATH 150: Elements of Statistics	3
Science Elective	3
Semester 3	
BUAD 201: Accounting Principles I	4
BUAD 214: Introduction to Law and Business Law	4
BUAD 222: Organizational Behavior	4
BUAD 230: Introduction to Business Ethics	1
ECON 230: Microeconomics	3
General Studies Elective	3
Semester 4	
BUAD 251: Accounting Principles II*	4
BUAD 268: Human Resources Management	4
BUAD 271: Business Skills Lab	1
BUAD 277: Business Communications	4
ECON 240: Macroeconomics	3
ENG 221: Public Speaking	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**75**

*** Prerequisite or Co-requisite Required. See Course Description.**
Students may not take CIS 111 or 211 since this material is covered in BUAD 166 and 266
Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 141, must take an additional Gen-Ed elective in order to meet their Gen-Ed

Business Administration (BUAD)

BUAD 117 (3 credits) Introduction to Business
This course is designed to introduce students to the primary fields of business and to inform them of the various career paths that they may pursue. The basic principles, forms, and practices involved in the administration of a modern business are examined.

BUAD 157 (3 credits) Principles of Marketing
An interactive approach to guide students in becoming better business people. The skills and responsibilities of planning, producing, pricing, promoting, and distributing are presented as an art and a science through realistic marketing situations and case studies.

BUAD 160 (3 credits) Principles of Management
This course is designed to prepare BUAD students for management success by studying the primary theories, principles and processes of management. Students will gain valuable insight in issues such as leadership, planning and control, problem solving and creativity, organizational culture and change, ethics and social responsibility, and working in and managing groups.

BUAD 166 (3 credits) Business Computer Applications I
Microsoft Office programs (Excel®, Access®, PowerPoint®, and Outlook®) are studied in order for students to develop intermediate skills in spreadsheet, database, e-mail, and presentation applications.

BUAD 180 (3 credits) Introduction to Corporate Finance
This course will cover the fundamental principles of Corporate Finance and explore how companies raise funding, structure capital, and manage investments to maximize stakeholder returns. Students will learn about analyzing cash flows, investing in stocks and bonds, evaluating risk and return, and capital budgeting.

BUAD 190 (3 credits) Introduction to Supply Chain Management
Introduction to the principles of Supply Chain and Operations Management underlying business today. This course is designed to provide students with an understanding of product and process design, inventory management, logistic networks, demand planning, sales and operations planning, material planning, project management, and sustainability.

BUAD 201 (4 credits) Accounting Principles I
Introduction to the principles of accounting, the accounting cycle, the interpretation and recording of financial data, and the summarizing and reporting process. Emphasis is on the sole proprietor of a business. This course provides a foundation for further study in the accounting field.

BUAD 214 (4 credits) Introduction to Law and Business Law
Designed to give students an introduction to the sources of law, judicial process, and an overview of laws including criminal law, property law (including personal property, real estate, and landlord-tenant law), and wills, estates, and trusts. Also provides a basic understanding of contracts, sales and leases of goods, secured transactions, agency and employment law, and forms of business organizations.

BUAD 222 (4 credits) Organizational Behavior
This course is a study of workplace behaviors, structures, and processes. Self-analysis and reflection are practiced in small groups through case studies, surveys, and discussion. Motivational theories and leadership styles are surveyed; decision making and business designs and cultures are investigated.

BUAD 230 (1 credit) Introduction to Business Ethics
An introduction to ethics and the role it plays in business. Students will use case studies and real life situations to learn common ethical theories, the role of government, the role of technology, and how to stay ethical in today's market.

BUAD 251 (4 credits) Accounting Principles II

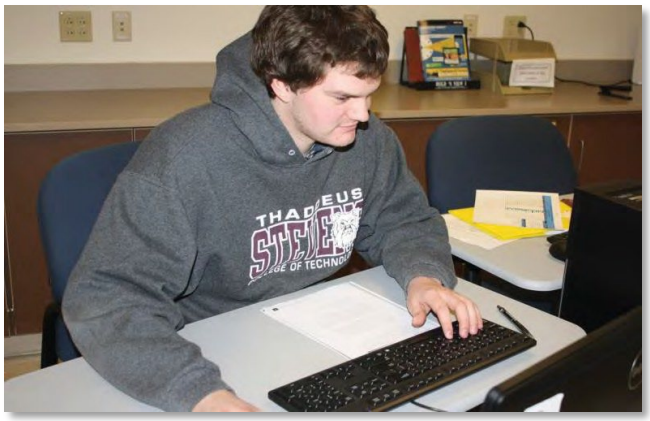
To provide a more complex understanding of the terminology, concepts, and procedures for classifying, recording, and reporting business transactions. Emphasis is placed on partnerships and corporations, financial statement analysis, and cash flows.
Prerequisite: BUAD 201

BUAD 257 (3 credits) Electronic Commerce

Overview of emerging online technologies and trends and their influences on the electronic commerce marketplace. Explores nature and impact of e-commerce on business operations, resources, and management. Upon completion of the course, students will have a firm grasp of global
e-commerce business trends and the technologies required to implement them.

BUAD 266 (3 credits) Business Computer Applications II – Data Analytics

Students will learn to examine data, ask the right questions, perform data analysis, and report the results to enhance business decision making. Students will learn data analytics and data visualization skills, along with a mastery of programs such as Microsoft Excel® and Power BI®, and Tableau©. Excel lessons will build on skills learned in BUAD 166 and prepare students to take the Microsoft certification at the intermediate level (MOS Excel©).
Prerequisite: BUAD 166



BUAD 268 (4 credits) Human Resources Management

This course prepares students to work in administrative and management positions and serves as a basis of further study in the field of human resources management. In accordance with suggested Society for Human Resource Management (SHRM) guidelines, both personal competencies and business policies are addressed in this course.

BUAD 271 (1 credit) Business Skills Lab

QuickBooks software training. Self-paced and guided learning to learn to use this popular accounting program

BUAD 277 (4 credits) Business Communications

Prepare students to communicate effectively, verbally and in writing, regardless of the medium selected. Write, revise, edit, and review all documents for a professional appearance. Compose various letter styles, memo's, emails, reports, IMs and social media for work. Write with style that is clear, concise, efficient, engaging, and reader/business oriented.

Cabinetmaking & Wood Technology

What is Cabinetmaking and Wood Technology?

Repeated surveys of the woodworking industry have revealed the number one concern facing the industry for the 21st century is the lack of skilled and motivated workers.
There is a continual need in the furniture, kitchen cabinet, and architectural millwork industries for persons possessing the skills and knowledge required to produce high quality wood products.

The Cabinetmaking and Wood Technology program is committed to continually providing students with the skills and knowledge required for rewarding jobs in the various woodworking industries. Based upon the belief that students learn best by working on projects, this program is strongly project-oriented.

Hence, students will produce several pieces of fine furniture after which they will further develop and display their skills by producing an advanced wood project of their choosing.
Through the use of the College's housing project, students will also learn to list and produce all the millwork items required for a residential house. Additionally, students will design, produce, finish, and install a complete kitchen. Through the use of lectures, demonstrations, and the above projects, the program faculty feel they can best prepare students for careers in any of the three major woodworking fields: fine furniture, architectural millwork, and kitchen cabinetry.

A Graduate of this Program will be able to:

- Identify nomenclature and the proper use of hand and portable power tools.
- Apply the knowledge of wood as a material in the proper construction of various fine furniture projects.
- Demonstrate safe practice in the use and setup of trade machinery.
- Demonstrate skill in the use of drafting equipment in order to produce shop drawings.
- Read shop blueprints to develop accurate material lists.
- Demonstrate knowledge of finishing materials along with the skills required for wood finishing including the following: wood preparation, wood coloring using various stains, and top coating using oil finishes, shellacs, varnishes, and lacquers.
- Demonstrate the ability to list and prepare millwork items required for various building projects.
- Demonstrate proficiency in grinding knives for the shaper and moulder and the setup of machines for production.
- Demonstrate the ability to produce jigs and fixtures required for production work.
- Demonstrate the skills and knowledge necessary for kitchen layout, design, construction, and installation.
- Develop the skills and knowledge required for producing various types of countertops.
- Develop a strong work ethic along with the ability to work independently and as a contributing member of a team.

Evan Germann
BFA: University of Kansas
AAS: Thaddeus Stevens College of Technology
Lancaster Chapter of the PA Guild of Craftsmen

Jeremiah Polynone, Instructor
BS: Millersville University
AAS: Thaddeus Stevens College of Technology
AWI Central PA Chapter Board Member
Furniture Society Member
Lancaster Designer Craftsmen
Lancaster Chapter of the PA Guild of Craftsmen

Model Schedule for
Cabinetmaking & Wood Technology

Semester 1	
CABM 106: Hand Tools and Portable Power Tools	4
CABM 111: Furniture Construction I	4
CABM 117: Finishing I	2
CABM 121: Related Drawing I	2
MATH 126: Technical Math I (or higher) †	3
CIS 111: Intro to Computer Applications	3
Semester 2	
CABM 151: Advanced Machinery*	3
CABM 156: Furniture Construction II*	4
CABM 162: Finishing II*	2
CABM 166: Job Management*	1
CABM 171: Related Drawing II*	2
CIS 105: Drawing with AutoCAD	3
MATH 132: Elementary Geometry (or higher)*	3
Semester 3	
CABM 206: Advanced Wood Project*	6
CABM 211: Machine Maintenance*	1
CABM 221: Architectural Millwork*	4
CABM 226: Custom Woodworking Cutters*	1
ENG 106: English Composition	3
Science Elective	3
Semester 4	
CABM 251: Shop Operations and Management*	1
CABM 261: Kitchen Cabinet Planning and Estimating*	3
CABM 263: Kitchen Cabinet Construction*	4
CABM 265: Cabinet Installation*	2
CABM 267: Countertop Fabrication*	2
Humanities Elective	3
Additional General Education Requirements	
Health and Physical Education Elective	1
General Studies Elective	3
TOTAL CREDITS	**73**

** Prerequisite or Co-requisite Required. See Course Description.*

Cabinetmaking and Wood Technology (CABM)

CABM 106 (4 credits) Hand Tools and Portable Power Tools
Students study the wide variety of hand tools, building a thorough foundation in hand tool usage, maintenance, and sharpening. They will learn the basics of hand joinery and develop an understanding for the capabilities and proper usage of portable power tools. This knowledge will be applied to various projects.

CABM 111 (4 credits) Furniture Construction I
This course provides a foundation for the construction of various types of cabinetry and furniture. The course includes an overview of wood characteristics and joinery methods, assembly, abrasives, adhesives, and veneering basics. Machinery maintenance, safety, and usage is stressed as well. Construction projects will aid in developing an understanding of the subject matter.

CABM 116 (2 credit) Finishing I
This class focuses on surface preparation and the proper use of finish materials. Various methods of application, including wiping, brushing, and spraying, is addressed. During this introductory course, students apply a wax, shellac, and lacquer finish on the projects completed in class.

CABM 121 (2 credits) Related Drawing I
An introduction to basic blueprint reading and drafting techniques applicable to the cabinetmaking profession.

CABM 151 (3 credits) Advanced Machinery
This course teaches the proper set-up and use of the hollow- chisel and slot mortiser, shaper, single-end tenoner, wide-belt sander, and panel saw. The course also provides an in-depth look at the various types of cutters and cutter-heads available for the shaper. Additional machines are added to fit project requirements and available time.
Prerequisite: CABM 106, CABM 111, and CABM 117

CABM 156 (4 credits) Furniture Construction II
Students take a more in-depth look at wood properties, joinery, and construction methods. An emphasis is placed on precision machining techniques and strategies for producing molding and other furniture and case components. Other topics include door and drawer construction and styles, hardware and its applications, and an introduction to furniture styles and types. The construction of various furniture projects help solidify the subject matter.
Prerequisite: CABM 106, CABM 111, and CABM 117

CABM 162 (2 credit) Finishing II
The finishing course involves the final preparation of wood surfaces and the selection and application of appropriate finishing materials. Topics include dyes and pigmented stains, a variety of sealers and top-coating materials, as well as spray finishing techniques.
Prerequisite: CABM 116

CABM 166 (1 credit) Job Management
This course provides an overview of estimating, cost analysis, and methods of job documentation. Students maintain daily time cards as well as job folders for their various furniture projects. Job folders contain drawings; route and cut sheets; time and cost analysis sheets; bill of materials; materials invoice; and a finishing schedule.
Prerequisite: CABM 111

CABM 171 (2 credits) Related Drawing II
A further study into basic blueprint reading and drafting techniques applicable to the cabinetmaking profession as introduced in CABM 121.
Prerequisite: CABM 121

CABM 206 (6 credits) Advanced Wood Project
From an existing plan of their choice, students construct and finish advanced pieces of furniture. This course emphasizes individual planning and problem solving. Students construct their own jigs and fixtures as well as machine set-ups. All projects require an existing set of plans and the approval of the instructor before starting. Students are responsible for supplying the necessary materials, hardware, and finishing supplies required for the project.
Prerequisites: CABM 111, CABM 151, CABM 156, and CABM 162

CABM 211 (1 credit) Machine Maintenance
To develop the skills necessary to grind jointer and planer knives, sharpen shaper cutters, and clean and lubricate a variety of common woodworking machines.
Prerequisite: CABM 151

CABM 221 (4 credits) Architectural Millwork
This course exposes students to the field of custom architectural millwork. Emphasis is placed on students developing an understanding of the Architectural Woodworking Quality Standards as developed by the Architectural Woodwork Institute. A large portion of the course is devoted to live work in which students produce the millwork items required for the housing project and other related campus work.
Prerequisites: CABM 111, CABM 151, and CABM 156

CABM 226 (1 credit) Custom Woodworking Cutters
Students learn how to design, draw, make a template, and grind two matching cutters for the shaper and the moulder.
Prerequisites: CABM 111, CABM 151, and CABM 156

CABM 251 (1 credit) Shop Operations and Management
This course stresses the fundamentals of ordering, purchasing, estimating, scheduling production, and general management techniques.
Prerequisite: CABM 151

CABM 261 (3 credits) Kitchen Cabinet Planning and Estimating
Students learn how to plan, draw, estimate the cost, and list the materials and supplies for the kitchen cabinets and vanities that are used in the housing project.
Prerequisites: CABM 121 and CABM 171

CABM 263 (4 credits) Kitchen Cabinet Construction
As follow-up to CABM 261, this course emphasizes the machining, construction, and finishing of the kitchen cabinets, vanities, and trim used in the housing project.
Prerequisites: CABM 111, CABM 151, CABM 156, and CABM 206

CABM 265 (2 credits) Cabinet Installation
This course involves site preparation and the installation of kitchen cabinets and bathroom vanities. Emphasis is placed on the installation manuals of the National Kitchen and Bath Association (NKBA).
Prerequisites: CABM 106 and CABM 263

CABM 267 (2 credits) Countertop Fabrication
This course involves the fabrication of high pressure plastic laminate and solid surface countertops. Exposure to other types of countertop materials is included.
Prerequisite: CABM 106

Carpentry Technology

What is Carpentry Technology?

The Carpentry Technology program provides carpentry students with a positive and professional experience. By using the most up-to-date equipment and the newest technology, program faculty always strive to run parallel with the present- day building industry. Students receive 2 years of excellent training that sufficiently prepares` them for the residential and light commercial construction workforce.

A Graduate of this Program will be able to:

- Write clear, concise, legible, and accurate technical reports and be skilled in oral communication related to the construction industry.
- Demonstrate the basic manipulative skills of the trade that are necessary in laying out work, planning, erecting, and framing.
- Interpret and prepare plans, drawings, codes and specifications, lines, symbols, and abbreviations on working drawings or blueprints.
- Analyze specifications and contract drawings as well as make accurate quantity take-offs and labor estimations to develop an estimated construction cost for a building project.
- Demonstrate the ability to lay out and erect a platform or western frame structure.
- Demonstrate basic knowledge and skill in masonry and in the concrete construction trade.
- Describe various types of materials and methods available to the construction trade.
- Describe business organization, financing, labor relations, selling, pricing, customer service, management, and other business principles.
- Describe the complexity of the building construction industry, the interrelationships of the various trades, and methods of communication and coordination among all trades and professions within the industry.
- Encourage the practice of staying current with any new technology or codes related to the building industry.

Timothy B. Draper, Instructor
AAS: Thaddeus Stevens College of Technology
Occupational Safety and Health Administration (OSHA): Construction Safety & Health Certificate

Daniel McCord, Instructor
BS: Millersville University of Pennsylvania

Daniel B. Noel, Assistant Professor
BS: Lancaster Bible College
AST: Williamson Free School of Mechanical Trades
NCCER Certified Instructor Carpentry Level 4
Occupational Safety and Health Administration (OSHA): Construction Safety & Health Certificate

Gary Schmaltz, Instructor
Vocational 1 & 2 Certifications: Temple University
Owens Technical College Architectural Drafting

Model Schedule for Carpentry Technology

Semester 1	
CARP 106: Hand Tools and Power Tools	3
CARP 111: Building Materials	3
CARP 116: Site Work and Foundations I	3
CARP 182: Construction Drawings and Blueprint Reading	3
MATH 126: Technical Math I (or higher) †	3
ENG 106: English Composition	3
Semester 2	
CARP 157: Floor, Wall, and Ceiling Framing	3
CARP 161: Stair Construction	2
CARP 166: Roof Framing and Materials	3
CARP 178: Exterior and Interior Finish	4
CIS 111: Intro to Computer Application	3
MATH 132: Elementary Geometry (or higher)*	3
Semester 3	
CARP 208: Floor Construction	3
CARP 209: Wall Construction	3
CARP 218: Roof Construction	3
CARP 219: Thermal Insulation	1
CARP 222: Exterior Finish and Trim	2
ENG 216: Technical Writing* OR	
ENG 221: Public Speaking	3
BUSN 106: Small Business Management	3
Semester 4	
CARP 227: Drywall Installation and Finish	2
CARP 257: Stair Trim	2
CARP 267: Interior Finish and Trim	3
CARP 272: Site Work and Foundations II	2
CARP 276: Residential Remodeling	3
Humanities Elective	3
Science Elective	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**73**

** Prerequisite or Co-requisite Required. See Course Description.*

† Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 126 and MATH 132, must take an additional Gen-Ed elective in order to meet their Gen-Ed requirements.

Carpentry Technology (CARP)

CARP 106 (3 credits) Hand Tools and Power Tools
This course is a general introduction to the basic tools that are used by a carpenter with an emphasis on safety, proper usage and procedures, and various applications that are most commonly used in the carpentry trades.

CARP 111 (3 credits) Building Materials
Covering the wide range of building materials used in carpentry, this course examines the many different types of wood products, including engineered lumber and the newest technology of steel framing. Proper procedures for estimating these building materials and the variety of fastening materials are also discussed and practiced.

CARP 116 (3 credits) Site Work and Foundations I
In this course, students learn how to set up and operate the transit level and laser level. Building layout and excavation of residential construction will be explained, with particular
emphasis on building stake-off. Types of footers, foundations, and concrete forming are also explored. Students will be challenged to practice proper building site layout, constructing concrete stair and sidewalk forms, and installing the form-a- drain system.

CARP 157 (3 credits) Floor, Wall, and Ceiling Framing
With a strong emphasis on platform framing, students will examine and demonstrate the proper methods of constructing subfloors, walls, and ceilings in the framework of residential and light commercial construction. This includes discussing the basic components and construction methods of light- gauge steel framing.

CARP 161 (2 credits) Stair Construction
Students learn the different types of stairways and all parts pertaining to them. They also learn how to calculate, lay out, and construct stairway stringers with their proper landings, risers, treads, and railings.

CARP 166 (3 credits) Roof Framing and Materials
The different types of roof systems and all the material members that are involved in the different roof types are discussed. Students learn theoretically how to calculate rafters to fit their proper situations and practice laying out and cutting common and hip rafters.

CARP 178 (4 credits) Exterior and Interior Finishes
In this course, students will study and practice installing various types of exterior and interior finish material for residential construction. Exterior finish will include installation procedures for: roofing; siding; soffit; windows and doors; and aluminum trim. Interior finish will include techniques for: hanging drywall; installing prehung doors and door trim; applying trim around a window unit; and other common trim materials.

CARP 182 (3 credits) Construction Drawing and Blueprint Reading
In this course students will learn the proper techniques necessary to dissect a set of residential blueprints and develop a broad understanding of the language of construction drawings. We will also become involved in duplicating, through the process of mechanical architectural drafting, a few select detailed residential section drawings, with each having different drafting scales.

CARP 208 (3 credits) Floor Construction
Covers both dimensional and engineered lumber applications. To meet current building designs and codes, students perform installation from a detailed blueprint for sill plates, joists, joist hangers, stair beams, sub flooring, and stair stringer construction.

CARP 209 (3 credits) Wall Construction
Covers both dimensional and engineered lumber applications. To meet current building designs and codes, students perform installation and layout from a detailed blueprint for wall plates, stud size and spacing, header design and size, and rough opening sizes for window and door schedules.

CARP 218 (3 credits) Roof Construction
Covers engineered trusses and hand-framed rafters with ceiling joists. The students become familiar with the installation and design criteria of an engineered truss
including detailed truss drawings for field applications and the codes applying to field modifications. Students perform layout, cutting, and installing roof rafters from a detailed blueprint including proper ceiling joists, collar ties, and gable overhang construction and codes. Students install roof sheeting and fascia boards.

CARP 219 (1 credit) Thermal Insulation
Covers the various types of insulation for thermal, noise, and fire protection. Ventilation baffles, vapor barriers, and types of loose fill insulation are detailed. Students perform installation of insulation for wall, ceiling, and fire-stop applications.

CARP 222 (2 credits) Exterior Finish and Trim
Covers the exterior materials used for siding, roofing, flashing, and aluminum trim. Using accepted methods, students perform siding, soffit, fascia, and fiberglass shingle applications, including proper flashing and counter flashing techniques.

CARP 227 (2 credits) Drywall Installation and Finish
Covers the types and sizes of drywall installed in construction, as well as proper hanging and finishing. Site techniques are covered. Students perform installation and finishing methods for standard applications.

CARP 257 (2 credits) Stair Trim
Covers the variety and designs of interior custom stair trim. Students are instructed in the different stair designs, building codes and the perspective trim applications. Students install custom stair trim for an open stair and box stair designs including over the tread skirt board applications.

CARP 267 (3 credits) Interior Finish and Trim
Covers the various interior painting and staining finishes. The proper wood types and species, finishing methods, and applications are detailed. Details of interior pre-hung doors, window trim including extension jambs and sills are covered. Students perform the installation of a standard trim package.

CARP 272 (2 credits) Site Work and Foundations II
Covers the details associated with site preparation and foundation inspections for a new building. Specifics are for lot size, set back, right of way, and building location. Work includes using various instruments for batter board installations, excavation of foundation, locating footer elevation, and forming and pouring footers. Locating, forming, and pouring of sidewalks and exterior porches.

CARP 276 (3 credits) Residential Remodeling
Covers the details and techniques used for residential remodeling and restoration. Students perform demolition, and repair and update existing structures to current building codes. The topics covered can include kitchens, bathrooms, flooring and exterior finishes.

Civil Engineering Construction Technology

What is Civil Engineering Construction Technology?

The heavy civil engineering construction profession is a dynamic industry that has untapped potential for career advancement, including transformational financial growth. If you like to work outside with your hands, with innovative technology and equipment, civil construction will provide you with countless opportunities. In addition, there will be opportunities for field experience with a summer on-the-job internship.

The Civil Engineering Construction Technology (CECT) program is committed to provide students with a broad range of skills necessary to thrive, and work in an industry that has been around since early civilization. This industry sector continues to grow, offering job security in a wide range of positions, a meaningful career, and an opportunity to help build our country's infrastructure. The combination of theory, and hands-on in both a lab and field portions of this program will allow students to develop the skills to work in the construction of roadways, municipal and state infrastructure, underground utilities, energy, horizontal site development, materials production and application, and construction of water and wastewater infrastructures. Students will learn how to use and make the most of today's innovations, so you will be prepared when you enter the industry full time. Upon competition of the program, graduates will find a wealth of employment opportunities to invest your future, to build a better America.

A Graduate of this Program will be able to:

- Identify the different types of heavy civil construction projects that include earth moving operations, transportation, infrastructure, utility installation, material production, transportation, water and wastewater plant work, and site development;
- Learn and describe the regulations that impact employee job site safety;
- Demonstrate the ability to read and interpret construction documents including drawings, details, materials, specifications, quality standards and apply to field work,
- Demonstrate pipe work installation skills using different pipe products;
- Explain the importance of pipe work as it relates to underground infrastructure;
- Interpret blueprints, benchmarks, elevations, scaling, survey, and apply this information in civil construction projects;
- Explain material production and uses for asphalt, concrete, aggregates, and precast as well as modes for transporting these products;
- Acquire leadership skills, business communications, basic construction finance to become both an internal and external leader for an organization;
- Differentiate heavy equipment types based on usage, weight, classification, safety, and maintenance;
- Demonstrate skills in quality control using best practice, inspection methods involving civil construction projects;
- Demonstrate good oral communication skills, speak logically, and use various types of oral and written communication techniques to promote sound business, and employer-employee relationships.

Mitch Kauffman, Instructor
BS: Kutztown University

Steve Simes, Instructor
AAS: Thaddeus Stevens College of Technology

Model Schedule for Civil Engineering Construction Technology

SEMESTER 1	
CIVL 101: Principles of Civil Engineering Construction Technology	3
CIVL 105: Job Site & Traffic Safety	3
CIVL 110: Construction Drawings, Site Plans, Specifications	3
CIVL 115: Construction Survey I*	3
ENGLISH 106: English Composition	3
MATH 126: Technical Math I (or higher)	3
SEMESTER 2	
CIVL 150: Erosion & Sediment Control	3
CIVL 155: Utility Installation I*	3
CIVL 160: GPS Fundamentals*	3
CIVL 165: Construction Survey II*	3
MATH 132: Elementary Geometry (or higher)	3
CIS 105: Drawing with AutoCAD	3
SEMESTER 3	
CIVL 205: Earthwork Fundamentals*	3
CIVL 210: Engineering Materials and Processes*	3
CIVL 215: Utility Installation II*	3
CIVL 220: Site Grading Designs and Grading Types*	3
ENG 216 Technical Report Writing OR ENG 221 Public Speaking	3
Humanities Elective*	3
SEMESTER 4	
CIVL 255: Leadership, Ethics, and Legal Issues in Construction Management	3
CIVL 260: Cost Estimating, Project and Field Construction Management*	3
CIVL 265: Structured Concrete Operations*	3
CIVL 270: Asphalt Paving Operations	3
Science Elective	3
General Studies Elective	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**74**

*** Prerequisite or Co-requisite Required. See Course Description.**

Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 141, must take an additional Gen-Ed elective in order to meet their Gen-Ed requirements.

Civil Engineering Construction Technology (CIVL)

CIVL 101 (3 credits) Principles of Civil Engineering Construction Technology

This course, principles of Civil Engineering Construction Technology, while incorporating scientific principles serves as an introduction to the civil construction industry. The history of the industry's impact on society, past and present has met and will continue to meet our needs well into the future. This acceleration of technology has created one of the most emerging construction career fields in our nation.

CIVL 105 (3 credits) Job Site and Traffic Safety

This course is designed for students to gain knowledge and technical skills related to best practices for jobsite safety. This includes following all personal protective equipment (PPE), Occupational Safety & Health Administration (OSHA), Mine Safety & Health Standards (MSHA), Department of Transportation (DOT), Maintenance of Traffic Control Devices (MUTCD), and underground utility regulations. Applications will include verbal and nonverbal communication, work zone safety, and injury prevention.

CIVL 110 (3 credits) Construction Drawings, Site Plans, Specifications

This course provides an overview of construction drawings, plans, details, takeoffs, survey, redlines, cut/fills, conflicts, design issues involving a construction project. Emphasis will be placed on applications for reading and interpreting construction drawings in the field, while ensuring materials, scaling, and specifications complying with local, state and federal requirements.

CIVL 115 (3 credits) Construction Survey I

This course introduces the history of surveying, use of state- of-the-art equipment and blueprint reading. Students will use survey equipment to layout the jobsite prior to the start of construction. Applications will include reading and understand blueprint.
Prerequisite: CIVL105

CIVL 150 (3 credits) Soil and Erosion Control

This course introduces the history and evolution of erosion & sediment (E&S) control for construction projects. National standards for earth disturbing construction has been determined by the National Pollutant Discharge Elimination System (NPDES). Students will practice construction standards that have improved the quality of tributary streams, wetlands, environment, water quality, and the Chesapeake Bay ecosystem.

CIVL 155 (3 credits) Utility Installation I

This course introduces the history of utility installation, as well as new technology and advancements. The course introduces the basics of utility installation, materials and tools needed for utility construction. As well as construction including sanitary and storm sewer, water, gas, electric and communication lines.
Prerequisite: CIVL105 and CIVL 110

CIVL 160 (3 credits) Global Positioning System Fundamentals

This course introduces the history and evolution Global Positioning Systems (GPS) technology and its application to civil construction projects. This is an intensive course that builds upon Construction Survey I.
Prerequisite: CIVL105 and CIVL 110

CIVL 165 (3 credits) Construction Survey II

This course builds upon Construction Survey I. Applications includes utilization of construction drawings and equipment including GPS, modeling, drones, total stations, and lasers to layout a construction project.
Prerequisite: CIVL105 and CIVL 115

CIVL 205 (3 credits) Earthwork Fundamentals

This course introduces the history and evolution of earthwork operations. Students will learn differences in soil characteristics, work ability, and treatment for certain soil characteristics. Students will also learn about equipment applications used in earthwork operations.
Prerequisite: CIVL105 and CIVL 110

CIVL 210 (3 credits) Engineering Materials Processes

This course introduces the history and evolution aggregate production, usage and application. Students will also learn usage and manufacturing of aggregate, concrete asphalt, and DOT specifications.
Prerequisite: CIVL105

CIVL 215 (3 credits) Utility Installation II

This course builds on learning in Utility Installation I. Students will learn best practices of safe assembly and installation various types of pipe. Students will understand step-by-step application to assemble pipe per manufacture specifications in excavated trenches.
Prerequisite: CIVL105 and CIVL 155

CIVL 220 (3 credits) Site Grading Designs & Grading Types

This course builds upon Earthwork Fundamentals I. Students will be involved with crew and equipment package setup and planning for efficiency, involved in costs, and production calculations.
Prerequisite: CIVL105, CIVL 110, and CIVL 165

CIVL 255 (3 credits) Leadership in Construction Management, Ethics and Legal Issues

This course will cover a broad range of services construction companies provide to their employees, clients, and general public. The four fundamental principles will include: ethical practice, legal practice, professional excellence, and responsibility to the employee, client, and general public. In addition, students will learn personal leadership styles, good communication and presentation skills, working in a team environment in diverse organizational context.

CIVL 260 (3 credits) Cost Estimating, Project and Field Construction Management

This course is designed to train students the job estimating fundamentals to determine project construction costs. Construction estimating is tedious, time-consuming and requires a high level of skill. In addition, students will learn to impact of quality management systems (QMS) for company profitability.
Prerequisite: CIVL110 and CIVL 210

CIVL 265 (3 credits) Structured Concrete Operations

This course introduces the history and evolution concrete. Students will learn materials in concrete production processes, and, transporting from plant to jobsite, and placement applications in the construction industry. Emphasis will be place on hands-on preparation, formwork, and finishing.
Prerequisite: CIVL105 and CIVL 210

CIVL 270 (3 credits) Asphalt Paving Operations

This course introduces the history and evolution asphalt. Students learn best safety practices when working on an asphalt paving jobsite. This course "introduces" the student to the asphalt paving practices, materials, and evaluation including demolition and site preparation, laying subbase and a binder layer, laying butt joints, compaction of asphalt, and installing the top layer of asphalt. In addition, students will learn the composition of asphalt and manufacturing processes.
Prerequisite: CIVL105 and CIVL 210

Collision Repair Technology

What is Collision Repair Technology?

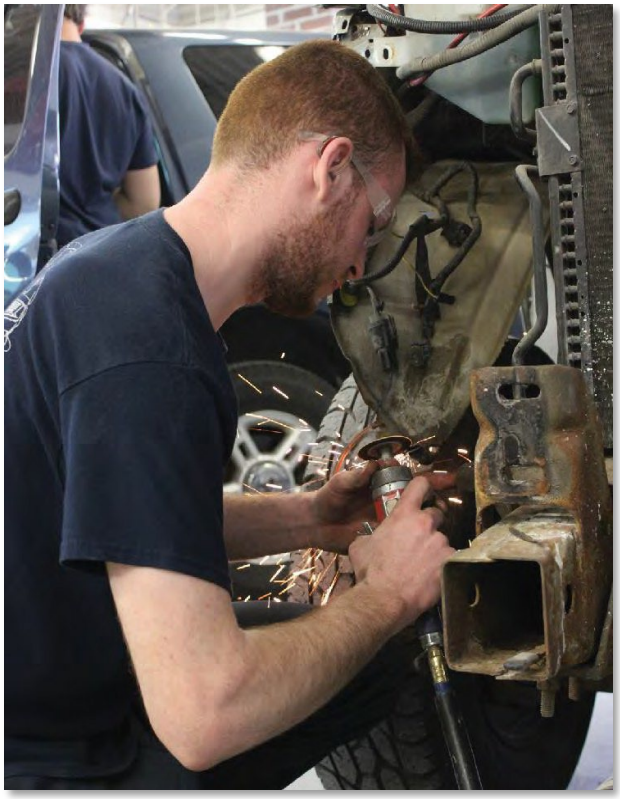
Students will be instructed in a series of I-CAR courses in Non-Structural ProLevel 1 and Refinishing ProLevel 1, the industry standard for collision repair training. Students graduate with a variety of nationally-recognized platinum certificates from I-CAR. This program aligns with collision repair businesses needing to hire employees to maintain or to become I-CAR Gold Class professionals. This program makes students proficient at entry-level tasks. Students also have the opportunity to become certified as ASE Master Technicians. The Collision Repair Technology program is dedicated to providing the most current and complete information, knowledge, and skills required to perform complete, safe and quality repairs. Thaddeus Stevens College of Technology provides students with comprehensive training and industry recognized credentials for a successful career in collision repair.

A Graduate of this Program will be able to:

- Use collision repair tools and equipment safely and effectively.
- Analyze the structural design of a vehicle and its reaction to an impact.
  - Repair damaged metal.
  - Refinish vehicles.
  - Install panels.
  - Repair frame damage.

Edwin Ortiz, Instructor
BA: Southern New Hampshire University
AAS: Thaddeus Stevens College of Technology

Jason Weiler, Assistant Professor
BA: Ashford University
AAS: Thaddeus Stevens College of Technology



Model Schedule for Collision Repair Technology

Semester 1	
CORT 107: Details of Body Construction	4
CORT 111: Collision Repair Welding*	4
CORT 116: Repairing Damaged Panels and Metalworking*	4
MATH 126: Technical Math I (or higher)	3
BUSN 106: Small Business Management	3
Semester 2	
CORT 156: Introduction to Refinishing Procedures*	4
CORT 162: Panel Replacement, Adjustment, Corrosion Protection*	4
CORT 166: Introduction to Frame Alignment and Repair*	4
ENG 106: English Composition	3
CIS 111: Intro to Computer Applications	3
Semester 3	
CORT 212: Estimating Technology*	4
CORT 222: Aluminum Technology*	4
CORT 232: Non-Structural Technology*	4
MATH 111: Business Math	3
ENG 216: Technical Writing*	3
Semester 4	
CORT 252: Steel Structural Technology*	4
CORT 262: Refinishing Technology*	4
CORT 272: Mechanical Technology*	4
Humanities Elective	3
Science Elective	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**73**

*** Prerequisite or Co-requisite Required. See Course Description.**

Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 141, must take an additional Gen-Ed elective in order to meet their Gen-Ed requirements.

Collision Repair Technology (CORT)

CORT 107 (4 credit) Details of Body Construction
Different types of automobile bodies and how they are made at the factory. The locations of body joints and parts and the proper methods for parts removal and replacement are also covered.

CORT 111 (4 credits) Collision Repair Welding
Designed to prepare students in the use of a MIG welder and the various uses of oxyacetylene equipment for cutting and heating to normalize and shrink metal. Proper use of equipment is stressed.

CORT 116 (4 credits) Repairing Damaged Panels and Metalworking Methods
Use of proper tools and techniques to bend sheet metal. Direct and indirect damage are explained along with ways damage can be corrected.

CORT 156 (4 credits) Introduction to Refinishing Procedures
Refinishing and the use of tools operated by compressed air. Proper use of various finish materials such as primers,
sealers, and thinners. Masking and spray painting techniques are also covered.

CORT 162 (4 credit) Panel Replacement, Adjustment, and Corrosion Protection
Proper removal and replacement of panels are stressed as well as the proper alignment of panels. A general overview of determining repair procedures, inspecting areas for hidden damage, removal of damaged panels, and corrosion protection.

CORT 166 (4 credits) Introduction to Frame Alignment and Repair
Frame alignment and straightening is studied, including the use of gauges and frame straightening equipment needed to restore a damaged frame or body to factory specifications.

CORT 212 (4 Credits) Estimating Technology
Estimators inspect and analyze collision-damaged vehicles to create a repair plan. The technician builds relationships with vehicle owners, repairers, and insurance personnel, ensuring satisfaction when repairs are complete.

CORT 222 (4 Credits) Aluminum Technology
An aluminum structural technician restores aluminum structural dimensions and structural integrity to collision damaged vehicles. He or she uses measuring and frame equipment to diagnose, damage, and return damaged frame or uni-body parts to manufacturer's specifications.

CORT 232 (4 Credits) Non-Structural Technology
Non-structural technicians restore damaged vehicles to their original structural integrity, function, and appearance. These technicians use hand tools and power tools to remove or repair damaged parts, weld as needed, and properly install new parts. They work with a variety of metals and plastics, as well as glass, electrical, and mechanical parts.

CORT 252 (4 Credits) Steel Structural Technology
Steel structural technicians restore structural dimensions and integrity to collision damaged vehicles. Technicians use measuring and framing equipment to diagnose damage and return damaged frame or uni-body parts to manufacturer's specifications. Hand tools and power tools are used to remove or repair damaged parts, weld as needed, and properly install new parts. This individual also works with a variety of metals and plastics, as well as glass, electrical, and mechanical parts.

CORT 262 (4 Credits) Refinishing Technology
Refinish technicians prepare and apply paint to repaired vehicles. Duties may include final sanding, masking, color mixing and tinting, operating spray booths, and applying primers, sealers, color, and clear coats. They may need to blend color into adjacent panels for a better color match to existing vehicle paint. These individuals work with potentially hazardous materials, so attention to safety and personal protection are essential. Vehicles must be correctly prepared and refinished to ensure proper adhesion, color match, and overall appearance.

CORT 272 (4 Credits) Mechanical Technology
The mechanical technician diagnoses and repairs collision- related mechanical damage which includes steering and suspension systems. Hand tools and power tools are used to remove or repair damaged parts and properly install new and used parts.

Computer & Network Systems Administration

What is Computer and Network Systems Administration?

The Computer and Network Systems Administration program prepares students for employment in a wide variety of positions in the information technology field. Students work in a live network environment, managing their own servers, clients, routers, and switches by applying concepts learned in the theory classroom. The combination of theory and hands-on lab exercises allows CNSA students to acquire comprehensive skills in the following technical areas: The internal operation of personal and server computer systems; the physical infrastructure of local and wide area networks; the design and management of computer networks; the administration of Microsoft Windows and non-Windows server and client operating systems; the design and development of Windows- based and web-based applications; the management and design of relational databases; and the integration of enterprise software applications to solve business problems.

Upon completion of the program, graduates of the CNSA program have obtained employment in information technology as systems administrators, network administrators, network technicians, PC technicians, help desk analysts, systems engineers, structured data cabling installers, application programmers, web application developers, web administrators, database administrators, and sales engineers. High school prerequisites for this program are Algebra I & II, and a GPA of at least 2.5.

A Graduate of this Program will be able to:

- Solve business problems by applying sound information technology principles.
- Implement and administer a broad range of information technology systems, networks, and applications.
- Manage information technology projects from conceptualization through implementation.
- Make significant contributions as a member of an information technology team.
- Explain with authority current technologies and standards in the field.
- Maintain information technology skills through appropriate industry certifications and/or continuing education.
- Demonstrate a strong professional work ethic.
- Protect and preserve a business organization's critical information assets from all threats.

Tim Freund, Instructor
BS: Western Governors University

Dr. Jameson McFarlane, Professor
DSc, Towson University
MBA, BSc: York College of Pennsylvania
Advanced Cybersecurity Certificate: Stanford University
Certificate in Music Theory: St. Lucia School of Music
Certificate in Teacher Ed. and Ed. Adm.: Sir Arthur Lewis Community College/University of the West Indies

Matthew McLaughlin, Instructor
MPS: Central Penn College
BS: Central Penn College
AAS: Thaddeus Stevens College of Technology

Rebecca Schultz, Instructor
MA Ed: University of Phoenix
BS: Kutztown University
AAS: Silicon Valley College

Model Schedule for Computer & Network Systems Administration (Option #1)

Semester 1	
CNSA 107: PC Hardware and Support Fundamentals	3
CNSA 108: Operating Systems & Software Fundamentals	
CNSA 111: Intro to Networking*	3
CNSA 117: Analysis of TCP/IP & Local Area Networking*	3
MATH 137: Intermediate Algebra (or higher) †^	3
ENG 106: English Composition	3
Semester 2	
CNSA 156: Operating Systems I*	3
CNSA 161: Systems Administration I*	3
CNSA 166: Internetworking Devices and Concepts*	3
CNSA 172: Web Technologies and Network Security Fund	3
ENG 216: Technical Writing*	3
MATH 141: Trigonometry (or higher)*	3
Semester 3	
CNSA 212: Programming I*	3
CNSA 222: Database Management Systems*	3
CNSA 227: Management Information Systems*	3
CNSA 256: Operating Systems II*	3
ENG 221: Public Speaking	3
Humanities Elective	3
Semester 4	
CNSA 216: Web Programming*	3
CNSA 266: Systems Administration II*	3
CNSA 271: Network Design*	3
CNSA 276: Practical Applications*	3
Science Elective	3
General Education Elective	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**73**

*** Prerequisite or Co-requisite Required. See Course Description.**
^Minimum Grade Required. See Course Description.

Model Schedule for Computer & Network Systems Administration. (Option #2)

Semester 1	
CNSA 107: PC Hardware and Support Fundamentals	3
CNSA 108: Operating Systems & Software Fundamentals	3
CNSA 111: Intro to Networking*	3
CNSA 117: Analysis of TCP/IP & Local Area Networking*	3
MATH 207: Pre-Calculus†	4
ENG 106: English Composition	3
Semester 2	
CNSA 156: Operating Systems I*	3
CNSA 161: Systems Administration I*	3
CNSA 166: Internetworking Devices and Concepts*	3
CNSA 172: Web Technologies and Network Security Network Security Fund*^	3
ENG 216: Technical Writing*	3
General Studies Elective	3
Semester 3	
CNSA 212: Programming I*	3
CNSA 222: Database Management Systems*	3
CNSA 227: Management Information Systems*	3
CNSA 256: Operating Systems II*	3
ENG 221: Public Speaking	3
Humanities Elective	3
Semester 4	
CNSA 216: Web Programming*	3
CNSA 266: Systems Administration II*	3
CNSA 271: Network Design*	3
CNSA 276: Practical Applications*	3
Science Elective	3
General Education Elective	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**74**

†Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 141, must take an additional Gen-Ed elective to meet their Gen-Ed requirements.

Computer and Network Systems Administration (CNSA)

CNSA 107 (3 Credits) PC Hardware and Support Fundamentals

This foundational course introduces students to essential PC hardware and support concepts. Topics include hardware components of both PCs and laptops, mobile devices, basic networking and troubleshooting. This course covers installation, configuration, and maintenance of PCs, laptops, and related hardware along with basic network principles and mobile device support. This course provides students with theory and hands-on lab experience directly related to the CompTIA A+ Core 1 certification exams.

CNSA 108 (3 Credits) Operating Systems & Software Fundamentals

This course provides students with a comprehensive understanding of operating systems, focusing on core concepts and tasks needed to support current end-user systems. Students will explore installation, configuration, management and troubleshooting of these systems.
Emphasis is placed on system maintenance and customer support. This course provides students with theory and hands-on lab experience directly related to the CompTIA A+ Core 2 certification exams.

CNSA 111 (3 Credits) Introduction to Networking

This course provides a foundational introduction to network technology. Students will learn about the essential principles of networking, including network architecture, topologies, and standards. The course will cover current network models, the functions of network devices, protocols, and logical addresses. Through hands-on labs and theoretical instruction, students will develop an understanding of network infrastructure, cabling, and network data transmission.
Prerequisite: CNSA 108

CNSA 117 (3 Credits) Analysis of TCP/IP and Local Area Networking

This course provides an in-depth exploration of the TCP/IP protocol suite and its role in modern networking. The course focuses on analyzing the structure and operation of TCP/IP within local area networks (LANs). Students will study the layers of the OSI and TCP/IP models, data encapsulation, IP addressing, subnetting, and packet analysis. The course also covers LAN technologies, including Ethernet, Wi-Fi, and VLANs, with an emphasis on practical, hands-on lab experience in configuring and troubleshooting LANs.
Prerequisite: CNSA 108

CNSA 123 (3 Credits) LAN Cabling and WAN Technologies

Cabling standards and best cabling practices in the industry are covered. Students practice hands-on cable termination of copper and fiber cables in the lab. This course also provides an overview of telecommunications technologies and the use of telecommunications in wide area networks (WANs).
Prerequisite: CNSA 117

CNSA 156 (3 Credits) Operating Systems I

This course provides a comprehensive introduction to Microsoft's server operating systems, one of the most widely implemented network operating systems in the IT industry. This course combines in-depth lectures with practical, hands-on labs that build foundational skills in server management. Labs and lectures cover essential topics in network administration, such as attended and unattended installations, cloning and imaging, print server configuration, securing files with share and NTFS permissions, disk management (including RAID configurations), and strategies for disaster recovery and backup. This course prepares students to understand and manage key aspects of Microsoft server environments.
Prerequisite: CNSA 108

CNSA 161 (3 Credits) Systems Administration I

This course introduces students to Microsoft Active Directory structure and management. Students will explore essential concepts in user account maintenance, user profiles, and group policy management. Additionally, the course covers critical networking services, including Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) network services. Through both lectures and hands-on labs, students gain practical experience by creating Active Directory domains and configuring DHCP and DNS services. This course provides students with the skills needed to manage and maintain a networked environment using Microsoft's server technologies.
Prerequisite: CNSA 156

CNSA 166 (3 Credits) Internetworking Devices and Concepts

This is a Cisco-centric course on IP routing and switching. Traditional routers and L3 switches are discussed in the classroom and used in the lab. Routing protocols such as RIPv2, EIGRP, and OSPF are covered. In addition to routing, voice-over IP (VoIP) is a significant technology that businesses implement in order to reduce cost and leverage investments in the data network. For that reason, this course provides an overview of VoIP and assigns a lab project to configure a software private branch exchange (PBX) telephone switch that is capable of routing phone calls within the lab environment.
Prerequisite: CNSA 161

CNSA 172 (3 Credits) Web Technologies and Network Security Fundamentals

This course covers web server configuration, maintenance, and security. HTML and CSS for web page creation are introduced. Through lectures and hands-on labs students will build web pages with HTML and CSS, configure web servers to host multiple websites, and explore common network security topics. Security measures used on the internet including threats, defenses, Public Key Infrastructure (PKI), digital certificates, hash codes, and digital signatures will be covered.

CNSA 212 (3 Credits) Programming I

An introduction to the fundamentals of computer programming. Students learn a structured, object-oriented approach to problem solving and automating routine processes using modern programming languages. The programming concepts used emphasize logical thinking and current programming standards and conventions. Students learn to plan, design, compile, debug, and document applications in a visual programming environment using a programming language that is compatible with the Microsoft.NET Framework. In addition, the course introduces the integration of programming applications with databases as well as next generation programming environments.
Prerequisites: CNSA 161

CNSA 216 (3 Credits) Web Programming

A course that builds upon the information learned in CNSA 172, CNSA 212, and CNSA 222, it introduces advanced web programming and development techniques and tools. The primary focus of the course is on the design of dynamic, interactive websites, using current web programming languages and tools, including the technology of the Microsoft.NET Framework. Students integrate the use of relational databases to provide data storage and retrieval for their interactive websites. Students also configure and manage web servers to support interactive web pages.
Prerequisites: CNSA 212

CNSA 222 (3 Credits) Database Management Systems

An in-depth, hands-on survey course in which students develop the skills and the expertise required to design, to implement, and to manage databases using a relational database management system (RDBMS). Students learn concepts of the relational database model, the principles of database design and normalization, and database administration. In addition, the basic commands and functions of structured query language (SQL) are used for data manipulation and extraction, as well as for database administration. Finally, topics are introduced that relate enterprise databases to client/server systems, application programming, web database development, and e-commerce.

CNSA 227 (3 Credits) Management Information Systems

A course that introduces students to the policies and procedures required to administer an enterprise computer network and to support an effective information technology department and users in the enterprise. Students learn how to prepare and to maintain documentation for information technology systems, software, processes, and projects. The skills learned in this course are integrated into the other CNSA courses throughout the sophomore year. An important component of the course is research, readings, and discussion related to ethical practices in the field of information technology.

CNSA 256 (3 Credits) Operating Systems II

The second operating systems course in the CNSA curriculum that introduces students to the design, functionality, and administration of the predominant non-Windows operating system in the current computer industry. At this particular time, the course presents an in-depth examination of Linux, focusing on the proper installation and administration of the operating system. Students explore the wealth of support sites available to administrators of Linux systems, as well as the availability of productivity software applications and system administration tools for Linux systems.
Prerequisite: CNSA 156

CNSA 266 (3 Credits) Systems Administration II

This is a study of programming languages including variables and strings, software development, data types and expressions, selections and loop statements, arrays and lists, state maintenance and management, functions, semantics, implementation, and database connectivity. Students will explore language features such as formal syntax, scoping and binding of variables, higher- order programming, typing, inheritance, type polymorphism and design techniques. Introduces basics of security attacks and software security. Some of the models of languages may include scripting and dynamic languages such as Python, PHP, etc.

CNSA 271 (3 Credits) Network Design

This is the first of two capstone courses in the CNSA curriculum that requires students to rely heavily upon the knowledge and skills acquired from their entire previous course experiences. Project teams manage all accounts (i.e., user, group, computer, security) in their respective domains. In designing their enterprise domains, the teams conduct appropriate research; analyze and evaluate enterprise requirements and specifications; and document the network design. Knowledge of the fundamentals of networking technology, experience supporting a network, or successful completion of a networking essentials course is required.

CNSA 276 (3 Credits) Practical Applications

The second of two capstone courses in the CNSA curriculum that requires students to rely heavily upon the knowledge and skills acquired from their entire previous CNSA course experiences. This course also includes in-depth research and examination of selected network applications and the implementation of those applications in the enterprise. Students learn how to plan, to configure, and to administer the specified application(s); how to implement the application(s); how to document the installation(s); and how to train the appropriate individuals to use and administer the application(s).

Computer Integrated Machining

What is Computer-Integrated Machining?

Students in the Computer-Integrated Machining program will spend considerable time in the study and actual operation of industrial equipment and tools to develop skills used by tool and die making companies and production and manufacturing facilities. This includes emphasis on the set up and operation of computer numerical controlled (CNC) lathes and milling machines. Students will also be introduced to computer- controlled measuring machines and computer-aided design/ computer-aided machining (CAD/CAM) software and its applications. A strong project, method-driven curriculum assures both theoretical and practical skill development.

This program prepares students to enter the workforce fields of CNC, CAM, tool making, mold making, machine tool operating, quality control, industrial sales, and production or manufacturing.

A Graduate of this Program will be able to:

- Demonstrate safe work habits and be conscious of safety when working with machinery.
- Read blueprints, interpret drawings, understand specifications, and establish tolerances.
- Apply mathematics in the machine tool technology (speeds, feeds, thread measurement, sine bar, etc.)
- Apply the principles of physics and metallurgy to the science of heat treatment operations, including hardening of steel, carburizing, case hardening, tempering, and annealing.
- Operate basic machine tools and demonstrate knowledge of their construction in relation to the metal industry.
- Demonstrate skills on computer numerical control machines and in digital readout.
- Operate abrasive cutting machinery; select and plan machining operations on this equipment.
- Demonstrate skills in quality control, inspection, gauging methods, and production control as they relate to manufacturing design and production.
- Demonstrate basic oral communication skills, speak logically, and use various types of oral and written communication techniques to promote good business relationships, to develop leadership, and to establish good employer-employee relationships.
- Demonstrate understanding of CAD/CAM programs for part design and generation of CNC code.

Jared Keim, Associate Professor
AAS: Thaddeus Stevens College of Technology
BS: Millersville University of Pennsylvania

Kyle Young, Instructor
AAS: Thaddeus Stevens College of Technology

Model Schedule for Computer Integrated Machining

Semester 1	
CIM 106: Blueprint Reading and Related Math	**3**
CIM 110: Manufacturing Processes	**2**
CIM 115: Measurement Systems	**2**
CIM 118: Lathe and Vertical Milling Machine I	**4**
CIM 161: Metallurgy	**2**
MATH 137: Intermediate Algebra (or higher) †^	**3**
CIS 105: Drawing with AutoCAD	**3**
Semester 2	
CIM 158: Lathe and Vertical Milling Machine II*	**3**
CIM 166: Manufacturing Processes II*	**3**
CIM 176: Computer Numerical Control I*	**3**
CIM 222: CAD/CAM I*	**3**
MATH 141: Trigonometry (or higher)*	**3**
ENG 106: English Composition	**3**
Semester 3	
CIM 210: CNC Milling*	**4**
CIM 211: CNC Turning*	**4**
CIM 220: Geometric Dimensioning & Tolerancing*	**3**
CIM 272: CAD/CAM II*	**3**
ENG 216: Technical Writing OR	
ENG 221: Public Speaking	**3**
Science Elective: ANY Physics or Chemistry Course	**3**
Semester 4	
CIM 228: CAE/CAM*	**3**
CIM 229: Automation and Production Lab* OR	
CIM 231: Machine Tool Internship*	**4**
CIM 259: Advanced CNC Milling and Automation*	**3**
CIM 269: Advanced CNC Turning and Automation	**3**
Humanities Elective*	**3**
Additional General Education Requirements	
Health and Physical Education Elective	**1**
General Studies Elective	**3**
TOTAL CREDITS	**75**

** Prerequisite or Co-requisite Required. See Course Description.*
†Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 141, must take an additional Gen-Ed elective in order to meet their Gen-Ed requirements.
^ Minimum Grade Required. See Course Description.

Computer Integrated Machining (CIM)

CIM 106 (3 credits) Blueprint Reading and Related Math
This course will introduce the student to industrial drawings, basic sketching, and applied mathematics. Interpretation of title blocks, orthographic projection, dimensioning and tolerancing, assemblies, and the elementary application of Geometric Dimensioning & Tolerancing (GD&T) will be covered throughout this course. The skills and knowledge obtained through CIM 106 will prepare the student for application in the machine lab to manufacture machined components.

CIM 110 (2 credits) Manufacturing Processes
Students will learn laboratory safety and material handling. The physics of metal cutting, and the machinability of metals are introduced. Semi-precision and precision measuring instruments are introduced and practiced. Precision layout, bench grinding, surface grinding and power sawing operations will also be introduced and exercised.

CIM 115 (2 credits) Measurement Systems
This course will introduce the student to basic metrology including precision layout. The use of indirect and direct measurement instruments including micrometers, calipers, indicators, and various gages will be utilized. Blueprint reading skills, including elementary GD & T, will be necessary for completion of this course.

CIM 118 (4 credits) Lathe and Vertical Milling Machining I
This course will introduce the student to procedures used on the vertical milling machine and lathe. Course content will include a wide variety of operations including, milling, turning, facing, drilling, reaming, tapping, and calculations related to set up.
Corequisite: CIM 106

CIM 158 (3 credits) Lathe & Vertical Milling Machining II
This course will introduce the student to advanced techniques and procedures used on the vertical milling machine and lathe. Course content will include offset boring, cutting slots and pockets, taper turning, and thread cutting. An emphasis on workholding will be integrated into this course.
Prerequisites: CIM 106, CIM 110, CIM 115 and CIM 118 and MATH 137

CIM 161 (2 credits) Metallurgy
This course covers the basic principles related to metallurgy. Many industrial processes are clarified as the student gains an understanding of quenching, annealing, case hardening, tempering, and crystallization. In addition, students will see how these changes occur through heat treating projects in the lab. Students will also experience real world applications through industry visits.

CIM 166 (3 credits) Manufacturing Processes II
This is a lab intensive course which provides students with extensive hands-on training. Assigned projects aid students in gaining critical experience contributing to a well-rounded machining education.
Prerequisites: CIM 106, CIM 110, CIM 115, CIM 118, CIM 161 and MATH 137

CIM 176 (3 credits) Computer Numerical Control (CNC) I
CIM 176 introduces the student to basic CNC concepts such as word-address programming, machine set-up, and program proofing. This course serves as an introduction to CNC machines and CNC programming methods and techniques.
Prerequisites: CIM 106, CIM 110, CIM 118 and MATH 137

CIM 210 (4 credits) CNC Milling
This course expands upon introductory concepts learned in CNC I and provides for increased hands-on application of learned material. New programming techniques will focus completely on milling and the use of CNC machining centers. Students are required to complete specific laboratory work to gain confidence in working with CNC Machining Centers.
Prerequisites: CIM 158, CIM 166, CIM 176, CIM 222.

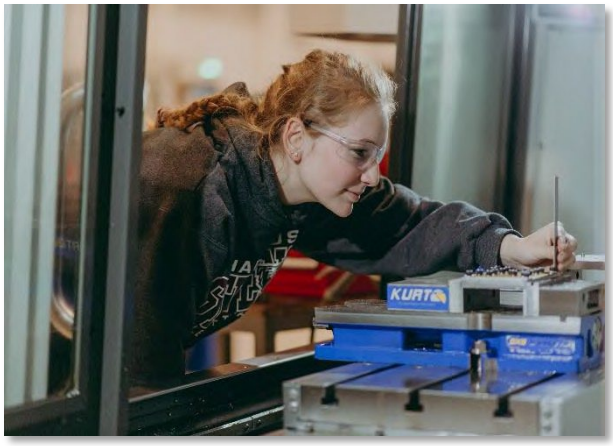
CIM 211 (4 credits) CNC Turning
This course expands upon introductory concepts learned in CNC I and provides increased hands-on application of learned material. New programming techniques will focus completely on turning and the use of CNC turning centers. Students are required to complete specific laboratory work to gain confidence in working with CNC Turning Centers. *Prerequisites: CIM 158, CIM 166, CIM 176, CIM 222.*

CIM 220 (3 credits) Geometric Dimensioning & Tolerancing
This course provides the basic elements required to define and apply industry accepted design specifications. The curriculum covers ASME Y.14.5 and associated standards, datum selection, benefits of bonus tolerance, manufacturing and inspection implications when using GD&T. Students will learn the rules, symbolic language and concepts used to define part dimensions and tolerances. As a result, students will increase their productivity due to clear product definition and function based design rationale.
Prerequisites: CIM 106, CIM 110, CIM 115, and MATH 137

CIM 222 (3 credits) Computer-Aided Design and Computer-Aided Machining (CAD/CAM) I
This course introduces the use of Computer Aided Drafting & Computer Aided Manufacturing (CAD/CAM) as a tool for defining part geometry and generating Computer Numerical Control (CNC) machine code. Two-axis and three-axis applications are demonstrated, along with the use of the CAD/CAM applications.
Prerequisites: CIM 106, CIM 110, CIM 115, and MATH 137.

CIM 228 (3 credits) CAE/CAM

This course teaches an intermediate level use of CAE/CAM software for generating code for use on multi-axis machine tools. Parametric modeling will be introduced using Computer Aided Engineering (CAE) software. Students will learn to design and engineer parts for manufacturing and assembly. This course will emphasize the connection between design and machine tool applications.
Prerequisite: CIM 272, CIM 210, CIM 211, CIM 220



CIM 229 (4 credits) Automation and Production Lab

This class focuses on production setups and automation. On the lathe, advanced setups including dual-spindle, Y-axis milling, and the use of live tooling and bar pullers will be studied. On the mill, broaching, 3+2 milling and 5-axis simultaneous milling will be covered and applied. Preparing machined parts for heat-treating and required grinding will be covered in this course.
Prerequisites: CIM 210, CIM 211, CIM 220, CIM 272, and MATH 137

CIM 231 (4 credits) Machine Tool Internship

This course expands upon the intermediate concepts learned in CNC Milling and introduces advanced milling techniques. This course also provides more hands-on experience with those techniques. New milling procedures and cycle time reduction will be the focus of this course. This course will focus on production techniques for CNC Machining Centers, including macro-B programming.
Prerequisites: CIM 210, CIM 211, CIM 220, and CIM 272
Corequisite: CIM 269

CIM 259 (3 credits) Advanced Milling & Automation

This course expands upon the intermediate concepts learned in CNC Milling I and introduces advanced milling techniques. This course also provides more hands-on experience with those techniques. New milling procedures and cycle time reduction will be the focus of this course. This course will focus on production techniques for CNC Machining Centers, including macro-B programming.
Prerequisites: CIM 210, CIM 220, and CIM 272
Corequisite: CIM 269

CIM 269 (3 credits) Advanced Turning & Automation

Provides the student with additional time to perform specific advanced laboratory exercises in both programming and setup operations on CNC Turning Centers. Programming techniques will focus completely on CNC Turning Centers and will include multi-axis programming, live-tooling, and Swiss-style turning. A greater emphasis will be placed on the incorporation of CAM generated code in the production of finished parts. This class introduces Macro B programming techniques.
Prerequisites: CIM 211, CIM 220, and CIM 272
Corequisite: CIM 259

CIM 272 (3 credits) Computer-Aided Design and Computer-Aided Machining (CAD/CAM) II

This course teaches Intermediate-level use of CAM software as a tool for defining part geometry for both lathes and mills. Two axis and three axis application will be demonstrated along with the use of CAD/CAM applications. Three-dimensional surfacing and solids will be taught.
Prerequisite: CIM 222, CIM 176, CIM 158, and CIM 166
Corequisite: CIM 269

Computer Software Engineering Technology

What is Computer Software Engineering?

Computers have become a major factor in the development and operation of modern industry. From providing means of communications, to operating machines, to facilitating international commerce, to systems animation, computers and their related software programs makes things possible.

The Computer Software Engineering Technology program prepares students to design, to develop, and to build customized software programs for specific applications.
Specifically, students will learn basic programming; how to interpret specifications; application of software architecture, verification and validation principles; and software performance standards. Students will create software programs which address known specifications. The program emphasizes a practical hands-on education as software projects are required each semester.

Upon completion of the program, graduates will find a wealth of employment opportunities in a variety of businesses and industries. Unlike some disciplines which are tied directly to a specific technical area, graduates of this program will work in small businesses, large industries, private organizations, software specialty businesses, IT department, government, and other agencies.

Job titles might include the following:

- Software designers
- Software test technicians
- Software maintenance technicians
- Technical writer for software publishing companies
- Customer service technicians for software companies

A Graduate of this Program will be able to:

- Edit and modify existing software programs with the aim of upgrading and correcting errors.
- Improve the performance of software programs or adapt it to new and old hardware and software.
- Analyze the needs of users for project design.
- Design and modify software systems for specific applications.
- Analyze and recommend all necessary system layouts and modifications.
- Train users how to make use of new software

Mainul Chowdhury, Asst Professor
BSS: Economics, University of Chittagong
MS: Economics, University of North Texas
MS: Information Science, University of North Texas

Arafat Hassan, Instructor
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Fahim Shams, Instructor
BS: Computer Science, University of North Texas
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of Science & Technology

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BS: Physics, University of Dhaka
MS: Physics, University of Dhaka
MS: Computer Science, Harrisburg University
of Science & Technology

Model Schedule For Computer Software Engineering Technology

Semester 1	
CSET 105: Intro to Web Applications	3
CSET 110: Web Development I	3
CSET 115: Technical Requirements & Data Structures	3
CSET 120: Software Project I	3
BUSN 106: Small Business Management	3
ENG 221: Public Speaking	3
Semester 2	
CSET 155 Database Design	3
CSET 160 Web Development II	3
CSET 170 Security & Professional Ethics	3
CSET 180 Software Project II	3
MATH 137: Intermediate Algebra (or higher)	3
ENG 106: English Composition	3
Semester 3	
CSET 205: Advanced Data Integration*	3
CSET 222: Database Management Systems*	3
CSET 210: Workplace Communications	3
CSET 220: Software Project III	3
ENG 216: Technical Report Writing*	3
CIS 111: Introduction to Computer Applications	3
Semester 4	
CSET 265: Software Principles	4
CSET 270: Mobile Development	4
CSET 280: Capstone Project OR	
CSET 290: CSET Internship	4
Health and Physical Education Elective	1
Humanities Elective	3
PHYS 106: Physics for Everyday Life OR	3
any CHEM, BIO, SCI, or higher PHYS	
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**73**

*** Prerequisite or Co-requisite Required. See Course Description.**
Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 141, must take an additional Gen-Ed elective to meet their Gen-Ed requirements.

Computer Software Engineering Technology (CSET)

CSET 105 (3 Credits) Introduction to Web Applications
The course provides an introduction to the basic tools, processes, and workflow in the development of web applications with a focus on the JavaScript language. Students will embark on a comprehensive journey into the exciting world of web development, gaining foundational knowledge and practical skills essential for creating dynamic and interactive web applications.

CSET 110 (3 Credits) Web Development I
The course introduces front end web development concepts including HTML, CSS, and JavaScript, and their role in building web applications.

CSET 115 (3 Credits) Technical Requirements and Data Structures
The course provides information regarding the process of disseminating specifications and managing a project, as well as data structures concepts. Students will cover various concept of version control, with emphasis on Git.

CSET 120 (3 Credits) Software Project I
This course requires the student to complete a computer software project that employs the skills acquired during that semester. The specific projects are those suggested by local employers and advisory committee members. Optional challenge projects are available for those students who wish to tackle complex problems.

CSET 155 (3 Credits) Database Design
The course develops skills in the administration of databases. Students learn to organize data and to store the data for use and retrieval. Common systems of data storage are introduced. Students will build a database, script a process to load data, and outline how to retrieve data from that database.

CSET 160 (3 Credits) Web Development II
Students will look at server-side development and build more complex web applications using their knowledge gained in CSET 110 (Web Development I). Students will be using Python as their development language for labs and projects in this course.

CSET 170 (3 Credits) Security and Professional Ethics
The course explores issues of security in software development. Students analyze security problems and learn how they can be minimized or controlled. Students will also cover Secure Socket Layer (SSL) protocol and learn how to apply it to their web applications.

CSET 180 (3 Credits) Software Project II
This course requires the student to complete a computer software project that employs the skills acquired during that semester and previous semesters. Scheduled during the semester, the specific projects are those suggested by local employers and advisory committee members. Optional challenge projects are available for those students who wish to tackle complex problems.

CSET 205 (3 Credits) Advanced Data Integration

The course is an extension to more complex data operations skills. Students will learn a new programming language called PHP which will be used in creating APIs, interacting with local databases and creating a web application.
Prerequisite: CSET 155

CSET 220 (3 Credits) Software Project III

This course requires the student to complete a computer software project that employs the skills acquired during that semester and previous semesters. The specific project is designed by the instructor. Optional features in the project are available for those students who wish to tackle complex problems.

CSET 222 (3 Credits) Data Management System

An in-depth, hands-on course in which students will develop the skills and the expertise required to design, implement, and manage databases using a relational database management system (RDBMS). Students will learn concepts of the relational database model, the principles of database design and normalization, and database administration. In addition, the basic commands and functions of Structured Query Language (SQL) will be used for data manipulation and extraction, as well as for database administration. *Prerequisite: CSET 155*

CSET 265 (4 Credits) Software Principles

Students will be introduced to the most fundamental concepts and principles of software that have been used in practical means throughout this program using Java Programming Language. Course may cover topics including fundamentals of programming, object oriented principles and software design patterns.

CSET 270 (4 Credits) Mobile Development

In this project-based course, students will be introduced to mobile application programming concepts and learn to build their own apps. Theory and concepts will be cross-platform, but examples and lab work will focus on one major platform. Topics will include working with Software Development Kits (SDKs), creating user interfaces, and utilizing mobile APIs such as notifications and location- based services.

CSET 280 (4 Credits) Capstone Project

The capstone project is designed to serve as a culminating experience for students, integrating the knowledge and skills acquired throughout their academic journey. Through this project, students will tackle real-world problems within their chosen field, demonstrating their ability to apply critical thinking, problem-solving, and creativity. The objective is to empower students to independently plan, execute, and present a substantial project, showcasing their proficiency and readiness for professional endeavors or further academic pursuits. Additionally, the capstone project aims to foster collaboration, innovation, and interdisciplinary learning, preparing students to navigate complex challenges in today's dynamic workforce or academic landscape.

CSET 290 (4 Credits) Internship

The internship course aims to provide students with practical, hands- on experience in their chosen field of study. Through structured internships, students will develop professional skills, gain real-world insight, and build industry connections. The objective is to enhance students' employability by immersing them in authentic work environments, allowing them to apply theoretical knowledge to practical situations. Furthermore, the course aims to cultivate critical thinking, problem-solving abilities, and effective communication skills, essential for success in their future careers. Ultimately, the internship course endeavors to empower students with the confidence and competence needed to transition smoothly from academia to the professional world.

Diesel Technology

What is Diesel Technology?

Diesel Technology Program is designed to prepare students to enter the diesel technician career field. This instruction gives an understanding of diesel equipment construction, theory of operation, standard industry service, and repair procedures. This instruction not only provides knowledge to perform equipment repair and service but also develops skills necessary to diagnose malfunctions. Two of the most important skills that will be developed are problem solving and critical thinking.

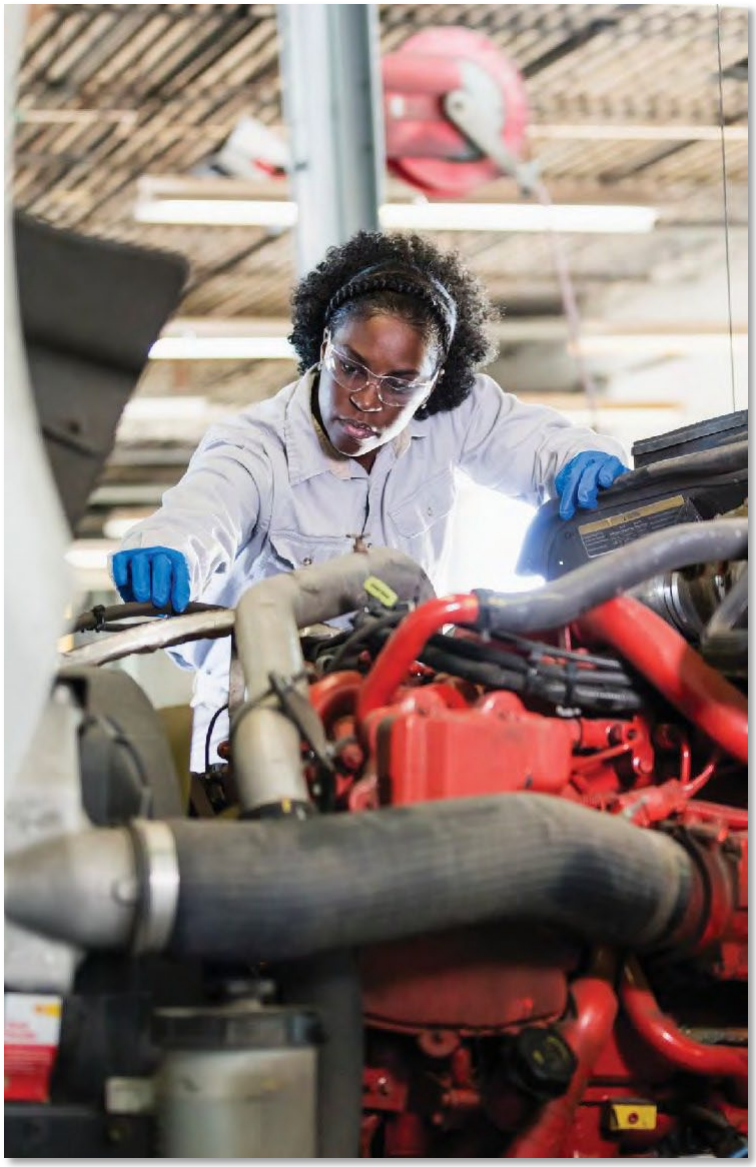
A Graduate of this Program will be able to:

Diagnose and repair common malfunctions of the following systems:

- Diesel Engine principles and operation, shop operation and tool/equipment usage.
- Diesel Engine – lubrication, cooling, fuel injection systems, mechanical systems, intake and exhaust including turbo chargers.
- Diesel Engine Troubleshooting, Testing, Repair, and Rebuild.
- Medium and Heavy-duty Truck and Equipment electrical/electronic systems.
- Medium and Heavy-duty Vehicle braking systems; hydraulic and air brake systems.
- Steering and suspension systems.
- Drive Train Systems – Including automatic, auto-shift, and manual transmissions; driveline and differentials.
- Preventive Maintenance Inspections
- Basic Hydraulics and Hydraulic Systems
- Heavy Duty HVAC Systems
- Basic welding, oxy-acetylene, plasma, and metal fabrication.
- PA State Cat 3 Inspection and Federal DOT Safety Inspection procedures.
- Develop sound and safe Diesel Shop practice skills, including environmental protection.
- Develop good shop habits, including demonstrating a good attendance record, punctuality, a willingness to work as a team, and a positive attitude toward lifelong learning.
- Apply laws of physics/scientific principles to Diesel Equipment systems and components when performing in-shop testing exercises and diagnostic procedures.
- Record diagnostic testing data and reports using necessary mathematics; solve basic problems using algebra.
- Locate and interpret technical data represented in shop manuals, diagnostic charts, and wiring diagrams. This could be hard copy or electronically driven.
- Demonstrate appropriate Diesel Shop management practices, including management, customer relations, shop procedures, and writing repair orders.
- Prepare to take and pass the ASE Medium and Heavy- Duty Truck Entry Level Certification test series after successful completion of this program. Professional Level Certification can then be taken after only one year of on-the-job experience.
- Prepare to become a lifelong learner. The Diesel Equipment Industry is very fast paced with technology changing daily. Technicians will be constantly upgrading their knowledge and skills. A solid fundamental base is crucial for building these skills.

Edward Hughes, Instructor
Associate degree in Specialized Technology: Vale Technical Institute
NC3 Certified Instructor

Matthew Herr, Instructor
AAS: Thaddeus Stevens College of Technology



Model Schedule for Diesel Technology

Semester 1	
DETC 105: Diesel Shop Safety	1
DETC 110: Diesel Service Fundamentals	3
DETC 115: Diesel Engine, Electrical, and Drive Train Components and Systems Preventive Maintenance*	3
DETC 120: Diesel Vehicle Brake, Suspension & Steering, and Cab Components Systems Preventive Maintenance*	2
DETC 160: Basic Electricity*	3
CIS 111: Intro to Computers	3
MATH 126: Technical Math I**^	3
Semester 2	
DETC 125: Diesel Fuel and Supply Systems*	3
DETC 150: Diesel Engine Technology*	4
DETC 155: Diesel Engine Lab*	3
DETC 165: Introduction to Hydraulics*	3
MATH 132: Elementary Geometry* or Math 136 Technical Math II*	3
ENG 106: English Composition	3
Semester 3	
DETC 205: Diesel Engine Electronic Fuel Systems, Operation and Diagnostics*	3
DETC 210: Vehicle Electronic Operation, Diagnostics, and Troubleshooting*	3
DETC 215: Medium and Heavy-Duty Brake Systems*	4
DETC 220: Diesel Equipment HVAC*	3
ENG 216: Technical Report Writing* or ENG 221: Public Speaking*	3
Humanities Elective	3
Semester 4	
DETC 250: Manual, Automatic/Autoshift Transmission*	4
DETC 255: Steering, Suspension, Alignment*	3
DETC 260: Basic Welding and Fabrication*	3
DETC 265: Diesel Equipment Drive Train*	3
General Studies Elective	3
PHYS 106: Physics for Everyday Life	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**76**

** Prerequisite or Co-requisite Required. See Course Description.*

***Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 126 and MATH 132/MATH 136, must take an additional Gen-Ed elective in order to meet their Gen-Ed requirements.*

^ Minimum Grade Required. See Course Description.

Diesel Technology (DETC)

DETC 105 (1 credit) Diesel Shop Safety

Diesel Shop Safety presents an overview of safety in the Diesel Industry, including an introduction to OSHA requirements. Safety in the Diesel Shop is stressed. Instructor demonstrations and student hands on training in common shop safety practices, i.e., PPE, Fire Protection and Egress, Flammable and Combustible Liquids, Machine Guarding, Electrical Safety, Lock Out/Tag Out, and Fall Prevention is thoroughly covered. Students will also complete the SP-2 online safety training course.

DETC 110 (3 credits) Diesel Service Fundamentals

Diesel service fundamentals presents an overview of the Diesel Industry, including an introduction to the Diesel Vehicle and its systems. Jobs in the Diesel Service field are covered. Safety in the Diesel Shop, including the proper use of hand and power tools is demonstrated. Instructor demonstrations and student hands on training in common shop practices, i.e., proper vehicle lifting and jacking procedures, thread cutting and repair, fasteners, torque, and torque to yield is thoroughly covered. Measurement systems, including USC and metric are discussed. Students will receive hands on training using most of the common diesel precision measurement tools including micrometers, dial indicators, bore gauges, and torque wrenches. Students will also receive training on common tools and equipment found in a modern diesel shop. This includes: grinders, drill press, hydraulic press, and many more shop tools and equipment.

DETC 115 (3 credits) Diesel Engine, Electrical, and Drive Train Components and Systems Preventive Maintenance

Diesel Engine, Electrical, and Drive Train Components and System Preventive Maintenance presents an overview of the Diesel Systems and how they are inspected and maintained. Industry procedures on maintaining the Diesel Vehicle is discussed and demonstrated. Instructor demonstrations and student hands on training in common shop practices, i.e., Diesel Engine Maintenance and Inspection, Drive Train Maintenance and Inspection, and Electrical/Electronic System Maintenance and Inspection. The tasks included in this Course are entry level Technician skills and designed to introduce the student to correct procedures and practices of vehicle maintenance and inspection in a teaching/ learning environment.
Prerequisite: DETC 105, DETC 110

DETC 120 (2 credits) Diesel Vehicle Brake, Suspension, Steering, & Cab Components Systems Preventive Maintenance

Diesel Vehicle Brake, Steering & Suspension, and Cab Components and System Preventive Maintenance presents an overview of the Diesel Vehicle Systems and how they are Maintained. Industry procedures on maintaining the Diesel Vehicle is discussed and demonstrated. Instructor demonstrations and student hands on training in common shop practices, i.e., Diesel Vehicle Air and Hydraulic Brakes Maintenance and Inspection, Steering &Suspension System Maintenance and Inspection, and Cab Maintenance and Inspection. The tasks included in in this Course are entry level Technician skills and designed to introduce the student to correct procedures and practices of vehicle inspection in a teaching/learning environment.
Prerequisite: DETC 105, DETC 110

DETC 125 (3 credits) Diesel Fuel and Supply Systems

Diesel Fuel and Supply Systems presents an overview of the Diesel Fuel Delivery Systems. Instruction starts at the supply tank and includes lines, filters, transfer pumps, and injector types and includes Instructor demonstrations and student hands on training in the most common fuel system preventative maintenance, diagnosis, and repairs. Students will also receive training in Shop practices, i.e., inspect fuel tanks and lines, low pressure fuel system components, and high-pressure system components. Students will receive hands on training using most of the common diesel fuel system diagnostic tools including electronic diagnostic equipment.
Prerequisite: DETC 105, DETC 110

DETC 150 (4 credits) Diesel Engine Technology

Diesel Engine Technology presents an overview of the Diesel Engine, Diesel Engine components, Diesel Engine Systems and Operation. Industry procedures dealing with the Diesel Engine are discussed and demonstrated. This course includes Instructor demonstrations and student hands on training in common shop practices, i.e., Diesel Engine Cylinder Head and Valve Train, Engine Block, Lubrication System, Cooling System, Air Induction and Exhaust Systems, and Engine Brakes. The tasks included in this Course are designed to give the student a thorough understanding of the Diesel Engine, Diesel Engine Systems, and Diesel Engine Components.
Prerequisite: DETC 115

DETC 155 (3 credits) Diesel Engine Lab

Diesel Engine Technology Lab provides hands on training and skill acquisition from the Diesel Engine Course. The Diesel Engine Lab presents an overview of the Diesel Engine, Diesel Engine components, Diesel Engine Systems and Operation. Industry procedures dealing with the Diesel Engines are discussed and demonstrated. This course includes Instructor demonstrations and student hands on training in common shop practices, i.e., Diesel Engine Cylinder Head and Valve Train, Engine Block, Lubrication System, Cooling System, Air Induction and Exhaust Systems, and Engine Brakes. Each student will disassemble, measure components, diagnose wear and/or failure, and reassemble a Diesel Engine. The tasks included in this course are designed to give the student a thorough understanding of the Diesel Engine, Diesel Engine Systems, and Diesel Engine Components.
Prerequisite: DETC 115

DETC 160 (3 credits) Basic Electricity

Diesel Basic Electricity Course is an overview of the Diesel Electrical System, Battery System, Starting System, Charging System, Lighting System, and Cab & Chassis Electrical System. Industry procedures dealing with the Electrical Systems are discussed and demonstrated. This course includes Instructor demonstrations and student hands on training in common shop practices, i.e., Basic Electrical Theory, 12- & 24-Volt Battery Systems, Engine Starting Systems, Unit Charging Systems, Vehicle Lighting Systems, and Vehicle Cab & Chassis Electrical Systems. The tasks included in this Course are designed to give the student a thorough understanding of Basic Electrical Principles and specific skills as related to a Diesel Vehicle.

DETC 165 (3 credits) Introduction to Hydraulics

Introduction to Hydraulics Course is an overview of Hydraulic Systems used in Diesel Powered Equipment. Hydraulic power is used to assist the operator to perform tasks otherwise impossible to complete. Fluid power is used to move and lift heavy objects. This course includes Instructor demonstrations and student hands on training in common shop practices, i.e., Basic Hydraulic Theory, Hydraulic pumps, Filtration/Reservoirs, Hoses, Fittings & Connections, Control Valves, and Actuators. The tasks included in this Course are designed to give the student a thorough understanding of Basic Hydraulic Principles and specific skills as related to Diesel Powered Equipment.
Prerequisite: DETC 105 &110

DETC 205 (3 credits) Diesel Engine Electronic Fuel Systems, Operation and Diagnostics

Diesel Engine Electronic Fuel Systems, Operation, and Diagnostics presents an overview of the Diesel Engine Electronic Fuel Systems. It covers the use of electronic equipment for troubleshooting, diagnosing, and repairing modern computerized fuel systems. Industry procedures dealing with Electronic Fuel Systems are discussed and demonstrated. This course includes Instructor demonstrations and student hands on training in common shop practices, i.e., Identify Electronic Fuel System components and configuration, perform system performance tests, and repair and service the Electronic Fuel System. The tasks included in this Course are designed to give the student a thorough understanding of the Diesel Engine Electronic Fuel System.
Prerequisite: DETC 160

DETC 210 (3 credits) Vehicle Electronic Operation, Diagnostics, and Troubleshooting

Vehicle Electronic Operation, Diagnostics, and Troubleshooting presents an overview of the Vehicle Electronic Systems. It covers the use of electronic equipment for troubleshooting, diagnosing, and repairing modern vehicle systems. Industry procedures dealing with Vehicle Electronic Systems are discussed and demonstrated. This course includes Instructor demonstrations and student hands on training in common shop practices, i.e., Identify Vehicle Electronic System components and configuration, perform system performance tests, and repair and service the Vehicle Electronic Systems. These systems include: body controllers, Diagnostic software, multiplexing, and exhaust treatment systems. The tasks included in this Course are designed to give the student a thorough understanding of the Diesel Vehicle Electronic Systems.
Prerequisite: DETC 160

DETC 215 (4 credits) Medium and Heavy-Duty Brake Systems

Medium and Heavy-Duty Brake Systems presents an overview of the Vehicle Braking Systems. It covers both hydraulic and air brake systems. Modern vehicle brake systems, both hydraulic and air, are studied. The course includes standard repair and service procedures for; hydraulic systems, hydraulic system foundation components, air system, air system foundation components, drum and disc brake systems, power assist and parking brake systems. Troubleshooting ABS (antilock braking system), traction control, and vehicle stability are also covered. *Prerequisite: DETC 120*

DETC 220 (3 credits) Diesel Equipment HVAC

Diesel Equipment HVAC presents an overview of the Diesel Equipment Heating, Ventilation, and Air Conditioning System and Operation. Industry procedures dealing with the HVAC System are discussed and demonstrated. This course includes Instructor demonstrations and student hands on training in common shop practices, i.e., Identify HVAC system components and configuration, identify refrigerant types, Perform system performance tests, and repair and service HVAC system controls. The tasks included in this Course are designed to give the student a thorough understanding of the Diesel Equipment HVAC System, and controls.
Prerequisite: DETC 120

DETC 250 (4 credits) Manual, Automatic/Autoshift Transmission

The Manual, Automatic/Autoshift Transmission Course presents an overview of transmissions used in modern Medium and Heavy-Duty Trucks. It covers both maintenance and repair of these transmissions. The course includes standard repair and service procedures for; manual transmissions, automatic transmissions, and autoshift transmissions. Troubleshooting noise complaints and shifting problems, including electronic and air shift are also covered.
Prerequisite: DETC 115

DETC 255 (3 credits) Steering, Suspension, Alignment

The Steering, Suspension, and Alignment Course presents an overview of how these systems are used in modern Medium and Heavy-Duty Trucks. It covers both maintenance and repair of these systems. The course includes standard repair and service procedures for; manual and power steering systems, air and spring suspension systems, and checking and adjusting vehicle alignment. Troubleshooting steering, suspension, and handling complaints and repairing these system problems are also covered.
Prerequisite: DETC 120

DETC 260 (3 credits) Basic Welding and Fabrication

The Basic Welding and Fabrication Course presents an overview of how these skills are used in the modern Medium and Heavy- Duty Truck Shop. The course includes basic blueprint reading, Oxy-fuel heating, cutting, and welding. It also provides training in Plasma Arc Cutting, Stick, and MIG Welding. These entry level skills are utilized in truck repair shops, trailer repair and fabrication facilities, and agriculture/heavy equipment repair shops.
Prerequisite: DETC 115

DETC 265 (3 credits) Diesel Equipment Drive Train

The Diesel Equipment Drivetrain Course presents an overview of how these systems are used in modern Medium and Heavy-Duty Trucks. It covers both maintenance and repair of these systems. The course includes standard repair and service procedures for; clutch, driveshaft and universal joints, drive axles, wheel bearings, and tires and wheels. Troubleshooting and repairing these systems is a key skill needed for today's technician.
Prerequisite: DETC 115

Electrical Technology

What is Electrical Technology?

Electrical Technology provides the opportunity to acquire the theory and skills needed to gain entry-level employment and advancement at an accelerated pace in the electrical field. Students will be able to apply basic electrical theory to all aspects of electrical technology. Skills and safe working habits are developed through construction and maintenance work project assignments. Since electricity has become an integral part of everyday life, an adequate supply of electrical power is necessary, as well as a reliable system for efficient utilization; thus, there is a continuing need for qualified electrical technicians.

Graduates' knowledge and skills are useful in such career areas as electrical engineering technicians, power plant technicians, electrical construction, industrial maintenance, and as technical representatives. High school prerequisites for this program are Algebra I & II, and a GPA of at least 2.5.

A Graduate of this Program will be able to:

- Demonstrate technical skills in a variety of electrical fields, apply these skills to new developments in these fields, and apply accepted safety standards.
- Demonstrate the ability to design, develop, and analyze electrical circuits and systems.
- Complete parts lists and order forms that demonstrate knowledge of catalogs and of coding and numbering systems for devices, hardware, and materials.
- Interpret and develop blueprints, schematic diagrams, and wiring plans and transform them into functioning projects that conform to the National Electrical Code and/ or other specifications.
- Evaluate electrical circuits and systems and communicate the results of such evaluations verbally or in writing.
- Demonstrate basic knowledge of construction procedures and electrical wiring techniques.
- Demonstrate knowledge of the use of test equipment and the electrical theory used in troubleshooting, repair, and operation of circuits, systems, and equipment.
- Demonstrate knowledge of the theory and mechanics of rotating machinery, programmable controllers, transformers, and instrumentation.
- Demonstrate leadership skills.

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BA: Western Governors University
AAS: Thaddeus Stevens College of Technology
Journeyman Electrician Electrical Apprenticeship Program:
Associated Builders and Contractors, Inc., Keystone Chapter

Frederick F. Bube, Associate Professor
BS: The Pennsylvania State University
Occupational Safety and Health Administration (OSHA)
General Industry Certification Trainer

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MEd: Temple University
BS: The Pennsylvania State University
Electrical Apprenticeship Program: IBEW, Local 98 Philadelphia Secondary
School Counselor: Immaculata University
Occupational Safety and Health Administration (OSHA)
10 Trainer, WVUVU
NABCEP Entry Level Solar PV Installer Certification
Program Instructor

Brian J. Kochan, Professor
MA: University of Maine
BS: Millersville University
AAS: Thaddeus Stevens College of Technology

Model Schedule for Electrical Technology

Semester 1	
ELEC 107: Electricity I: Theory and Analysis Lab	1
ELEC 113: Electricity I: Theory and Analysis	4
ELEC 117: Electricity I: Practicum	4
ELEC 120: Electricity I: Systems Design	3
MATH 137: Intermediate Algebra (or higher) †^	3
ENG 106: English Composition	3
Semester 2	
ELEC 126: Electricity II: Systems Design*	3
ELEC 157: Electricity II: Theory and Analysis Lab*	1
ELEC 162: Electricity II: Theory and Analysis*	4
ELEC 168: Electricity II: Practicum*	4
ENG 216: Technical Writing*	3
MATH 141: Trigonometry (or higher) *^	3
Semester 3	
ELEC 211: Industrial Electronics*	4
ELEC 216: D.C. & A.C. Motors and Generators*	4
ELEC 257: Industrial Motor Control*	4
PHYS 213: General Physics I*	4
CIS 111: Intro to Computer Applications	3
Semester 4	
ELEC 206: Industrial Electricity*	4
ELEC 263: Advanced Industrial Motor & Drive Control*	4
ELEC 267: Programmable Logic Controllers*	4
Humanities Elective	3
General Studies Elective	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**74**

*** Prerequisite or Co-requisite Required. See Course Description.**

†Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 141, must take an additional Gen-Ed elective in order to meet their Gen-Ed requirements.

^ Minimum Grade Required. See Course Description.

Electrical Technology (ELEC)

ELEC 107 (1 credits) Electricity I: Theory and Analysis Lab

Laboratory assignments enable students to demonstrate the theoretical topics covered in ELEC 113. Lab sessions train students to properly connect electrical circuitry and to utilize appropriate metering instruments to take specific measurements to determine voltage, resistance, current, and power, and to troubleshoot various circuit layouts.
Co-requisite: ELEC 113

ELEC 113 (4 credits) Electricity I: Theory and Analysis

This course presents principles, laws, and formulas relating to basic direct current (DC) and alternating current (AC) applications in electricity. Topics include electron theory, magnetism, DC power supplies, Ohm's Law, Kirchhoff's Laws, AC waveform analysis and basic motor design. Resistive and inductive loads and various electrical circuit layouts are analyzed.
Co-requisite: ELEC 107

ELEC 117 (4 credits) Electricity I: Practicum

Workshop projects enable students to develop an understanding of fundamental residential and preliminary commercial circuit design and installation in accordance with the National Electric Code (NEC) and associated building regulations.
Co-requisite: ELEC 120

ELEC 120 (3 credits) Electricity I: Systems Design

This course is an introduction to fundamental residential and preliminary commercial wiring systems design. Topics include Occupational Safety and Health Administration (OSHA) certification; electrical and on-the-job safety; tool and material familiarization; plan design and specifications; wire diagramming; and the use of applicable National Electrical Code (NEC) standards.
Co-requisite: ELEC 117

ELEC 126 (3 credits) Electricity II: Systems Design

This course is an advanced study in commercial and industrial electrical systems design and installation. Sizing various raceway systems for commercial and industrial applications, custom electrical enclosure sizing, and poly-phase distribution systems are reviewed in detail. Industrial process and motor control material, circuit planning and design, and AC motors sizing and wiring methods introduce students to advanced electrical control systems.
Prerequisites: ELEC 117 and ELEC 120
Co-requisite: ELEC 157 and ELEC 168

ELEC 157 (1 credit) Electricity II: Theory and Analysis Lab

Laboratory assignments enable students to analyze AC waveforms and AC circuit characteristics by connecting the appropriate electrical components and utilizing electrical measuring instruments to take specific measurements. Computer software is used to enable advanced circuit analysis and troubleshooting.
Prerequisites: ELEC 107 and ELEC 113
Co-requisite: ELEC 162

ELEC 162 (4 credit) Electricity II: Theory and Analysis

This course presents advanced study in the principles, laws, and formulas relating to alternating current (AC) applications in electricity. Topics include AC waveform analysis, electromagnetism, power generation and distribution, vector diagrams, power factor and correction, single-phase and poly- phase systems, and motors.
Prerequisites: ELEC 107 and ELEC 113
Co-requisite: ELEC 157

ELEC 168 (4 credit) Electricity II: Practicum

This course is a hands-on approach to commercial and industrial electrical systems design and installation. Assignments include schematic and ladder diagramming, commercial wiring and raceway systems installations, process control wiring, troubleshooting single-phase and poly-phase distribution systems, motors, and motor control circuits.
Prerequisites: ELEC 117 and ELEC 120
Co-requisite: ELEC 126

ELEC 206 (4 credits) Industrial Electricity

This course presents principles and industry standards relating to industrial electrical power distribution systems. Students will learn about power distribution equipment including single- and three-phase transformers, power switchgear, switchboards, panelboards, and motor control centers. Student learning is centered on the design and installation of industrial power equipment based on the standards established by the National Electrical Code.
Prerequisites: ELEC 126, ELEC 157 and ELEC 162

ELEC 211 (4 credits) Industrial Electronics

This course presents theory and practice in basic industrial electronic components found in the electrical industry. Students will learn about digital and analog electronic devices including diodes, transistors, SCRs, Triacs and common Integrated Circuits. A laboratory component will provide students with the opportunity to observe the operational characteristics of electronic components and their use in common electrical control devices/circuits.
Prerequisites: ELEC 126, ELEC 162, and ELEC 168

ELEC 216 (4 credits) DC and AC Motors and Generators

This course presents principles and industry standards relating to electric generators and motors. Students will learn about both DC and AC machines and their usage in power generation and industrial environments. Student learning is centered on the operation and performance of DC and AC generators and motors under varying load conditions. Additionally, students will lean installation and troubleshooting practices associated with electric motors. *Prerequisites: ELEC 126, ELEC 162, and ELEC 168*

ELEC 257 (4 credits) Industrial Motor Control

This course presents principles and industry standards relating to the design and installation of basic industrial motor control circuits. Additionally, the theory and operational characteristics of electrical devices utilized in control circuits are covered. Topics include electrical drawings, contactors/ motor starters, basic motor control circuits (two-wire/three- wire/reversing), and control devices. A laboratory component provides students with the opportunity to design, to install, and to operate various motor control schemes/circuits.
Prerequisites: ELEC 162 and ELEC 168

ELEC 263 (4 credits) Advanced Motor and Drive Controls

This course presents principles and industry standards relating to the design and installation of advanced industrial motor and drive control circuits. Additionally, the theory and operational characteristics of starting/stopping and motor speed control are covered. Topics include reduced voltage starting techniques, motor speed control, and AC/DC drive controls. A laboratory component provides students with the opportunity to design, to install, and to operate various motor control schemes/circuits, as well as opportunities to troubleshoot faulted circuits.
Prerequisites: ELEC 216 and ELEC 257

ELEC 267 (4 credits) Programmable Logic Controllers

This course presents principles and industry standards relating to the use of PLCs used for the automation of industrial process controls. Additionally, students learn to utilize the proprietary programming software to interact with and program PLCs. Topics include PLC hardware characteristics, Boolean logic, number systems, relay-type, timing, counter and advanced PLC instructions. A laboratory component provides students with the opportunity to design, to install, and to operate various PLC-controlled processes in a simulated and hands-on environment.
Prerequisites: ELEC 211 and ELEC 257

Electro-Mechanical Technology

What is Electro-Mechanical Technology?

The Electro-Mechanical Technology Associate Degree program prepares students to work at the intersection of mechanical systems, electronics, and automation. Through hands-on training, students develop skills in troubleshooting, system integration, and equipment maintenance using tools such as PLCs, sensors, motors, hydraulics, pneumatics, and robots. The program emphasizes practical application across areas like circuit analysis, industrial wiring, mechanical drives, fluid power, process control, and automation. Graduates are equipped to interpret technical drawings, program automated systems, and maintain efficient manufacturing operations—making this an ideal path for careers in industrial maintenance, automation, and advanced manufacturing.

A Graduate of this Program will be able to:

- Implement industry-standard safety procedures, including Lockout/Tagout and PPE use, in lab and field environments, maintaining a safety-first mindset in accordance with **OSHA** regulations.
- Diagnose, analyze, and resolve faults in electro-mechanical systems using industry-standard tools, techniques, and logical problem-solving methods.
- Design, assemble, and control fluid power systems, applying theoretical knowledge to practical applications.
- Wire, configure, and program industrial PLCs for various applications, interfacing with analog and digital sensors and output devices.
- Demonstrate understanding of AC/DC circuit principles and motor control by reading schematics, measuring electrical values with a multimeter, and wiring components.
- Understand mechanical drive systems belt, chain, gear, their components, operation, applications, and demonstrate the ability to identify and address common issues like misalignment and tension.
- Measure and control temperature, pressure, flow rate and tank level for industrial applications involving fluids.

Andrew Friedlund
MS: Montana State University
BS: Albright College

Benjamin Harmuth, Instructor
MEd: Temple University
BS: The Pennsylvania State University
AAS: Thaddeus Stevens College of Technology

Caleb Lower, Instructor
B.S: Eastern Mennonite University
AAS: Thaddeus Stevens College of Technology

David Thompson, Instructor
BS: The Pennsylvania State University
AAS: Thaddeus Stevens College of Technology

Model Schedule for
Electro-Mechanical Technology

Semester 1	
ELME 104: Mechanical Systems I	4
ELME 105: Manufacturing Fundamentals	4
ELME 107: Electrical Systems I	4
MATH 137: Intermediate Algebra†^ OR MATH 207: Pre-Calculus†^ (4 credits)	3
ENG 106: English Composition	3
Semester 2	
ELME 109: Programmable Logic Controllers I	4
ELME 116: Mechanical Systems II*	4
ELME 117: Electrical Systems II*	4
ENG 216: Technical Writing*	3
MATH 141: Trigonometry (or higher)*^	3
Semester 3	
ELME 204: Mechanical Systems III*	4
ELME 208: Programmable Logic Controllers II*	4
ELME 215: Robotics and Motion Control	4
PHYS 213: General Physics I*	4
Humanities Elective	3
Semester 4	
ELME 214: Mechatronics Seminar & Advanced Project	4
ELME 218: Process Control & Industrial Instrumentation	4
ELME 225: Computer Integrated Manufacturing Systems & PLCs III*	4
General Studies Elective	3
General Studies Elective	3
TOTAL CREDITS	**73**

Prerequisite or Co-requisite Required. See Course Description

†Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 141, must take an additional Gen-Ed elective in order to meet their Gen-Ed requirements.

^ Minimum Grade Required. See Course Description.

Electro-Mechanical Technology (Mechatronics) (ELME)

ELME 104 (4 credits) Mechanical Systems I

This course introduces the principles and applications of the most commonly found mechanical drive and fluid power components in an industrial manufacturing environment. Topics include mechanical power transmission devices, hydraulics, and pneumatics through a fundamental level along with related construction and troubleshooting techniques. All course material is supplemented with practical, hands-on exposure to the items described.

ELME 105 (4 credits) Manufacturing Fundamentals

This course provides students with an overview of the various types of manufacturing that take place in the discrete, hybrid, and continuous sectors and of the jobs that must be performed within manufacturing. The course provides an introduction to the techniques and resources that manufacturers employ to improve operations, preparing students for independent investigating and life-long learning. It provides basic knowledge and skills with regard to print/ schematic reading, CAD drawing, measurement, and quality assurance. At least one plant tour is included as part of this course to provide firsthand validation of the topics covered.

ELME 107 (4 credits) Electrical Systems I

This course covers the principles and application of alternating current (AC) and direct current (DC) electricity, industrial sequential control, and electrical controls construction as found in a typical manufacturing environment. Topics include AC and DC circuit analysis and measurement in resistive, capacitive, and inductive circuits; AC fixed-speed motor control; control transformers, relays, timers, and counters; mechanical, pneumatic, and hydraulic input and output devices; sequencing and logic functions; introduction to component and systems troubleshooting; electrical wiring practices; conduit and raceways; and requirements for conductors, disconnects, and raceways as specified by the National Electric Code (NEC). All course material is supplemented with practical hands-on exposure to the items described.

ELME 109 (4 credits) Programmable Logic Controllers I

This course covers the principles and application of programmable logic controllers (PLCs) as found in a typical manufacturing environment. Topics include understanding the physical components that make up a PLC, basic PLC programming, and understanding the components that make up input/output, including AC/DC discrete input modules and analog input and output modules; how these modules connect to the PLC and to output devices such as motor controls, variable frequency drives, valves, and other types of machine controls.

ELME 116 (4 credits) Mechanical Systems II

This course covers the principles and applications of the most commonly found mechanical drive and fluid power components in an industrial manufacturing environment. Topics include mechanical power transmission devices and pneumatics and hydraulics through an intermediate level along with related construction and troubleshooting techniques. All course material is supplemented with practical, hands-on exposure to the items described.
Prerequisites: ELME 104

ELME 117 (4 credits) Electrical Systems II

This course covers the principles, application, troubleshooting, and maintenance of rotating electrical motors and electronic motor drives as used in industry. Topics include various types of single- and three-phase motors, various types of DC motors, reduced voltage starting, braking, DC electronic drives and AC variable frequency drives. The course builds upon the principles and applications covered in ELME 107.
Prerequisites: ELME 107

ELME 204 (4 credits) Mechanical Systems III

This course covers the principles and applications of the most commonly found mechanical drive and fluid power components in an industrial manufacturing environment. Topics include mechanical power transmission devices, pneumatics, and hydraulics through at an advanced level along with related construction and troubleshooting techniques. All course material is supplemented with practical hands-on exposure to the items described.
Prerequisites: ELME 104 and ELME 116

ELME 208 (4 credits) Programmable Logic Controllers II

This course covers the principles and application of programmable logic controllers (PLCs) featuring the IEC 61131-3 programming standard. Topics include how to install PLCs; how to configure modules; how to wire input and output modules, including temperature-sensing devices (thermocouples and resistive temperature detectors) and analog devices featuring 0–10 volts and 4–20 mA standards. The course also includes programming the built-in human- machine interface (HMI) which allows program control and status update through a built-in touch screen.
Prerequisites: ELME 109

ELME 214 (4 credits) Mechatronics Seminar and Advanced Project

This course provides a capstone experience for the associate of applied science degree in Electro-Mechanical Technology by requiring that students—with a teammate(s)—apply skills and knowledge from each of the program areas to an independent mechatronics project. Students develop and implement a project plan and budget approved by the instructor that demonstrates the ability to integrate the skills and knowledge obtained over the previous three semesters of study. Students work with actual industrial equipment and machinery in a realistic application. This course broadens students' knowledge with respect to technology suppliers, equipment, and applications. Students should begin planning for this course during the semester prior to the semester in which the course is completed.

ELME 215 (4 credits) Robotics and Motion Control

This course provides students with a background in the programming and application of industrial robots and general purpose synchronized multi-axis motion control. Expanding upon previously-learned concepts, this course examines the combination of multiple axes of motion to perform useful functions such as creating a flexible manufacturing system utilizing robots and broadens the knowledge of different programming languages to initiate and control motion sequences. Students learn how to implement electronically many of the simple machines introduced in previous courses such as gear drives, belt drives, line shafts, and cams.

ELME 218 (4 credits) Process Control and Industrial Instrumentation

This course covers the fundamentals of process control and instrumentation as applied in industry for the control of level, flow, temperature, and pressure. The concept of a control loop is introduced and each of the loop's components— sensor, controller, and final element—are examined. Design, documentation, operation, performance tuning, and troubleshooting of single-loop systems is discussed.

ELME 225 (4 credits) Computer Integrated Manufacturing Systems and PLCs III

This course guides students through the processes of interfacing and integrating manufacturing components and unit operations into useful systems. Students work with touch screen displays (HMI) networked to programmable logic controllers. System integration is accomplished using digital input/output, DeviceNet, and TCP/IP Ethernet networking. The course involves working with a flexible manufacturing lab that includes a bar code reader, vision system, servo, and AC drive to manipulate a conveyor and other equipment to sort and fill.
Prerequisites: ELME 109 and ELME 208

Electronic Engineering Technology

What is Electronic Engineering Technology?

Electronic Engineering Technology provides the opportunity to acquire the skills needed to gain employment as an engineering technician in manufacturing and industry. Skills are developed by theoretical analysis and by the use of manipulative practice in the laboratory. The program gives students a broad theoretical and practical background in analog and digital electronic circuits. Graduates of the Electronic Engineering Technology program are prepared to find employment as technicians with the ability to prototype, to test, to program, to integrate, to install, to maintain, and to repair electronic systems. Because of the use of electronics in most industries, many employment opportunities in varied environments exist. High school prerequisites for this program are Algebra I and II, and a GPA of at least 2.5.

A Graduate of this Program will be able to:

- Demonstrate a working knowledge of DC and AC components and circuits.
- Demonstrate a basic knowledge of solid state devices and circuits.
- Analyze, design, construct, and integrate components and circuits of various types.
- Demonstrate a basic knowledge of digital electronics, logic circuits, microprocessors, and programmable logic controls (PLCs).
- Solve math problems related to circuit analysis, digital electronics, and other systems.
- Operate standard test equipment to analyze electronic systems.
- Design and troubleshoot simple microprocessor-based systems and interface peripheral devices.
- Work with robotics and motion control systems at a basic level.
- Understand pneumatics at a basic level.
- Network PLCs and other data acquisition and control systems.
- Interface sensors and control elements to PLCs

Thomas L. Evans, Instructor
AAS: Thaddeus Stevens College of Technology

Bruce C. Schreiner, Professor
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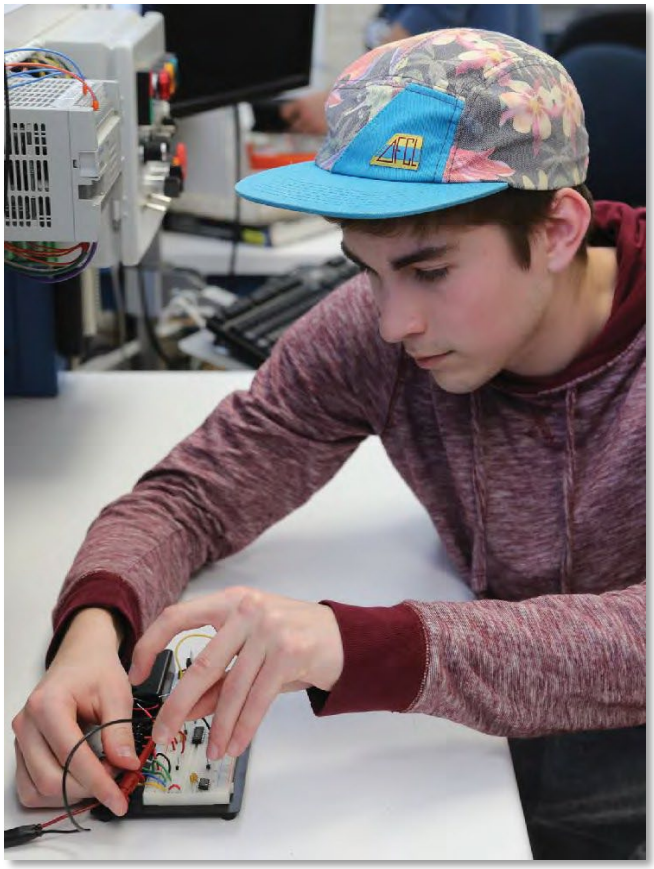


Model Schedule for Electronic Engineering Technology

Semester 1

EET 108: DC Fundamentals (w/lab)*	4
EET 118: AC Fundamentals (w/lab)*	4
EET 128: Combinational Digital Logic (w/lab)	4
MATH 137: Intermediate Algebra†^ OR MATH 207: Pre-Calculus† * (4 credits)	3
ENG 106: English Composition	3

Semester 2

EET 158: Solid State Devices I (w/lab)*	4
EET 168: Solid State Devices II (w/lab)*	4
EET 178: Sequential Digital Logic (w/lab)*	4
ENG 216: Technical Writing*	3
MATH 141: Trigonometry (or higher)*^	3

Semester 3

EET 217: Microprocessors/Microcontrollers (w/lab)*	4
EET 222: Interfacing & Programming Microprocessors (w/lab)*	4
EET 238: Interfacing and Basic Control Circuits (w/lab)*	4
PHYS 213: General Physics I*	4
Humanities Elective	3

Semester 4

EET 258: Automation & Control Systems with PLCs I (w/lab)*	4
EET 268: Automation & Control Systems with PLCs II (w/lab)*	4
EET 278: Data Acquisition and Control Project*	4
General Studies Elective	3
General Studies Elective	3

TOTAL CREDITS	73

* Prerequisite or Co-requisite Required. See Course Description.

†Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 141, must take an additional Gen-Ed elective in order to meet their Gen-Ed requirements.

^ Minimum Grade Required. See Course Description.

Electronic Engineering Technology (EET)

EET 108 (4 credits) DC Fundamentals (w/Lab)
Voltage, current, resistance, conductance, power, and energy are defined. Ohm's law, Kirchoff's laws, Thevenin, Norton, and Superposition theorems are used to analyze resistive circuits. Components studied include resistors, potentiometers, bridge circuits, comparators, simple timing circuits, switches, circuit breakers, relays, h-bridges, solenoids, photo-resistors, thermistors, voltage sources, and current sources. Students build simple DC circuits based on concepts and components being studied. Electrical measurements are performed to verify proper circuit operation. Circuit construction and measurement techniques are taught. Students are trained in the use of digital multi-meters and DC power supplies as test equipment.
Co-requisites: Math 137

EET 118 (4 credits) AC Fundamentals (w/Lab)
Waveforms, capacitors, inductors, and transformers are studied. Reactance, impedance, phase angles, and power factor are calculated. Pulse width modulation, time constants, and filters are introduced. Students build simple AC circuits based on concepts and components being studied. Wave parameters, capacitance, inductance, impedance, and phase angles are measured to verify proper circuit operation. Students are trained in the use of signal generators and oscilloscopes as test equipment.
Prerequisite: EET 108

EET 128 (4 credits) Combinational Digital Logic (w/Lab)
Basic digital electronic concepts are covered including introduction to digital machines, number systems (binary and hexadecimal), binary arithmetic, digital signals and switching, Boolean algebra, logic gates (AND, OR, NAND, NOR, XOR, XNOR), logic gate specifications, and basic combinational logic circuits. Includes an introduction to and programming of programmable logic devices (PLDs). Circuits are built from schematics and test equipment (DVM, logic analyzer, digital signal generator, and circuit simulation software) is used to learn the operation of the circuits.

EET 158 (4 credits) Solid State Devices I (w/Lab)
Diodes, rectifiers, power supplies, regulators BJT transistors, and transistor amplifiers are studied. Students build and test diode circuits, power supplies, transistor circuits, and amplifiers.
Prerequisites: EET 108 and EET 118

EET 168 (4 credits) Solid State Devices II (w/Lab)
FET transistors, op amps, thyristors, opto-isolators, and solid state relays are studied. Drivers, buffers, interfacing, pre-amps, amplifiers, active filters, mixers, oscillators, and phase controllers are built and tested.
Prerequisite: EET 158

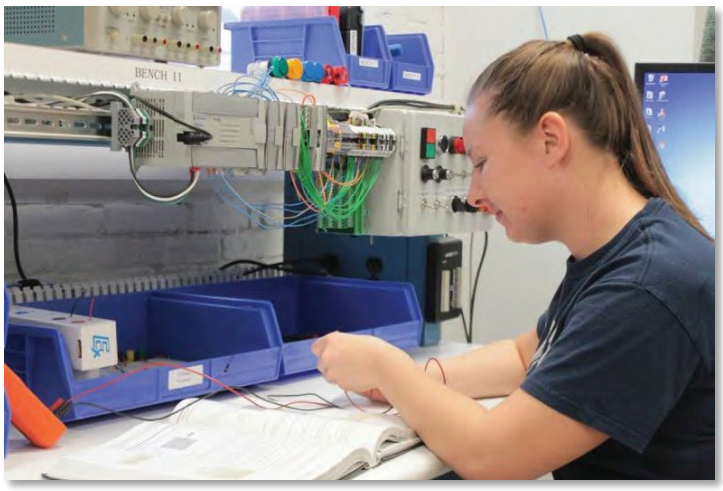
EET 178 (4 credits) Sequential Digital Logic (w/Lab)
Comprehensive coverage of combinational and sequential logic circuits including adders, subtractors, flip-flops, shift registers, counters, digital multiplexors/de-multiplexors, and A/D and D/A conversions. Electronic equipment schematics are reviewed to develop technician-level skills. Circuits are built from schematics and test equipment (DVM, logic analyzer, digital signal generator, and circuit simulation software) is used to learn the operation of the circuits.
Prerequisite: EET 128

EET 217 (4 credits) Microprocessors/Microcontrollers (w/Lab)
This course is an introduction to the basic architecture and instruction sets of microprocessors and microcontrollers. Learning activities include basic assembly language programming, working with programming IDE environment, software simulation tools, hardware emulation tools, and logic analysis of hardware signals. Both Harvard architecture and von Neumann architecture devices are covered.
Prerequisites: EET 128 and EET 178

EET 222 (4 credits) Interfacing and Programming Microprocessors (w/ Lab)
This course involves the interfacing of basic input and output devices at the chip level to microprocessors and microcontrollers and also includes their support ICs and common peripheral devices. Learning activities include interfacing, programming (at assembly language level) and modifying existing assembly and C language code. Test equipment—including DSOs, DVMs, logic analyzers, and data analyzers—is used in support of these activities.
Prerequisite: EET 217

EET 238 (4 credits) Interfacing and Basic Control Circuits (w/Lab)

This course will provide an introduction to common interfacing schemes and foundational control circuits. The student will gain insight into concepts involved in interfacing the outside world to and from a controller. The student will be introduced to basic circuits, ladder diagrams, and GUIs (graphic user interfaces) to create HMIs (human machine interfaces).
Prerequisite: Successful completion of 1st year EET courses



EET 258 (4 credits) Automation and Control Systems with PLCs I (w/Lab)

This course handles electronic topics from an industrial viewpoint and deals with actual control systems utilizing programmable logic controllers (PLCs), IEC-61131 programming concepts, and industrial circuits. It also serves as introduction to process control, industrial process techniques, and instrumentation. During this course, the PLC is used as the control device where possible and therefore PLC knowledge is advanced in both interfacing and programming areas.
Prerequisites: EET 108, EET 118, and EET 128

EET 268 (4 credits) Automation and Control Systems with PLCs II (w/Lab)

This course introduces mechanical, pneumatic, and photoelectric transducer devices used to convert all types of stimuli to electronic pulses and their use in industrial control circuits. Most activities use the PLC as the control element. Advanced ladder programming skills and higher-level language IEC-61131 programming is also covered. Industrial networking topics for control systems include RS232, TCP/IP, DH+, Modbus, DeviceNet, ASi, and other industrial networks. Motor and motion control topics include AC, DC, servo, and stepper motor operation. Motor and motion control systems are put into practical use and discussed as part of robotic systems.
Co-requisites: EET 258

EET 278 (4 credits) Data Acquisition and Control Project

Students create a control system of their own design. The project incorporates topics from all semesters. Programming and interfacing are implemented with an automation emphasis. Aspects include design, construction, testing, and documentation.
Prerequisite: Successful completion of first three semesters of EET courses.
Co-requisites: EET 258 and EET 268

Engineering CAD Technology

What is Engineering CAD Technology?

The Engineering CAD Technology program prepares graduates for positions as entry-level CAD operators in a wide range of manufacturing and engineering industries. Skills acquired from this program of study will allow students to become an integral part of product design and the manufacturing of those products. Graduates will apply
specialized knowledge and skills utilizing state-of-the-art CAD software to think critically, to solve problems, and to effectively communicate with colleagues and supervisors in today's ever- changing work environment.

From preliminary drawings and sketches, to parametric design, to animated assemblies, graduates will learn how to simplify, enhance and streamline the manufacturing and engineering processes utilizing CAD. Students acquire comprehensive skills in the following technical areas: fundamentals of drafting, technical drawing, process pipe drafting, processes of manufacturing, geometric dimensioning and tolerancing (GD&T), metals fabrication drafting, and power transmission. Students' CAD skills are developed with a comprehensive exposure to the latest software releases of AutoCAD®, Autodesk Inventor®, SolidWorks®, and PTC CREO® (Pro/Engineer®).

A Graduate of this Program will be able to:

- Produce working drawings such as detail, subassembly, and full-assembly drawings utilizing manual, freehand, and computer-aided drafting techniques.
- Recognize and apply the ASME Y14.5 guidelines in the creation of mechanical working drawings.
- Apply industrial standards to the creation of working drawings of sheet-metal components, welded assemblies, electronics drafting, piping systems, and power transmission components.
- Identify and understand basic manufacturing processes as they relate to the dimensioning of working drawings.
- Demonstrate an ability to work independently and to apply interpersonal and technical skills to solve problems as a member of a multi-disciplinary team.
- Demonstrate skills and proficiency in multiple 2D and 3D solid modeling CAD software packages.

Upon completion of the program, graduates will find various employment opportunities in the following fields:

- CAD operator
- Cost estimator
- Drafting manager
- Drafting supervisor
- Mechanical detailer
- Mechanical design technician

Donald Hart, Assistant Professor
AST: Thaddeus Stevens College of Technology
PCT Technical Committee, Sheet Metal
Society of Manufacturing Engineers (SME): Member
Technology Students Association (TSA):
State Conference Planning Team

James Knapp, Professor
MS: Millersville University
BS: Millersville University
American Design Drafting Association (ADDA): Member Society of Manufacturing Engineers (SME): Member International Technology and Engineering Education Association (ITEEA): Member Technology Students Association (TSA): State Event Coordinator
State Conference Planning Team
Epsilon Pi Tau (EPT) Honor Fraternity: Laureate Member

Model Schedule for Engineering CAD Technology

Semester 1	
ECAD 105: Metallic Manufacturing Processes	3
ECAD 112: Technical Drawing*	3
ECAD 120: Intro to AutoCAD Applications*	3
ECAD 130: Advanced AutoCAD Applications*	3
MATH 137: Intermediate Algebra (or higher) †^	3
CIS 211: Microsoft Excel	3
Semester 2	
ECAD 150: Intro to AutoDesk Inventor Applications*	3
ECAD 160: Advanced AutoDesk Inventor Applications*	3
ECAD 168: Process Pipe Drafting*	3
ECAD 171: Non-Metallic Manufacturing Processes*	3
ENG 106: English Composition	3
MATH 141: Trigonometry (or higher)*	3
Semester 3	
ECAD 207: Geometric Tolerancing*	3
ECAD 211: Metals Fabrication Drafting*	3
ECAD 220: Intro to Solid Works Applications*	3
ECAD 230: Advanced Solid Works Applications*	3
ENG 216: Technical Report Writing*	3
PHYSICS: Any Physics Elective	3
Semester 4	
ECAD 250: Introduction to Pro/Engineer Applications*	3
ECAD 260: Advanced Pro/Engineer Applications*	3
ECAD 266: Working Drawings*	3
ECAD 271: Power Transmission*	3
ENG 221: Public Speaking	3
Humanities: Elective	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**73**

*** Prerequisite or Co-requisite Required. See Course Description.**
†Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 141, must take an additional Gen-Ed elective to meet their Gen-Ed requirements.

^ Minimum Grade Required. See Course Description.

Engineering CAD Technology (ECAD)

ECAD 105 (3 Credits) Fundamentals of Machining
This course will introduce students to common machine tools and processes. Students will be exposed to the various hand and power tools as well as the Vertical Mill and the Engine Lathe.

ECAD 112 (3 Credits) Technical Drawing
A study of orthographic projection and drawing creation with applications in multi-view drawings including sectioning and auxiliary views. Techniques in pictorial drawing are also used to convey orthographic views as pictorial representations.
Co-requisites: ECAD 105 and ECAD 120 or instructor approval

ECAD 120 (3 Credits) Introduction to AutoCAD® Applications
A practical application of 2D orthographic skills utilizing AutoCAD® integrating knowledge of software commands with drafting standards. Students also experience dimensioning styles, templates, and symbols libraries. During the course, students create a series of mechanical drawings.
Co-requisites: ECAD 105 and ECAD 112 or instructor approval

ECAD 130 (3 Credits) Advanced AutoCAD® Applications
An advanced application of 2D orthographic skills utilizing AutoCAD® integrating knowledge of software commands with drafting standards. Students also experience advanced 2D commands, system variables, symbols libraries, attributes, customization, and macros. During the course, students create a series of mechanical working drawings packets.
Prerequisite: ECAD 120 or instructor approval

ECAD 150 (3 Credits) Introduction to AutoDesk Inventor® Applications
An AutoCAD Inventor® applications course with an emphasis on solid modeling parts and basic assemblies and the transition from 3D solid models to 2D working drawings.
Prerequisite: ECAD 130 or instructor approval

ECAD 160 (3 Credits) Advanced AutoDesk Inventor® Applications
An advanced AutoDesk Inventor® applications course with an emphasis on advanced modeling of parts, advanced assemblies, and working drawings and the generation of 2D working drawings from the solid models. Add-on packages such as pipe and tube, sheet metal, weldments, and wire harness diagrams are explored.
Prerequisite: ECAD 150 or instructor approval

ECAD 168 (3 Credits) Process Pipe Drafting
An intermediate drafting course covering the topics appropriate for reading and creating the working drawings necessary to instruct in the assembly of piping and equipment for industrial processes. Students are also exposed to cable and harness drafting and the process in which drawings are created.
Co-requisites: ECAD 150 and ECAD 160 or instructor approval

ECAD 171 (3 Credits) Processes of Manufacturing
An introduction to the processes commonly employed in the conversion of raw materials into finished products. This course provides students with a solid understanding of the operations necessary to cast, mold, form, separate, condition, assemble, and apply surface finishes to manufactured products.
Prerequisite: ECAD 105
Co-requisite: ECAD 150 or instructor approval

ECAD 207 (3 Credits) Geometric Tolerancing
A study of the American Society of Mechanical Engineers (ASME) dimensioning guidelines including geometric dimensioning and tolerancing (GD&T). This course emphasizes the creation and usage of the drafting symbols necessary to define the form, fit, and function of mechanical components.
Co-requisite: ECAD 211

ECAD 211 (3 Credits) Metals Fabrication Drafting
An intermediate drafting course covering the topics pertinent to reading and creating the working drawings necessary to instruct welders and metal fabricators in the creation of welded assemblies. This course includes a thorough review of industrial welding drafting practices and practical applications of the symbols required to specify them in an assembly.
Prerequisite: ECAD 171
Co-requisite: ECAD 207 or instructor approval

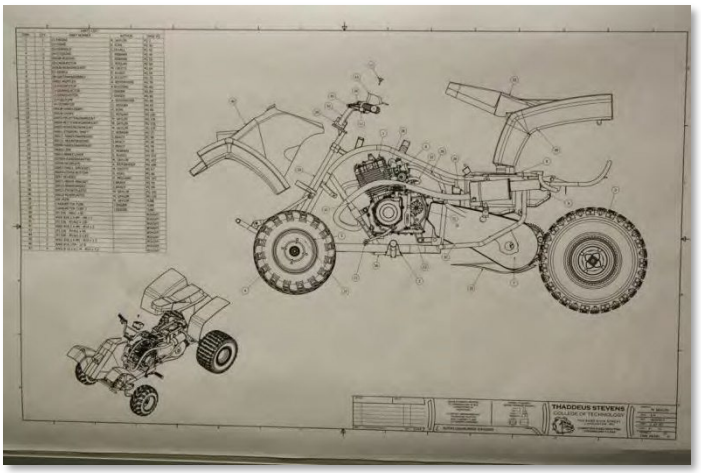
ECAD 220 (3 Credits) Introduction to SolidWorks® Applications
Introduces students to the essential applications with an emphasis on how to use the SolidWorks® mechanical design software to build parametric models of parts and assemblies and how to make drawings of those parts and assemblies.
Prerequisites: ECAD 112 and ECAD 160 or instructor approval

ECAD 230 (3 Credits) Advanced SolidWorks® Applications

Advanced SolidWorks® applications course focuses on developing skills central to the successful use of SolidWorks® parametric software. It is designed for SolidWorks users who have mastered the basics of parametric solid model design but who need to continue building skills for working with imported models, surface modeling, and an introduction to finite element analysis (FEA) using simulation software and model analysis.
Prerequisite: ECAD 220 or instructor approval

ECAD 250 (3 Credits) Introduction to PTC CREO® Pro/Engineer®Applications

Introduces students to the essential applications that focuses on learning core-modeling skills in this comprehensive, hands- on course. Topics include sketching, part modeling, assemblies, drawings, and basic model management techniques. The course also includes a comprehensive design project that enables to practice new skills by creating realistic parts, assemblies, and drawings.
Prerequisite: ECAD 230 or instructor approval



ECAD 260 (3 Credits) Advanced Pro/Engineer® Applications

Focuses on developing skills central to the successful use of PTC CREO® Pro/Engineer®Applications parametric software. It is designed for PTC CREO® Pro/Engineer® users who have mastered the basics of parametric solid model design but who need to continue building skills for working with imported models, surface modeling, sheet metal models and mechanism design which permits users to animate their assemblies in a mechanical fashion. Other skills covered are simplified reps, top-down design, flexible components, shrink-wrap feature, skeleton models, layouts, and advanced drafting commands.
Prerequisite: ECAD 250 or instructor approval

ECAD 266 (3 credits) Working Drawings

An advanced drafting course emphasizing the practices necessary to produce detail, sub-assembly, and full assembly mechanical drawings for industrial applications.
Co-requisite: ECAD 271 or instructor approval

ECAD 271 (3 credits) Power Transmission

A study of power transmission fundamentals, the related computations, and drafting methodologies. Applications include drafting standards for utilizing bushings, keys, sheaves, belts, chains, clutches, and conveyor pulleys in working assembly drawings.
Prerequisites: MATH 137 and MATH 141
Co-requisite: ECAD 266 or instructor approval

Graphic Communications & Printing Technology

What is Graphic Communications and Printing Technology?

The Graphic Communications and Printing Technology program provides a comprehensive understanding of the printing process and related fields. The student receives training in all major areas, with preparation to enter one of several printing fields, depending on interest and ability.

Graduates with technical and mechanical interests find employment in desktop publishing, pre-press, presswork, and bindery operations. Skills in computer operations, electronics, photography, chemistry, and physics will also be useful in these areas.

Graduates with good English and math skills will find employment in proofreading, estimating, production planning, and sales. Those students with artistic talent may enter layout and design, advertising, or commercial art.

A Graduate of this Program will be able to:

- Compare various segments of the commercial print industry and recognize print as a manufacturing business that integrates design, production, marketing, and distribution.
- Prepare files that meet technical specifications, ensuring efficient transitions from digital design files to printed materials.
- Implement design principles across various mediums to maximize reach and effectiveness while meeting client needs and articulating design specifications, production limitations, and project details clearly to clients and team members.
- Implement quality control and troubleshooting techniques to identify, diagnose, and resolve issues across both design and production stages.
- Ensure that design choices align with production capabilities and quality standards, for consistent and predictable print results.
- Adopt essential career skills including problem solving, effective communication, time management, customer service and teamwork to support success in a fast-paced, client-centered industry environment.
- Analyze current trends, and industry standards through continuous skill development to meet evolving business needs.

Michael Brady, Assistant Professor
BS: Walden University
AAS: Thaddeus Stevens College of Technology

Megan Tranquillo, Assistant Professor
BFA: Fashion Institute of Technology

Model Schedule for Graphic Communications & Printing Technology

Semester 1	
GRPH 105: Introduction to Graphic Communications	4
GRPH 127: Printing Processes I	3
GRPH 130: History of Graphics Industry	3
GRPH 135: Graphic Communications Applications	3
CIS 111: Intro to Computer Applications	3
MATH 111: Business Math (or higher)	3
Semester 2	
GRPH 160: Graphic Communications I	3
GRPH 165: Digital Design I	3
GRPH 180: Printing Processes II	3
GRPH 185: Typography I	3
CIS 211: Microsoft Excel	3
ENG 106: English Composition	3
Semester 3	
GRPH 207: Bindery and Finishing	3
GRPH 214: Print Design and Packaging	3
GRPH 222: Typography II	3
GRPH 228: Printing Processes III*	3
Humanities Elective	3
ENG 221: Public Speaking OR ENG 216: Technical Writing*	3
Semester 4	3
GRPH 258: Advanced Print Production*	3
GRPH 262: Color Theory	3
GRPH 267: Graphics Communications Studio*	3
GRPH 272: Digital Design II*	3
Science Elective	
General Studies Elective	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**73**

*** Prerequisite or Co-requisite Required. See Course Description.**
^ Minimum Grade Required. See Course Description.

Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 141, must take an additional Gen-Ed elective in order to meet their Gen-Ed requirements.

Graphic Communications & Printing Technology (GRPH)

GRPH 105 (3 credits) Introduction to Graphic Communications
Students explore the fundamental elements and principles of design and how they are applied across the graphic communications industry. Emphasis is placed on visual organization, hierarchy, and communication effectiveness.

GRPH 127 (3 credits) Printing Processes I
This course introduces students to the major commercial printing processes. Students gain hands-on access to lab equipment while learning foundational safety and operating procedures. Career opportunities, salary potential, and the role of each process in the modern industry are also discussed.

GRPH 130 (3 credits) History of Graphics Industry
This course examines the evolution of graphic communication and print production, tracing key technologies, individuals, and movements that shaped the field. Students connect historical developments to contemporary design and production practices.

GRPH 135 (3 credits) Graphic Communications Applications
This course familiarizes students with the industry-standard software used in design and production workflows. Students learn how to integrate multiple programs, combine digital and analog techniques, and prepare files for prepress and print.

GRPH 160 (3 credits) Graphic Communications I
Building upon design foundations, students apply design principles and communication theory to create effective printed pieces. Emphasis is placed on understanding client needs, audience expectations, and professional presentation. *Prerequisite: GRPH 117*

GRPH 165 (3 credits) Digital Design I
This course introduces design and production fundamentals for digital environments. Students explore HTML structure, digital file formats, and responsive design concepts for web and social media platforms.

GRPH 180 (3 credits) Printing Processes II
A continuation of Printing Processes I, this course deepens understanding of commercial printing through practical application and multi-color production. Students learn registration techniques and are introduced to basic prepress and color management principles. *Prerequisite: GRPH 126*

GRPH 185 (3 credits) Typography I
Students learn the foundations of typography, including its history, anatomy, and expressive potential. Emphasis is placed on type selection, hierarchy, readability, and layout design for single-page compositions.

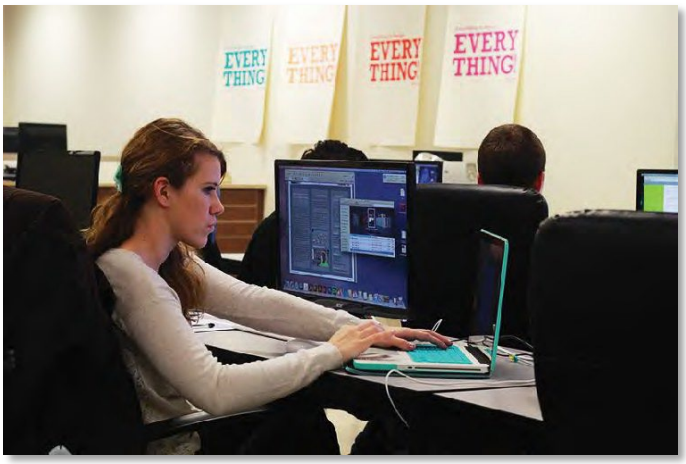
GRPH 207 (3 Credits) Bindery and Finishing
This course explores both historical and contemporary bindery methods. Students gain hands-on experience with folding, trimming, sewing, adhesive binding, laminating, and die-cutting, connecting craftsmanship to commercial workflows. Emphasis is placed on finishing techniques as intentional design elements and value-add components that enhance both function and visual impact.

GRPH 214 (3 Credits) Print Design and Packaging
Students explore the design and production of three-dimensional and structural printed materials. Projects include packaging, folding cartons, direct mail, and variable-data pieces with attention to material sustainability and cost.

GRPH 222 (3 Credits) Typography II
A continuation of Typography I, this course expands into multipage and complex typographic systems. Students refine their understanding of hierarchy, rhythm, and structure through advanced layout projects. *Prerequisite: GRPH 185*

GRPH 228 (3 Credits) Printing Processes III

This advanced course builds on prior printing knowledge with projects in digital, wide-format, lithography, and screen printing. Students explore specialty substrates, ink behavior, and troubleshooting while refining process control. *Prerequisite: GRPH 180*



GRPH 258 (3 Credits) Advanced Print Production

Students manage complex, real-world print projects from concept through completion. Topics include estimating, scheduling, workflow planning, and quality control. Emphasis is placed on collaboration and professional production standards. *Prerequisite: GRPH 228*

GRPH 262 (3 Credits) Color Theory

This course explores color from both artistic and technical perspectives. Students experiment with color harmony, perception, and psychology while learning industry practices for color management, calibration, and reproduction accuracy.

GRPH 267 (3 Credits) Graphic Communications Studio

Serving as the capstone course, students integrate design, production, and presentation skills to complete a final portfolio project. The course emphasizes project management, professional critique, and readiness for entry into the field. Prerequisite: GRPH 222

GRPH 272 (3 Credits) Digital Design II

Students build on digital design fundamentals to create cross-platform brand and marketing assets. Coursework emphasizes responsive design, interactivity, and visual consistency across digital media.
Prerequisite: GRPH 165

Heating, Ventilation, Air Conditioning, & Refrigeration

What is Heating, Ventilation, Air Conditioning, & Refrigeration (HVACR)?

The HVACR program is unique because it treats designing, retrofitting, testing, and balancing on a problem-solving level. This specialized program prepares the technician for the fast- growing, highly technical HVACR field.

The challenge for the service technician is to optimize the service operation of HVACR systems to maximize customer and employer satisfaction. Using computers to replicate various conditions that could be encountered, students develop a plan of action to use with live work.

Students learn current methods of identifying and performing efficiency evaluations on various types of heating, ventilation, and air-conditioning systems as well as adjusting and balancing equipment for maximum performance.

In addition to HVACR classroom theory sessions, students also perform service and installation on numerous live projects on and off campus. The HVACR laboratory includes tools, equipment, computers, and instrumentation typically found in commercial, residential, and industrial settings. The lab also includes ground source heat pumps, gas efficient furnaces, regular heat pumps, oil-fired furnaces, gas and oil boilers, ice machines, walk-in boxes, roof-top equipment, chiller systems, and commercial refrigeration trainers.

Challenging careers abound on a national level with firms offering graduates a variety of positions as service technicians, installation technicians, estimators, and in-plant industrial technicians. High school prerequisites for this program are Algebra I & II, and a GPA of at least 2.5.

A Graduate of this Program will be able to:

- Demonstrate the ability to do technical work in a variety of heating, cooling, plumbing, and refrigeration fields; apply safety standards and understand and work with technical developments in the industry.
- Apply concepts of algebra and physics in the layout, design, development, and analysis of refrigeration and air conditioning equipment and systems.
- Identify and demonstrate correct use of tools, materials, and equipment used in the trade.
- Demonstrate the ability to read and interpret blueprints and use blueprints when installing equipment.
- Troubleshoot heating, cooling, and refrigeration equipment using standard troubleshooting procedures.
- Write clear, concise, legible, and accurate technical reports using technical English and apply verbal communication skills in job-related activities.
- Read and interpret electrical schematics and use schematics when installing and repairing equipment.
- Estimate the cost of an installation and design and lay out an effective system for a specific location and use.
- Demonstrate knowledge of the operation and use of hermetic, reciprocating, and centrifugal compressors.
- Apply basic knowledge of airflow, ventilation, and energy conservation concepts to the design of systems, using modern building design and solar energy technology.

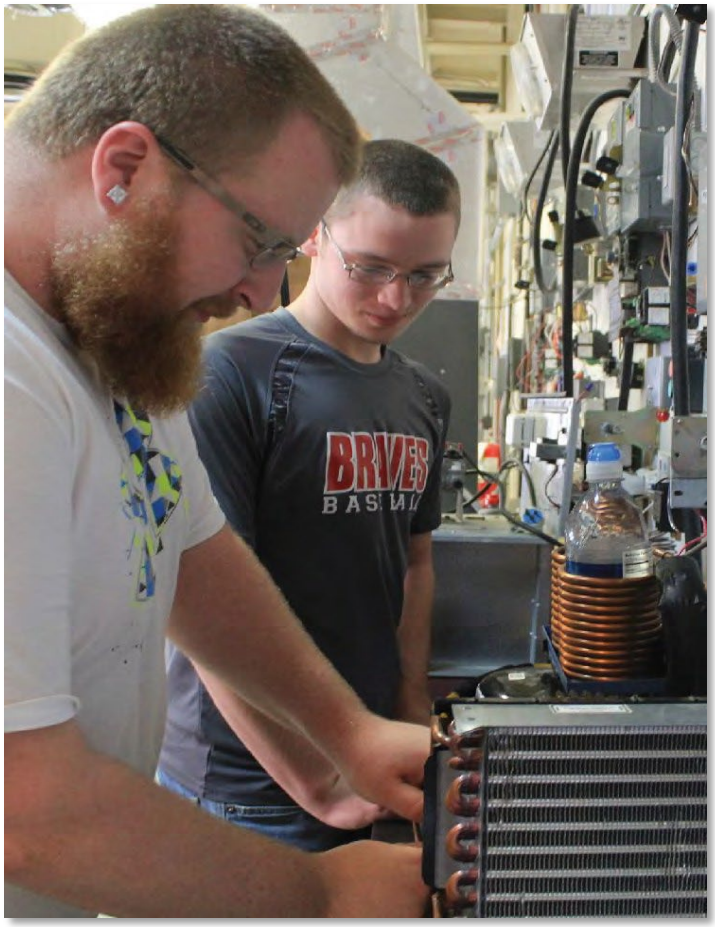
Matthew Bixler, Associate Professor
BS: Eastern Mennonite University
AAS: York Technical Institute

Ty Christman, Assistant Professor
BS: Eastern Mennonite University
AAS: Washtenaw Community College

Bart Heagy, Associate Professor
BS: Eastern Mennonite University
CTE Certification: Temple University

Bruce Hrycek, Instructor
MBA: Trinity University
MD HVACR Master 01

John Sweda, Instructor
BS: Temple University
MEd: Bloomsburg University
PA Instructional II Certification in HVACR and Plumbing



Model Schedule For HVACR

Semester 1	
HVAC 123: OSHA Electrical and Construction Safety	1
HVAC 135: Electricity for HVACR	3
HVAC 138: Lab Practice I: Electrical Applications	2
HVAC 143: HVAC Installation Procedures	1
HVAC 146: Lab Practice II: Installation Procedures	2
HVAC 150: Principles of Refrigeration	3
MATH 126: Technical Math I (or higher) †	3
Science Elective	3
Semester 2	
HVAC 157: Residential Heating Systems	3
HVAC 160: Lab Practice III: Heating Applications	2
HVAC 167: Refrigerant System Components	2
HVAC 170: Lab Practice IV: Cooling Applications	2
HVAC 175: Refrigerant Management	2
HVAC 180: Mechanical Codes for HVACR	1
MATH 132: Elementary Geometry (or higher)*	3
ENG 106: English Composition	3
Semester 3	
HVAC 206: Air Conditioning Systems*	4
HVAC 216: Systems Installation and Start Up	3
HVAC 256: Load Calculations	3
HVAC 266: Ventilation	3
ENG 221: Public Speaking OR ENG 216: Technical Writing*	3
Humanities Elective	3
Semester 4	
HVAC 211: Heat Pump Systems	3
HVAC 221: Commercial Refrigeration	3
HVAC 261: Controls of HVACR	3
HVAC 271: System Servicing and Troubleshooting	3
General Studies Elective	3
CIS 105 OR CIS 111	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**74**

** Prerequisite or Co-requisite Required. See Course Description.*

† Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 126 and MATH 132, must take an additional Gen-Ed elective to meet their Gen-Ed requirements.

Heating, Ventilation, Air Conditioning, & Refrigeration (HVACR)

HVAC 123 (1 credit) OSHA Electrical and Construction Safety
This course is designed to meet the requirements that all service technicians must have for training in the rules and regulations of Occupational Safety and Health Administration (OSHA) Construction Safety and Building Maintenance Electrical Safety. Emphasis is on the requirements for compliance, identifying a proper lock-out/tag-out policy, and procedures a technician should follow for safe electrical work.

HVAC 135 (3 credits) Electricity for HVACR
This course is designed to provide the basic knowledge of electrical theory and application as it pertains to the HVACR industry. The course will emphasize the basic electrical laws and definitions, generation and distribution of electrical power, and the functions of electrical controls and loads, including electrical measurements and testing. Further emphasis is placed on the application of electrical theory as it pertains to the HVACR industry. Wiring diagrams and schematics will be developed and used to wire basic electrical components including testing and troubleshooting electrical circuits.

HVAC 138 (2 credits) Lab Practice I: Electrical Applications
Practical experience is provided to apply the theory learned concerning electrical components and controls of the HVACR industry. Students demonstrate the proper electrical installations for basic A/C and heating equipment. Emphasis is placed on the installation, testing and start-up operation of motors, relays, thermostats, pressure switches, and other basic controls.

HVAC 143 (1 credit) HVAC Installation Procedures
This course introduces the basic methods, tools, and materials needed for the installation of the HVACR equipment to students. A foundational study of the purpose of various tools and skills necessary for their safe use is emphasized. Materials and joining methods of various piping, tubing, wiring, and ductwork systems as used in this industry is studied.

HVAC 146 (2 credits) Lab Practice II: Installation Procedures
This course provides the practical hands-on skill training. Piping practice utilizes various refrigeration trainers and a selection of commonly used A/C and heating equipment. Residential duct systems are installed on working systems. Practice is provided for the development of skills needed for various methods of joining copper tubing, stainless steel natural-gas tubing, plastic, and iron pipe.

HVAC 150 (3 credits) Principles of Refrigeration
This course provides a study of the basic principles of thermodynamics as applied to the refrigeration cycle. The Mollier diagram is used to display the purpose and operation of the various components used in the system at expected standard operating conditions. The lab portion provides practice in measuring various system performances.

HVAC 157 (3 credits) Residential Heating Systems
This course provides a basic understanding of different types of oil and natural gas residential heating systems. Emphasis is on proper installation, sequence of operation, and proper maintenance requirements.

HVAC 160 (2 credits) Lab Practice III: Heating Applications
This lab time provides the hands-on training pertaining to residential heating systems. Typical residential heating systems is utilized in the lab experience to master the skills necessary for proper installation and service. Students practice typical annual servicing, combustion analysis, and efficiency testing of fossil fuel heating systems.

HVAC 167 (2 credits) Refrigerant System Components
Introduction to residential and light commercial A/C system components. This course details the following components of air conditioner and refrigeration systems: Evaporators, condensers, metering devices, compressors, and other safety and servicing system components. Emphasis is placed on applying the knowledge gained in HVAC 150, along with manufacturer specifications, to determine proper installation and operating conditions of these cooling system components.

HVAC 170 (2 credits) Lab Practice IV: Cooling Applications
This lab provides the hands-on training for skills necessary to properly install and start-up comfort cooling systems. Students are required to assemble a refrigeration system and test it for proper operation under various conditions.

HVAC 175 (2 credits) Refrigerant Management

This course is designed to give students the knowledge to understand the laws on venting and handling of the various refrigerants covered in the Clean Air Act–Section 608. A requirement for this course is to take the EPA Technician Certification Exam provided by ARI. Lab practice is provided in refrigerant recovery, recycling, evacuation, and charging various small appliances and high pressure appliances.

HVAC 180 (1 credit) Mechanical Codes for HVACR

This course introduces HVACR students to the current International Code Council (ICC) codes. The emphasis highlights the sections of these codes that are relevant to the technician for proper HVACR equipment installation. A brief overview of other national and local building codes is also provided.

HVAC 206 (4 credits) Air Conditioning Systems

Air conditioning benefits, unitary cooling, unitary combination cooling and heating equipment, central station systems, service and problem analysis, and absorption refrigeration system topics are studied.
Prerequisites: HVAC 150

HVAC 211 (3 credits) Heat pump Systems

Covers basic principles, components, and application of heat pump systems.

HVAC 216 (3 credits) System Installation and Start Up

Codes and standards, heating start-up, heating checkouts, heating operation, AC start-up, AC checkouts, AC operation, heat pump start-up, heat pump checkouts, and heat pump operation are covered.

HVAC 221 (3 credits) Commercial Refrigeration

Discusses system applications, refrigerated storage, and ice machines.

HVAC 256 (3 credits) Load Calculations

Covers refrigeration, psychometrics, heating load, and cooling load calculations.

HVAC 261 (3 credits) Controls of HVAC

Topics include controls, valves, regulators, sensing devices/ fuel controls, residential control systems—heating/cooling, commercial and engineered control systems, and heat pump controls.

HVAC 266 (3 credits) Ventilation

Students learn about air flow principles/duct design, mechanical and electronic filtration, and fans.

HVAC 271 (3 credits) System Servicing and Troubleshooting

Refrigeration system problems, electrical troubleshooting, heating service/problem analysis, heat pump service/ problem analysis, and AC service/problem analysis are covered.

Masonry Construction Technology

What is Masonry Construction Technology?

Masonry Construction Technology provides the opportunity to develop the skills of a proficient mason, from the simple spreading of mortar to the complex construction of an inside fireplace. These skills are developed by practice projects, which are preceded by theory lectures and demonstrations. Faculty members show films on various aspects of the trade, and students take field trips to learn about the manufacture of masonry products.

Since a large part of masonry work is decorative as well as functional, special emphasis is placed on appreciation of the beauty and permanence of brickwork and on the development of pride in good workmanship.

Students find employment in the field as masons and with experience, as forepersons or superintendents. Many masons are self-employed.

A Graduate of this Program will be able to:

- Operate masonry tools and equipment safely and effectively.
- Use masonry terminology.
- Read blueprints to estimate materials quantity and pricing.
- Lay out and construct footings and build a block foundation.
- Apply brick veneering to a structure.
- Construct a masonry arch.
- Lay out and set ceramic tile.
- Construct an inside fireplace and chimney.
- Repair older masonry structures.
- Organize personnel and materials at a construction site.
- Provide all masonry options in current residential construction.

Michael T. Gardner, Instructor
AAS: Thaddeus Stevens College of Technology

Chad Hummel, Instructor
AAS: Thaddeus Stevens College of Technology

Model Schedule For Masonry Construction Technology

Semester 1

Masonry Construction Technology

Semester 1	
MASN 101: Intro to Tools, Safety, and Equipment	**3**
MASN 105: Introduction to Masonry Construction	**3**
MASN 110: Development of Masonry Construction	**3**
MASN 116: Chimney Construction	**3**
MATH 126: Technical Math I (or higher) †	**3**
ENG 106: English Composition	**3**
Semester 2	
MASN 155: Block Construction, Bearings & Anchoring Systems	**3**
MASN 158: Adhered Concrete Masonry Veneer	**2**
MASN 162: Masonry Hardscaping Patios & Retaining Walls	**2**
MASN 167: Masonry Restoration and Building Maintenance	**3**
MASN 171: Concrete Sidewalks	**1**
MATH 132: Elementary Geometry (or higher)*	**3**
CIS 111: Intro to Computer Applications OR CIS 105: Drawing with AutoCAD	**3**
Health and Physical Education Elective	**1**
Semester 3	
MASN 207: Advanced Masonry Applications	**5**
MASN 213: Planning and Management	**3**
MASN 216: Blueprint Reading and Estimating	**4**
ENG 221: Public Speaking OR ENG 216: Technical Writing	**3**
Science: Elective*	
Semester 4	
MASN 256: Fireplace Construction	**4**
MASN 261: Arch Construction	**3**
MASN 266: Tile Setting	**2**
MASN 271: Footings and Foundations	**3**
Humanities Elective	**3**
BUSN 106: Small Business Management	**3**
TOTAL CREDITS	**73**

Prerequisite or Co-requisite required. See Course Description.

†*Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 126 and MATH 132, must take an additional Gen-Ed elective to meet their Gen-Ed requirements.*

Masonry Construction Technology (MASN)

MASN 101 (3 credits) Introduction to Tools, Safety and Equipment
Students will be introduced to the tools required for the masonry trade, understand safety standards and practices, and receive training and certifications on various equipment used on a job site.

MASN 105 (3 credits) Introduction to Masonry Construction
This course will teach the fundamentals of the masonry trade. This will include spreading mortar and striking full joints, laying brick and block to the line, bonding the length and height of a wall, building leads, and hanging a corner pole.

MASN 110 (3 credits) Development of Masonry Materials
History and the manufacturing of masonry materials. In the manufacturing of materials, there are many different types of brick and block. Students will learn the various names and where the material should be used in a wall. Portland cement comes in different forms and how to properly mix the different types. Students will learn what the different strengths of cement and where they should be used.

MASN 116 (3 credits) Chimney Construction
Students will understand the difference between and be able to construct properly a single and double flue chimney.

MASN 155 (4 credits) Block Construction, Bearings, and Anchoring Systems
Students will learn terminology; the placement of anchor bolts, bearing plates, setting lintels, cutting in electrical boxes and door ties. They will be working around conduit, duct work and rebar reinforcement. They will also build a composite wall using block and brick.

MASN 158 (2 credits) Adhered Concrete Masonry Veneer
Students will learn to use the tools and equipment for installing veneer stone; to apply hanging wire, scratch coat, flashings, vapor barriers, and drain mats; to hang stone; and to point the mortar joints. Students will learn the different types of patterns stone can be laid in.

MASN 162 (2 credits) Masonry Hardscaping Patios & Retaining Walls
The proper use of masonry products in an outdoor environment. Understand the process to build an outdoor patio and retaining walls using masonry materials.

MASN 167 (3 credits) Restoration and Building Maintenance
Cover the various materials that go along with masonry products. These would be caulking, waterproofing, patching, repointing, cutting out and repairing damaged areas, and cleaning of masonry. This course will focus on preventive maintenance to stop any further damage of the masonry structure.

MASN 171 (1 credit) Concrete Sidewalks
Students will learn how to build forms and how to place concrete for a sidewalk.

MASN 207 (5 credits) Advanced Masonry Applications
Application of skills relative to masonry systems. Includes working on the off-campus housing project. Techniques include firewall construction, brick veneering, porch/patio and step construction, and proper preparation for varying weather conditions.

MASN 213 (3 credits) Planning and Management
Organizing personnel and materials on a job site; planning and coordinating the placement of equipment and materials; and completing a job on time and within budget. Supervisory duties and responsibilities are also covered.

MASN 216 (4 credits) Blueprint Reading and Estimating
Basic skills to interpret residential construction drawings. Emphasis on calculation of materials, labor, and equipment necessary to complete selected projects. Proposals and closed bids required.

MASN 256 (4 credits) Fireplace Construction

Provides history, theory, and function of the fireplace. Students design and construct a fireplace of their choice with emphasis on proper terminology, workmanship, and various components of different fireplaces.

MASN 261 (3 credits) Arch Construction

Provide the skills necessary to build various types of arches. Terminology, different types, and various techniques used in the construction of arches are taught.

MASN 266 (2 credits) Tile Setting

The basics of ceramic tile setting are covered. Emphasis is placed on terminology, tools, safety, and proper layout.

MASN 271 (3 credits) Footings and Foundations

Provides the opportunity to layout and construct a residential concrete block foundation. Topics include blueprint interpretation, materials estimating, installation of anchor bolts, partition construction, and the use of the transit for site layout.

Mechanical Engineering Technology

What is Mechanical Engineering Technology?

The Mechanical Engineering Technology program prepares graduates for entry-level employment in the mechanical engineering field. The skills acquired from this course of study allow the student to visualize objects in three dimensions, describe objects with manual and computer-aided drafting (CAD) techniques, and apply mechanical engineering principles to design products, tools, and equipment for a manufacturing-oriented industry. The program's affiliations with industry are maintained through an advisory committee and the Society of Manufacturing Engineers (SME).

The student's skills are developed with a comprehensive exposure to the concepts of orthographic projection, sectioning, and isometric drawing with an emphasis on instrument drawing techniques. A thorough understanding of geometric dimensioning and tolerancing (GDT) and a demonstrated proficiency with the latest CAD software complement these skills. Additional training in fabrication principles, mechanical design, product design, and manufacturing processes provides a well-rounded experience with mechanical design and manufacturing technology.

The principles of mechanical engineering are mastered by studying the motion of mechanical objects and the underlying concepts required to understand how a machine functions or a manufacturing process is performed. By studying the practical aspects of structured programming, parametric feature-based design, and solid modeling, the student gains the skills necessary to utilize the computer as a design tool. Further studies in fluid mechanics, production design, engineering materials, thermodynamics and heat transfer, machine design, and related engineering topics allow the student to build upon these concepts. Practical applications of these concepts are further realized as the student completes an internship project during the fourth semester. Upon entering the work place, the graduate can expect to assist engineers and scientists in the design and development of new products. As work experience is acquired, the graduate can expect to gain more design responsibility and thereby become a key member of an engineering team.

A Graduate of this Program will be able to:

- Produce detail, subassembly, and full-assembly engineering drawings utilizing manual and computer- aided drafting techniques.
- Recognize and apply the ASME Y14.5 guidelines in the creation of engineering drawings.
- Utilize ASME Y14.5 geometric dimensioning and tolerancing guidelines for establishing and maintaining the functional fit of mating parts.
- Apply industrial practices in the design and fabrication of sheet-metal components, welded assemblies, and piping systems.
- Identify and understand manufacturing processes and their effect on the cost and/or function of manufactured products.
- Analyze and design mechanical parts and systems for static and dynamic loading conditions.
- Apply engineering principles for determining the effects of stationary and moving fluids and the control and transformation of energy.
- Design manufacturing tooling for locating, clamping, forming, piercing, blanking, and/or shaping a given part.
- Employ structured programming techniques and utilize computer software tools to design and analyze mechanical parts or systems.
- Select and apply engineering materials for use in the design and manufacture of mechanical components.
- Analyze and design machine elements such as gears, shafts, bearings, clutches, brakes, flywheels, and related assemblies.
- Apply engineering problem-solving skills to complete a project on time and within budget.

Amy Jo Mumma-Frank, Professor
BA: Elizabethtown College

Christopher Way, Instructor
BS: The University of Iowa

Model Schedule for Mechanical Engineering Technology (Option #1)

Semester 1	
MET 101: Drafting Fundamentals	3
MET 106: Engineering Graphics^	3
MET 116: Computer-Aided Drafting^	3
MET 176: Manufacturing Processes^	3
MATH 137: Intermediate Algebra (or higher) †^	3
ENG 106: English Composition^	3
Semester 2	
MET 111: Engineering Standards*	3
MET 161: Fabrication Principles*	3
MET 166: Mechanical Design	3
MET 171: Product Design*	3
PHYS 207: Statics and Strength of Materials*^	3
MATH 141: Trigonometry (or higher) *^	3
Semester 3	
MET 201: Engineering Mechanics*^	3
MET 206: Fluid Mechanics*^	3
MET 211: Production Design*^	3
MET 216: Parametric Solid Modeling*^	3
ENG 216: Technical Writing*^	3
PHYS 213: General Physics I*^	4
Semester 4	
MET 261: Engineering Materials*	3
MET 266: Thermodynamics*	3
MET 271: Machine Design*	3
MET 276: Engineering Seminar*	3
Humanities Elective	3
General Studies Elective	3
TOTAL CREDITS	**73**

Model Schedule for Mechanical Engineering Technology (Option #2)

Semester 1	
MET 101: Drafting Fundamentals	3
MET 106: Engineering Graphics^	3
MET 116: Computer-Aided Drafting^	3
MET 176: Manufacturing Processes^	3
MATH 207: Precalculus (or higher) †^	4
ENG 106: English Composition^	3
Semester 2	
MET 111: Engineering Standards*	3
MET 161: Fabrication Principles*	3
MET 166: Mechanical Design	3
MET 171: Product Design*	3
PHYS 207: Statics and Strength of Materials*^	3
General Studies Elective	3
Semester 3	
MET 201: Engineering Mechanics*^	3
MET 206: Fluid Mechanics*^	3
MET 211: Production Design*^	3
MET 216: Parametric Solid Modeling*^	3
ENG 216: Technical Writing*^	3
PHYS 213: General Physics I*^	4
Semester 4	
MET 261: Engineering Materials*	3
MET 266: Thermodynamics*	3
MET 271: Machine Design*	3
MET 276: Engineering Seminar*	3
Humanities Elective	3
General Studies Elective	3
TOTAL CREDITS	**74**

** Prerequisite or Co-requisite Required. See Course Description.*
†Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MA
^ Minimum Grade Required. See Course Description.

Mechanical Engineering Technology (MET)

MET 101 (3 credits) Drafting Fundamentals
An introductory course in the basics of instrument drawing, lettering, geometric construction, and associated manual drafting techniques.

MET 106 (3 credits) Engineering Graphics
A study of orthographic projection and the creation of engineering drawings with applications in sectioning and auxiliary views. This course also includes isometric drawing and practice in freehand sketching.

MET 111 (3 credits) Engineering Standards
A study of the American Society of Mechanical Engineers (ASME) dimensioning guidelines including geometric dimensioning and tolerancing (GD&T) for the design and manufacture of interchangeable mechanical parts.
Prerequisites: MET 106 and MET 116 (Both with final grade of C or higher or instructor permission)

MET 116 (3 credits) Computer-Aided Drafting (CAD)
An introduction to computer-aided drafting and its applications. The student will learn the fundamentals of using the computer operating system and the CAD program. These skills are affirmed with the completion of a series of mechanical drawings.

MET 161 (3 credits) Fabrication Principles
A study of the industrial practices in the design and fabrication of sheet-metal components, welded assemblies, and piping systems.
Prerequisite: MET 116 (With final grade of C or higher or instructor permission)

MET 166 (3 credits) Mechanical Design
A study of power transmission fundamentals and design- related computations. Design applications include sizing and/or selection of belts, chains, gears, bearings, couplings, shafts, cams, linkages, and electric motors.

MET 171 (3 credits) Product Design
The practical implementation of the mechanical design practices, engineering standards, and computer-aided drafting techniques as they relate to the design and fabrication of a manufactured product.
Prerequisites: MET 106 and MET 116 (Both with final grade of C or higher or instructor permission)

MET 176 (3 credits) Manufacturing Processes
A comprehensive study of the processing of materials as it relates to manufacturing. In this course, class lectures and literature review will be combined with machine shop practice and plant visits to form a well-rounded understanding of the intricacies of manufacturing technology

MET 201 (3 credits) Engineering Mechanics
An introduction to the analysis of the static and dynamic forces which govern the behavior of structures and machines. The analytic skills in vector mechanics established in this course are employed for the design of structural components and assemblies as well as machine elements such as cams, gears, and linkages.
Prerequisites: MATH 137, MATH 141 and PHYS 207 (All with final grade of C or higher or instructor permission) Co-requisite: PHYS 213

MET 206 (3 credits) Fluid Mechanics
A study of the effects of stationary and moving fluids as it relates to the analysis and design of mechanical systems. Topics involving the volume and energy transfer of a working fluid are utilized to demonstrate the problems commonly encountered in industry.
Prerequisites: MATH 137, MATH 141 and PHYS 207 (All with a final grade of C or higher or instructor permission) Co-requisite: MET 201 and PHYS 213

MET 211 (3 credits) Production Design
An introductory course in manufacturing engineering and lean production methods. Major topics include manufacturing processes, economics of production design, and design of manufacturing systems.
Prerequisite: MET 176 (With a final grade of C or higher or instructor permission)
Corequisite: MET 216

MET 216 (3 credits) Parametric Solid Modeling
An intermediate computer-aided drafting course in three-dimensional, feature-based, parametric solid modeling with applications in the designing and detailing of mechanical components and assemblies. Applications include structured programming with practical applications in the creation and modification of solid models for complex parts, assemblies, and related engineering drawings.
Prerequisite: MET 116 (With final grade of C or higher or instructor permission)

MET 261 (3 credits) Engineering Materials

An introduction to the selection and utilization of engineering materials as they relate to their mechanical characteristics under various operating conditions. Material strength and failure criteria are utilized to identify design margins of safety for mechanical components.
Prerequisites: MET 176, ENG 106, ENG 216, PHYS 207, and PHYS 213 (All with final grade of C or higher or instructor permission)

MET 266 (3 credits) Thermodynamics

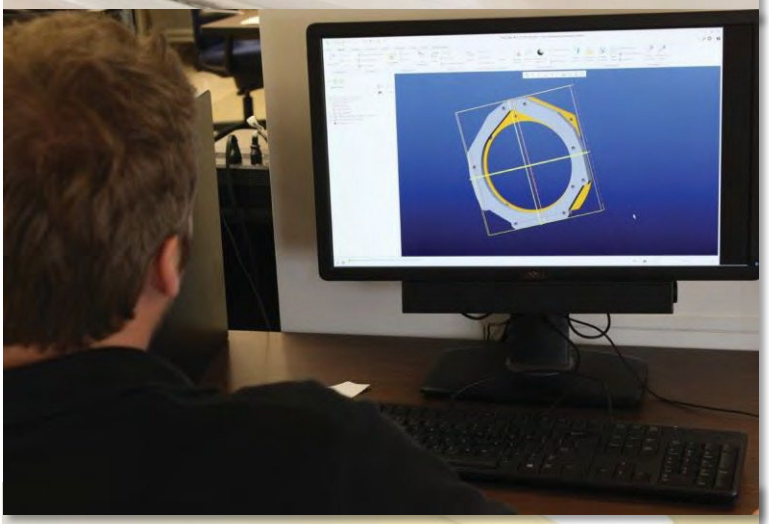
An introduction to the principles which govern the control and transformation of energy. These principles provide a concise description of the processes that are common to boiler, refrigeration, and related systems.
Prerequisites: MET 206 and PHYS 213 (Both with final grade of C or higher or instructor permission)

MET 271 (3 credits) Machine Design

A study of the design of machine elements such as gears, shafts, bearings, clutches, brakes, flywheels, and related assemblies. These concepts will be employed by the student through structural analysis of numerous machine elements.
Prerequisites: MET 201, MET 216, and PHYS 213 (All with final grade of C or higher or instructor permission)

MET 276 (3 credits) Engineering Seminar

A review course for the fundamentals of manufacturing including engineering economics and special topics of engineering technology. This course also covers engineering internship projects, technical presentations, and preparation for SME certification examination.
Prerequisites: MET 211 and MET 216 (Both with final grade of C or higher or instructor permission)
Co-requisites: MET 261, MET 266, and MET 271



Plumbing Technology

What is Plumbing Technology?

Students in the Plumbing Technology program learn how to design, install, and repair residential and commercial plumbing systems and hydronic heating systems. Some of the skills acquired are joining different types of piping materials, reading blueprints, and installing and repairing boilers, plumbing fixtures, faucets, and water heaters.

Employment opportunities in the plumbing and pipe- fitting industries include the installation of plumbing and heating systems in new buildings and the installation and maintenance of plumbing, heating, and piping systems for industries, public utilities, or government agencies. Self-employment is another option. Many graduates become self- employed plumbers after completing their apprenticeships.

A Graduate of this Program will be able to:

- Apply safety principles and demonstrate good work habits in the trade.
- Use the hand and power tools of the trade.
- Identify piping materials and install them using proper connections.
- Use and apply trade terms and technical data.
- Read and interpret blueprints, specifications, and codes as they apply to the trade.
- Lay out, estimate, calculate, and use mathematical skills as required in the trade.
- Install, maintain, and repair plumbing, heating, and mechanical systems and equipment.
- Keep abreast of new developments in the field.
- Demonstrate the ability to write letters of application, memos, work orders, reports, and apply communication skills in the world of work.

Skyler Major, Instructor
AAS: Thaddeus Stevens College of Technology

Kemon Papadimitriou, Instructor
AAS: Thaddeus Stevens College of Technology

Model Schedule for Plumbing Technology

Semester 1	
PLBG 107: The Plumbing Trade	3
PLBG 112: Plumbing Design I: Introduction to Plumbing Systems	3
PLBG 117: Plumbing Installation I (a) Plumbing Materials	3
PLBG 122: Plumbing Installation I (b) Plumbing Tools	1.5
PLBG 130: Construction Blueprint Reading	1.5
MATH 126: Technical Math I (or higher) †^	3
ENG 106: English Composition	3
Semester 2	
PLBG 156: Plumbing Design II: Blueprint Reading*	3
PLBG 170: Plumbing Installation II (a) Underground/Aboveground Rough In*	3
PLBG 176: Plumbing Installation II (b) Fixture Installation*	3
PLBG 167: Plumbing Service I: Introduction to Plumbing Service*	3
MATH: MATH 136 Technical Math II* (or higher) OR *MATH 132: Elementary Geometry (or higher)	3
CIS 111: Intro to Computer Applications	3
Semester 3	
PLBG 207: Plumbing Design III: Plumbing Codes*	3
PLBG 213: Plumbing Installation III*	3
PLBG 216: Plumbing Installation IV: Commercial Plumbing Installation*	3
PLBG 223: Plumbing Service II: Advanced Plumbing Services*	3
Science Elective	3
Humanities Elective	3
Semester 4	
PLBG 256: Plumbing Design IV: Designing Hydronic Heating Systems*	3
PLBG 262: Plumbing Installation V: Installing Hydronic Heating Systems*	3
PLBG 267: Plumbing Service III: Servicing Hydronic Heating Systems	3
PLBG 272: Plumbing Installation VI	3
General Studies Elective	3
BUSN 106: Small Business Management	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**73**

** Prerequisite or Co-requisite Required. See Course Description.*

† Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 126 and MATH 136 (or MATH 132), must take an additional Gen-Ed elective in order to meet their Gen-

Plumbing Technology (PLBG)

PLBG 107 (3 credits) The Plumbing Trade
Prepares students for their role in the Plumbing Technology program at Thaddeus Stevens College and for their future in the field. Examines organizational skills, safe work habits, and proper work attitude. Surveys the history of plumbing
while also offering an examination of job opportunities and an analysis of steps in career progressions.

PLBG 112 (3 credits)
Plumbing Design I: Introduction to Plumbing Systems
Study of potable water, methods of sewage disposal, components of plumbing systems, and basic physics as related to plumbing.

PLBG 117 (3 credits) Plumbing Installation I(a): Plumbing Materials
Familiarizes students with the proper selection and use of all the materials (cast iron, steel, copper, plastics, and others) of the plumbing and pipefitting trades.

PLBG 122 (1.5 credits) Plumbing Installation I(b): Plumbing Tools
Familiarizes students with the proper selection and use of all the basic tools (hand tools, power tools, and torches) of the plumbing and pipefitting trades, including measurement and other applied math.

PLBG 130 (1.5 credits) Construction Blueprint Reading
Introduces students to construction prints and documents. Basic drawing symbols and line forms are explained, and the course covers the use of basic drawing tools, dimensioning, and single line pipe drawing methods and practices.

PLBG 156 (3 credits) Plumbing Design II: Blueprint Reading
Focus on residential piping system design. Skills covered include the following: designing systems; reading blueprints; making orthographic and isometric pipe sketches and drawings; sizing potable water systems; sizing DWV systems; and sizing natural gas systems.
Prerequisite: PLBG 122

PLBG 167 (3 credits) Plumbing Service I: Introduction to Plumbing Service
Focuses on the selection and use of tools and procedures for servicing and repairing plumbing systems. Skills include troubleshooting and repairing faucets and valve, leaking pipes, clogged drains, and toilets.
Prerequisite: PLBG 170 and PLBG 175

PLBG 170 (3 credits) Plumbing Installation II(a): Underground And Aboveground Rough-In
Introduces the student to the installation of residential potable and DWV (drainage, waste, and vent) piping systems and the support of those systems.
Prerequisites: PLBG 111, PLBG 115, and PLBG 120

PLBG 176 (3 credits) Plumbing Installation II(b): Fixture Installation
Introduces the student to bathroom and kitchen fixtures and water heaters. Discusses the installation of residential piping systems, bathroom/kitchen fixtures, and water heaters.
Prerequisites: PLBG 111, PLBG 115, and PLBG 120

PLBG 207 (3 credits) Plumbing Design III: Plumbing Codes
By examining the 2015 International Plumbing Code, this course prepares students to design, install, and maintain plumbing systems in compliance with this statewide code. The course features the proper use of materials and fittings, correct venting, methods for testing plumbing systems, and the sizing of potable water, drainage waste and vent, storm water drainage, and natural gas piping systems.
Prerequisites: PLBG 107, PLBG 112

PLBG 213 (3 credits) Plumbing Installation III
An advanced residential plumbing course that is basically concerned with the plumbing of the housing project. Shop practice is made available as needed, but most instruction occurs at the housing project.
Prerequisite: PLBG 107

PLBG 216 (3 credits) Plumbing Installation IV: Commercial Plumbing Installation
Covers the design and installation of compressed air piping systems, storm water drainage systems, specification fittings and fixtures, and commercial sanitary drainage and venting, and potable water systems. Students learn to read commercial blueprints and to acquire information from specification literature, applying this information in developing the capstone project, a complete and functioning commercial toilet room facility.
Prerequisite: PLBG 117

PLBG 223 (3 credits) Plumbing Service II: Advanced Plumbing Services
An extension of PLBG 166. Covers the tools and procedures to repair flushometer valves, water heaters, frozen pipes, water hammer, and backflow.
Prerequisite: PLBG 167

PLBG 256 (3 credits) Plumbing Design IV: Designing Hydronic Heating Systems

Designing and sizing hydronic heating systems is taught. Includes the calculation of heat loss.
Prerequisite: PLBG 122

PLBG 262 (3 credits) Plumbing Installation V: Installing Hydronic Heating Systems

Students learn the proper installation of residential and commercial hot water heating systems.
Prerequisite: PLBG 117

PLBG 267 (3 credits) Plumbing Service III: Servicing Hydronic Heating Systems

Heating service, including repair of hot water circulation problems, combustion testing, oil burner, and gas burner repair, boiler clean-up, and system troubleshooting are covered.
Prerequisite: PLBG 167

PLBG 272 (3 credits) Plumbing Installation VI

Includes hands-on experience and training in the installation of plumbing fixtures, appliances, and the finished piping in a permanent structure. Work is done on the housing project and other appropriate projects around the campus.
Prerequisite: PLBG 213

Residential Remodeling Technology

What is Residential Remodeling Technology?

Residential Remodeling has become an essential part of the construction industry. Remodelers add living space to existing homes and retrofit homes to modern conveniences and updated building codes. Remodeling can be done not only for cosmetic purposes but also for structural reasons, as well as to increase the energy efficiency of older homes.

Jobs available in the residential remodeling field include but are not limited to carpenters; painters; drywall and ceiling tile installers; roofers; woodworkers; kitchen and bath remodelers;
siding, roofing, and aluminum installers; and flooring specialists.

Upon graduation, students of the Residential Remodeling Technology program will have a number of different opportunities available. In addition to working in their field, graduates will also have the chance to continue their education in areas
such as project management, technical education, residential designer, vv, and structural engineering degrees. Advanced opportunities as crew leaders, supervisors, assistant supervisors, superintendents and small business owners may also be possible for graduates of the program.

A Graduate of this Program will be able to:

- Understand the history of residential buildings in the 20th and 21st centuries.
- Demonstrate basic carpentry woodworking skills.
- Demonstrate successful use of basic and advanced tools of the profession.
- Read blueprints to lay out projects necessary to complete tasks.
- Calculate material quantities and estimate time allowances for projects using mathematical skills required in the profession.
- Apply remodeling skills necessary for interior, exterior, kitchen, and bathroom projects.
- Operate masonry tools and equipment safely and effectively.
- Complete basic masonry repairs.
- Identify and rectify basic plumbing problems in an existing dwelling.
- Troubleshoot basic electrical circuits found in a dwelling.
- Practice safety in the lab and on-site environments.
- Demonstrate a strong work ethic and the ability to work both independently and as a contributing member of a team.
- Stay current with any new technology or codes related to remodeling.

Loren Bishop, Instructor
BS: Eastern University OSHA Certified Outreach Instructor

Joseph Kiely, Instructor
AAS: Thaddeus Stevens College of Technology

Matthew Krupa, Instructor
Darden Executive Business Certificate: University of Virginia
BS: Pennsylvania College of Technology
AAS: Thaddeus Stevens College of Technology
OSHA: Construction Safety & Health Certificate
BCSP: Board of Certified Safety Professionals - Safety Trained Supervisor

Andrew Snavely, Instructor
BS: The Pennsylvania State University

Model Schedule for
Residential Remodeling Technology

Semester 1	
RMDL 106: Hand Tools and Power Tools	3
RMDL 111: Building Materials	3
CARP 157: Floor, Wall, and Ceiling Framing	3
CARP 182: Blueprint Reading	3
MATH 126: Technical Math I (or higher) †	3
ENG 106: English Composition	3
Semester 2	
CARP 116: Building Site and Foundations	3
CARP 161: Stair Construction and Remodeling	2
CARP 166: Roofing and Exterior Finishes	3
CARP 178: Exterior and Interior Finishes	4
CIS 111: Intro to Computer Application (must take before RMDL 216)*	3
MATH 132: Elementary Geometry (or higher)*	3
Semester 3	
RMDL 206: Remodeling Drafting & Design*	3
RMDL 210: Demolition & Stabilization*	2
RMDL 216: Estimating & Scheduling*	3
RMDL 221: Remodeling Electro-Mechanical Systems	2
RMDL 250: Insulation and Weatherization	2
Humanities Elective*	3
ENG 216: Technical Writing OR ENG 221: Public Speaking*	3
Semester 4	
CARP 272: Site Work and Foundations II	2
RMDL 260: Kitchen & Bath Remodeling*	3
RMDL 271: Advanced Interior Finishes*	4
RMDL 280: Advanced Exterior Finishes*	3
BUSN 106: Small Business Management	3
Science Elective	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**73**

** Prerequisite or Co-requisite Required. See Course Description.*

†*Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 126 and MATH 132, must take an additional Gen-Ed elective in order to meet their Gen-Ed requirements.*

Residential Remodeling Technology (RMDL)

RMDL 106 (3 credits) Hand Tools and Power Tools
This course is a general introduction to the basic tools that are used by a carpenter with an emphasis on safety, proper usage and procedures, and various applications that are most commonly used in the carpentry trades.

RMDL 111 (3 credits) Building Materials
This course covers the wide range of building materials used in carpentry, from the many different types of wood products used to the newest technology of steel framing. Proper procedures for estimating these building materials to the variety of fastening methods are also covered. Building anatomy from the 1940s and prior up to and including present is discussed.

CARP 116 (3 credits) Building Site and Foundations
In this course, students learn how to set up and operate the transit level and laser level. Building layout and excavation of residential construction will be explained, with particular emphasis on building stake-off. Types of footers, foundations, and concrete forming are also explored. Students will be challenged to practice proper building site layout, constructing concrete stair and sidewalk forms, and installing the form-a- drain system.

CARP 182 (3 credits) Blueprint Reading
In this course students will learn the proper techniques necessary to dissect a set of residential blueprints and develop a broad understanding of the language of construction drawings. We will also become involved in duplicating, through the process of mechanical architectural drafting, a few select detailed residential section drawings, with each having different drafting scales.

CARP 157 (3 credits) Floor, Wall, and Ceiling Framing
With a strong emphasis on platform framing, students will examine and demonstrate the proper methods of constructing subfloors, walls, and ceilings in the framework of residential and light commercial construction. This includes discussing the basic components and construction methods of light- gauge steel framing.

CARP 161 (2 credits) Stair Construction and Remodeling
Students learn the different types of stairways and all parts pertaining to them. They also learn how to calculate, lay out, and construct stairway stringers with their proper landings, risers, treads, and railings.

CARP 166 (3 credits) Roofing and Exterior Finishes
The different types of roof systems and all the material members that are involved in the different roof types are discussed. Students learn theoretically how to calculate rafters to fit their proper situations and practice laying out and cutting common and hip rafters. In addition, students are introduced to various exterior finishing with a focus on vinyl siding.

CARP 178 (4 credits) Exterior and Interior Finishes
In this course, students will study and practice installing various types of exterior and interior finish material for residential construction. Exterior finish will include installation procedures for: roofing; siding; soffit; windows and doors; and aluminum trim. Interior finish will include techniques for: hanging drywall; installing prehung doors and door trim; applying trim around a window unit; and other common trim materials.

RMDL 206 (3 credits) Remodeling Drafting and Design
This course covers the principles of drafting and design for remodeling purposes. Particular emphasis will be placed on documenting the existing structure where it meets the new construction, including kitchens, baths, utilities, and all mechanicals. Students will create sketches and working drawings that follow design constraints and a systematic renovation sequence.
Prerequisite: CARP 182

RMDL 210 (2 credits) Demolition and Stabilization
This course covers the principles of proper techniques used for demolition and stabilizing structures during the remodeling process. It covers the safe use of tools and equipment and salvaging existing materials for reuse.
Prerequisite: CARP 157

RMDL 216 (3 credits) Estimating and Scheduling
This course covers the principles of fundamental estimating and scheduling skills. Microsoft Excel® is used to establish estimating and scheduling procedures associated with a remodeling project. Cross-disciplinary estimating and inspection processes that will be necessary during the project are both addressed.
Prerequisites: RMDL 111 and CIS 111

RMDL 221 (2 credits) Remodeling Electro-Mechanical Systems

This course provides a general introduction to electro- mechanical systems in a residential structure and how to modify these systems during the renovation process. Students learn how to safely and properly re-rout basic electrical, plumbing, and HVAC ducts that are regularly encountered when remodeling a building. Emphasis is placed on when the scope of the work requires a sub-contractor to perform the work.

RMDL 250 (2 credits) Installation and Weatherization

This course covers the various types of products for reducing building heat loss by infiltration and conduction and the use of insulation used for noise and fire protection. Types of ventilation baffles, vapor barriers, infiltration barriers, and types of insulation are covered. Students perform installation of insulation materials for walls, ceilings, floors, and fire stop applications.
Prerequisites: CARP 178 and RMDL 220

RMDL 260 (3 credits) Kitchen and Bath Remodeling

This course covers the details and techniques used for residential remodeling and restoration of kitchens and baths. Students are exposed to a wide variety of products and the appropriate match for existing conditions. Emphasis is on the demolition of existing space and the acceptable design of the new space.
Prerequisite: RMDL 250

RMDL 271 (4 credits) Advanced Interior Finishes

This course covers the details and applications of various interior painting and finishing and materials integrated to match renovation work with the existing building. The proper wood types and species, finishing methods, and applications are utilized. Details of interior pre-hung doors, window stools, extension jambs, and casing are covered. Students perform the installation of a complete custom interior trim package.
Prerequisite: CARP 178

CARP 272 (2 credits) Site Work and Foundations II

Covers the details associated with site preparation and foundation inspections for a new building. Specifics are for lot size, set back, right of way, and building location. Work includes using various instruments for batter board installations, excavation of foundation, locating footer elevation, and forming and pouring footers. Locating, forming, and pouring of sidewalks and exterior porches.

RMDL 280 (3 credits) Advanced Exterior Finishes

This course covers the principles and practices of exterior finishes including roofing, siding, and aluminum trim applications.
Prerequisite: CARP 166

Water & Environmental Technology

What is Water and Environmental Technology?

The Pennsylvania Department of Environmental Protection requires that operators of drinking water and wastewater treatment facilities are certified. Certification is obtained through a combination of exams and operating systems. The completion of an approved associate degree program significantly reduces the number of years of operating experience required for certification. Students in the Water and Environmental Technology program gain the knowledge, skills, and abilities necessary for successful completion of Department of Environmental Protection examinations.

Courses in the Water and Environmental Technology program are designed to meet the knowledge, skills, and ability requirements tested on the Pennsylvania Department of Environmental Protection certification exams. This will include courses covering topics such as water and wastewater treatment; water distribution and wastewater conveyance systems; geographical information systems (GIS); equipment maintenance; solids handling; basic electricity; plant administration; and rules and regulations.

A Graduate of this Program will be able to:

- Describe the major processes, equipment, instrumentation, laws, and regulations associated with the collection and treatment of wastewater.
- Describe the major processes, equipment, instrumentation, laws, and regulations associated with the conveyance and treatment of potable water.
- Perform water and wastewater calculations involving flow, volume, surface area, disinfection, solids removal, retention time, and chemical feed rates.
- Analyze and improve operational procedures at water treatment and wastewater treatment facilities.
- Prepare, analyze, interpret, and report results of water and wastewater sample testing.
- Maintain a safe working environment as outlined by federal and state regulations.
- Describe the Safe Water Drinking Act and its implementation.
- Identify and describe the common diseases associated with water supply and sewage.
- Demonstrate the monitoring duties of water treatment operators.
- Describe the areas of safety to be considered in water treatment, storage, and laboratory testing.
- Describe the operation, components, and troubleshooting procedures for motors and electrical circuits.
- Determine and employ optimization strategies for water treatment and wastewater treatment processes and treatment facilities.

Shannon Butler, Asst Professor
B.A. Biology: Arcadia University
M.S.: Pennsylvania State University
PA Certified Wastewater Operator

Heath A. Edelman Ph.D, Associate Professor
Ph.D: Darden College of Education and Professional Studies
B.S.: Pennsylvania State University
M.S.: University of New Haven
Licensed Professional Engineer
PA Certified Wastewater Operator
PA Certified Water Operator
Certified Hazardous Material Manager

Model Schedule for
Water & Environmental Technology

Semester 1	
WET 102: Laboratory Skills	1
WET 111: Drinking Water Distribution	3
WET 116: Water Resources	4
WET 156: Drinking Water I	4
MATH 137: Intermediate Algebra (or higher) †	3
ENG 106: English Composition	3
Semester 2	
WET 106: Wastewater Collection	3
WET 121: Safety, Health, and Security	2
WET 161: Wastewater I	4
WET 168: Utility Management & Administration	3
MATH 132: Elementary Geometry OR	
MATH 150: Elements of Statistics (or higher)*	3
CHEM 100 – Conceptual Chemistry	3
Semester 3	
WET 203: Stormwater Management	1
WET 206: Wastewater II*	5
WET 211: Print Reading/Geographical Information Systems (GIS)	3
WET 216: Industrial Waste*	3
BIO 210: General Biology I OR	
SCI 107 Environmental Sciences OR	
PHY 106 Physics for Everyday Life	3
CIS 111: Intro to Computer Applications	3
Semester 4	
WET 256: Drinking Water II*	4
WET 261: Advanced Wastewater and Solids Handling*	4
WET 268: Equipment & Systems O&M	4
ENG 216: Technical Writing OR	
ENG 221: Public Speaking*	3
Humanities Elective	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**73**

** Prerequisite or Co-requisite Required. See Course Description.*

† Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 137 and MATH 132 (or MATH 150), must take an additional Gen-Ed elective in order to meet their Gen-Ed requirements

Water and Environmental Technology (WET)

WET 102 (1 credit) Laboratory Skills

In this course students will learn the basic math and laboratory skills needed to be successful as environmental professionals. Students will learn basic calculations, unit conversions, laboratory glassware, operation and maintenance of laboratory equipment, and basic laboratory testing used in the environmental field. Select lab methods will be utilized to provide students with a solid understanding of gravimetric, volumetric, and colorimetric methodologies. Basic chemical hygiene and chemical waste disposal will also be presented.

WET 106 (3 credits) Wastewater Collection

Wastewater Collection will provide students with an introduction to the practical aspects of operating and maintaining wastewater collection systems, with a focus on the knowledge and skills operators need to identify collection system problems and select appropriate methods to solve them. Students will learn the components and typical layouts of collection systems, and be introduced to safety procedures for construction, inspection and testing of sewers, inspection of manholes, and underground construction and repair. Students will learn the basics of closed-circuit television inspections, clearing stoppages, cleaning sewers, and controlling roots, grease, odors, and corrosion in collection systems, and will learn to solve arithmetic problems relating to the operation and maintenance of wastewater collection systems.

WET 111 (3 credits) Drinking Water Distribution

Students learn about the practical aspects of operating and maintaining water distribution systems, emphasizing safe practices and procedures, including the role and duties
of water distribution system operators, procedures for operating and maintaining clear wells and storage tanks, and components and characteristics of distribution system facilities. The course covers the basics of operating and maintaining distribution systems, maintaining water quality in the system, disinfecting new and repaired facilities as well as water delivered to consumers. Techniques for recognizing hazards and developing safe procedures and programs is also taught.

WET 116 (4 Credits) Water Resources

Water Resources will introduce students to topics such as the properties of water, water resources management, sources of water, management of stormwater, and water quantity and quality requirements. Students will develop an understanding of the characteristics surface water and groundwater sources, and will examine the impacts of urbanization on runoff. Students will discuss the relationship between the hydrological cycle and the treatment of water and wastewater. Students will gain hands on experience through laboratory exercises, case studies, and field trips, as appropriate.

WET 121 (2 credits) Safety, Health, and Security

Water and Wastewater Safety, Health, and Security will provide students with an introduction to Safety, Health, and Security procedures to address the hazards and risks associated with operating and maintaining water and wastewater systems. Students will learn about industry accepted safety practices to provide the workforce a safe working environment. Identify and predict hazards in the work environment. Learn the proper use of personal protective equipment to mitigate the risks and hazards associated with operating and maintaining treatment plants, water distribution systems, and wastewater collection systems. Students will learn about the biological and chemical hazards associated with operating plants. Students will be introduced to security and emergency preparedness and the importance of coordinating activities with other agencies.

WET 156 (4 credits) Drinking Water I

Drinking Water I provides students with an introduction to the equipment and processes used in the treatment of drinking water. The student will be introduced to different sources of water, reservoir management, and intake structures and will learn how to safely operate and maintain coagulation, flocculation, sedimentation, filtration, and disinfection processes. Topics such as the control of tastes and odors in drinking water, the Lead and Copper Rule, and solving arithmetic problems related to water treatment plant operations will also be covered. Students will be introduced to daily operating procedures, regulation of flows, chemical use and handling, records and reports, plant maintenance, safety and security, emergency conditions and procedures, handling complaints, and energy conservation.

WET 161 (4 credits) Wastewater I

Wastewater I provides students with an introduction to the equipment and processes used in the treatment of wastewater. The student will be introduced to the different components of wastewater treatment facilities, including racks and screens, grit removal, sedimentation and floatation, trickling filters, rotating biological contactors, activated sludge, wastewater stabilization ponds, and disinfection. Topics such as why we treat wastewater, the duties of a wastewater treatment plant operator, and NPDES permits will also be introduced.

WET 168 (3 credits) Utility Management & Administration

The Utility Management & Administration course will cover the major areas of responsibility of a utility manager, including legal requirements of federal legislation such as the Americans with Disabilities Act (ADA), the importance of developing policies and procedures for dealing with harassment, grievances, and violence in the workplace. Students will also discuss the financial management of a utility, including assessing the financial strength and stability of the utility, budgeting, and funding capital improvements. The course will also introduce students to Pennsylvania Department of Environmental Protection regulations governing water and wastewater treatment facilities, as well as federal, state, and local environmental regulations that pertain to construction and operation of drinking water, stormwater, and wastewater facilities.

WET 203 (1 credit) Stormwater Management

The stormwater management course equips students with the knowledge and skills needed to address the complexities of stormwater management in Pennsylvania, integrating regulatory compliance, Best Management Practices (BMPs), soil and plant considerations, structural and non-structural approaches, and practical construction and inspection practices of BMPs. Through a combination of theoretical learning and practical applications, students will emerge with a holistic understanding of sustainable stormwater management practices tailored to the local context.

WET 206 (5 credits) Wastewater II

Building upon the topics covered in WET 161, the course covers conventional and modified activated sludge processes, processes used for the removal of phosphorus and nitrogen, coagulation and filtration, and membrane bioreactors. Students will perform laboratory procedures and chemistry, analysis and presentation of data, and records and report writing. Operators also learn to analyze and solve operational problems and to perform mathematical calculations relating to wastewater treatment process control. A laboratory component will allow students to gain hands on experience. *Prerequisite: WET 161 & MATH 137*

WET 211 (3 credits) Print Reading/Geographical Information Systems (GIS)

This course introduces students to blueprint reading, geographical information systems (GIS), and the types of blueprints students may expect to encounter working in the water and wastewater industries. This includes land development prints and water and wastewater treatment facility prints. The GIS portion of the course introduces students to GIS mapping as it relates to municipal services.

WET 216 (3 credits) Industrial Waste

Topics include the operation and maintenance of industrial wastewater treatment facilities, regulations governing industrial waste, types of industrial waste, operation and maintenance of flow measurement equipment, preliminary treatment processes, physical-chemical treatment processes, and physical treatment processes. Students are also introduced to the treatment of metal waste streams.
Prerequisite: MATH 137

WET 256 (4 credits) Drinking Water II

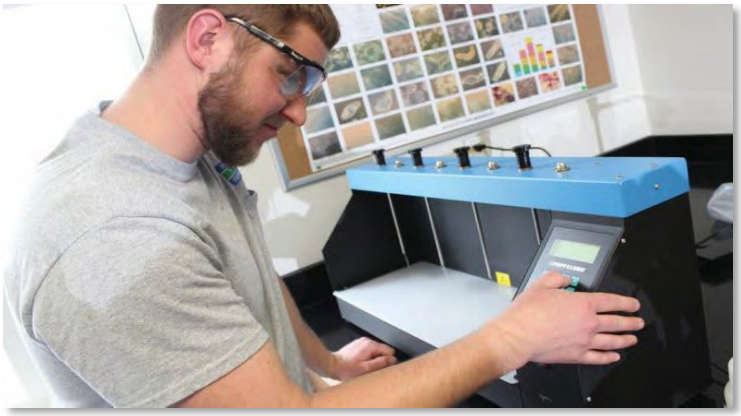
The Drinking Water II course will introduce operators to the practical aspects of operating and maintaining water treatment plants. Topics covered will include drinking water regulations (including the safe drinking water act), iron and manganese control, fluoridation, softening, disinfection by-products, emerging contaminants, nitrate and arsenic removal, corrosion control, handling and disposal of process wastes, maintenance, instrumentation, and advanced laboratory procedures. A laboratory component will allow students to gain hands on experience.
Prerequisite: WET 156

WET 261 (4 credits) Advanced Wastewater and Solids Handling

Advanced Wastewater and Solids Handling builds upon the material covered in Wastewater I and Wastewater II. Students will discuss the equipment and advanced treatment processes used for odor control and residuals solids management. Solids stabilization methods such as anaerobic and aerobic digestion and chemical stabilization will be covered. Additional topics such as sludge types, characteristics, and calculating sludge quantities are covered. Sludge thickening using gravity thickeners, dissolved air flotation units, centrifuges; as well as sludge conditioning such as thermal, wet oxidation, and elutriation are explored. Dewatering with pressure filtration (plate and frame, belt, vacuum), centrifuges and drying beds; and volume reduction using composting, mechanical drying, and incineration will be covered. Disposal methods for dewatered or liquid stabilized sludge, and applicable regulations for beneficial use and land application of biosolids are additional topics. Wastewater reuse, recycling, and reclamation are also explored.

WET 268 (4 credits) Equipment & Systems O&M

The Equipment & Systems O&M course will provide students with an introduction to the operation and maintenance of water and wastewater treatment facilities. Electrical and hydraulic concepts will be applied to water industry equipment. Typical maintenance procedures for pumps, blowers and compressors, valves, gauges and thermometers, and alarms will be covered. Motor control systems for pumps and blowers will be covered. Students will be introduced to maintenance programs and asset management. Topics such as preventive maintenance, emergency repairs, and scheduled repairs will be covered. Students will be given the opportunity to learn maintenance procedures in a laboratory setting. This will include developing some basic mechanical, electrical, and plumbing skills.



Welding Technology

What is Welding Technology?

The Welding Technology program provides the opportunity to develop the skills necessary to be a skilled entry-level welder in the welding industry. There is an increasing demand for welders in a variety of industries including light and heavy construction, automobile, aircraft, gas and oil, railroad, machinery and manufacturing industries. These skills are developed through theory and hands-on application into various welding specialties including blueprint reading and advanced computer-aided design; oxy-fuel welding and related processes; basic shielded metal arc welding; basic gas metal arc welding; and basic gas tungsten arc welding.

Students find employment in a wealth of industries related to construction, machinery, manufacturing oil and gas, and transportation industries. Graduates with entry-level certifications will find challenging jobs with the opportunity for rapid advancement.

A Graduate of this Program will be able to:

- Interpret welding blueprints
- Cut and Weld carbon steel using the Oxy-Fuel torch
- Weld carbon steel with the shielded metal arc welding process
- Weld carbon steel, aluminum and stainless steel with the gas metal arc welding process
- Weld carbon steel, aluminum and stainless steel with the gas tungsten arc welding process

Andrea Biesecker, Assistant Professor
AAS: Thaddeus Stevens College of Technology
BS: Eastern Mennonite University

Michael Marino, Assistant Professor
AAS: Thaddeus Stevens College of Technology
BS: Eastern Mennonite University

Jeffery Swoyer, Instructor
BS.Ed: Temple University
Vocational 1 & 2 Certifications: Temple University

Samuel Darley, Instructor
AAS: Thaddeus Stevens College of Technology
BS: Penn College of Technology

Model Schedule for Welding Technology

Semester 1	
WELD 106: Welding Blueprint Reading	4
WELD 110: Oxy-Fuel Welding and Related Processes	3
WELD 121: Shielded Metal Arc Welding I	4
WELD 150: Introduction to Safety	1
MATH 126: Technical Math I (or higher) †^	3
Science: Elective	3
Semester 2	
WELD 155: Gas Metal Arc Welding I	3
WELD 160: Gas Metal Arc Welding II	3
WELD 165: Gas Tungsten Arc Welding I	3
WELD 170: Gas Tungsten Arc Welding II*	3
MATH 136: Technical Math II (or higher)*	3
ENG 106: English Composition	3
Semester 3	
WELD 205: Flux-Cored and Submerged Arc Welding*	3
WELD 220: Shielded Metal Arc Welding II*	3
WELD 225: Metallurgy	3
WELD 230: Special Welding Processes*	3
Humanities Elective	3
ENG 216: Technical Report Writing*	3
Semester 4	
WELD 260: Gas Metal Arc Welding III*	3
WELD 270: Gas Tungsten Arc Welding III*	3
WELD 275: Pipe Welding*	3
WELD 280: Non-Destructive Testing*	3
CIS 105: Drawing with AutoCAD	3
General Studies Elective	3
Additional General Education Requirements	
Health and Physical Education Elective	1
TOTAL CREDITS	**73**

*** Prerequisite or Co-requisite Required. See Course Description.**
†Any Student who has taken pre-calculus (MATH 207) or calculus (MATH 213) instead of MATH 126 and MATH 136, must take an additional Gen-Ed elective in order to meet their Gen-Ed requirements.
^ Minimum Grade Required. See Course Description.

Welding Technology (WELD)

WELD 106 (4 credits) Welding Blueprint Reading
A study of industrial blueprints. Emphasis on terminology, symbols, graphic description, and welding processes, including systems of measurement and industry standards. Interpretation of plans and drawings used by industry.

WELD 110 (3 credits) Oxy-Fuel Welding and Related Processes
Provides a course that covers the oxygen-acetylene welding/cutting process. Topic includes the assembly and disassembly of an oxy-fuel torch setup, the correct settings required to flame-cut carbon steel as well as a basic introduction to the oxyfuel welding process. Safety around using an oxy-fuel torch is covered extensively to ensure the safe operation of the process. Plasma Arc Cutting (PAC) is reviewed as modern alternative to using oxyfuel to cut carbon steel. The safe and correct operation of the process is covered.

WELD 121 (4 credits) Shielded Metal Arc Welding 1
This course develops skills in shielded metal arc welding. Students will learn applications, set-ups, operations, and troubleshooting of these processes. Significant hands-on practice is provided.

WELD 150 (1 credit) Introduction to Safety
This course provides the fundamentals of safety in conducting welding operations and provides safety training using Organization Safety Health Administration (OSHA) standards that apply to the programs of study at Thaddeus Stevens College of Technology. The training received covers all topic areas required by the OSHA Outreach Training Program for industry recognized ten hour certification in General Industry Safety.

WELD 155 (3 credits) Gas Metal Arc Welding
This course develops skills in gas metal arc welding (GMAW). Students will learn applications, set-ups, operations, and troubleshooting of these processes. Significant hands-on practice is provided.

WELD 160 (3 credits) Gas Metal Arc Welding 2
This course further develops skills in gas metal arc welding (GMAW). Students will learn applications, set-ups, operations, and troubleshooting of these processes. Significant hands-on practice is provided.
Prerequisite WELD 155

WELD 165 (3 credits) Gas Tungsten Arc Welding
The course develops skills in gas tungsten arc welding (GTAW). Students will learn applications, set-ups, operations, and troubleshooting of these processes. Significant hands-on practice is provided.

WELD 170 (3 credits) Gas Tungsten Arc Welding 2
The course develops skills in gas tungsten arc welding (GTAW). Students will learn applications, set-ups, operations, and troubleshooting of these processes. Significant hands-on practice is provided in advanced skills.
Prerequisite WELD 165

WELD 205 (3 credits) Flux-Cored and Submerged Arc Welding
This course is an advanced welding application and examines safety, set-up, wire identification, current, shielding gases, operations and troubleshooting techniques of the process. Significant hands-on application designed to provide training in advancement of welding skills using the FCAW and SAW on carbon steels using small and large diameter flux-cored electrodes in all positions on fillet and groove welds.
Prerequisites: WELD 155 and WELD 160

WELD 220 (3 credits) Shielded Metal Arc Welding 2
This course is an advanced welding application and examines safety, current selection, electrode identification, welding methods, operations, and troubleshooting techniques of the process. Significant hands-on application designed to provide training in advancement of welding skills on carbon and stainless steels using various electrodes in all positions on fillet and groove welds.
Prerequisite: WELD 121

WELD 225 (3 credits) Metallurgy
This course develops the understanding of physical characteristics and mechanical properties of metals for welding application. This course is designed to provide training in identifying base metals and selection of weld filler metals and understand how welding heat affects base metals during the welding process.

WELD 230 (3 credits) Special Welding Processes
Significant hands-on application designed to provide training in advancement of welding skills using the submerged arc welding (SAW), stud welding, and tube welding processes on carbon and stainless steels using specialized equipment in various positions.
Prerequisites: WELD 155 and WELD 165

WELD 260 (3 credits) Gas Metal Arc Welding 3

This course is an advanced welding application and examines safety, set-up, wire identification, current, shielding gases, operations and troubleshooting techniques of the process.
Significant hands-on application designed to provide training in development of welding skills on aluminum, carbon and stainless steels on all positions on fillet and groove welds. *Prerequisites: WELD 155 and WELD 160*

WELD 270 (3 credits) Gas Tungsten Arc Welding 3

This course is an advanced welding application, set-up, welding rod identification, current, polarity and high frequency, shielding gases, operations and troubleshooting techniques of the process.
Significant hands-on application designed to provide training in advancement of welding skills on aluminum, carbon and stainless steels using various filler metals in all positions on fillet and groove welds.
Prerequisites: WELD 165 and WELD 170

WELD 275 (3 credits) Pipe Welding

This course develops pipe welding application, preparation and set-up, current, shielding gases, welding techniques and quality inspection of the welds. Significant hands-on application designed to provide training in development of pipe welding skills on carbon steel pipe using various welding processes in all positions on groove welds.
Prerequisites: WELD 121 and WELD 220

WELD 280 (3 credits) Non- Destructive Testing

This course introduces the welder to non-destructive examination methods to determine the physical properties of a weld and to predict the service life of a weld. Students will learn to differentiate between destructive and non-destructive testing methods to identify discontinuities and defects in welds by using various non-destructive testing equipment to various specifications and codes.
Prerequisite: WELD 106

Certificate Programs

Electrical Construction & Maintenance Certificate

What is the Construction Electrician Certificate?

The Construction Electrician certificate program provides students with the opportunity to acquire the theory and skills needed to gain employment as residential, commercial, and industrial construction electricians. Skills are developed through basic electrical theory and practical work project assignments. This program will give students a broad theoretical and practical background in all aspects of electrical construction.

Graduates of the Construction Electrician program are prepared to find employment as residential, commercial, and industrial construction electricians. Because of the continual growth in building construction, there are many employment possibilities.

A Graduate of this Program will be able to:

- Demonstrate appropriate technical skills in the electrical construction field.
- Demonstrate the ability to design, develop, and troubleshoot residential, commercial, and industrial circuitry.
- Complete parts list and order forms that demonstrate knowledge of coding and numbering systems for devices, hardware, and electrical equipment.
- Interpret, develop, and utilize blueprints, schematic diagrams, and wiring plans to perform electrical construction activities.
- Demonstrate the ability to apply OSHA-accepted safety standards as appropriate.
- Demonstrate knowledge of National Electrical Codes that apply to specific occupancies.
- Demonstrate knowledge of test equipment used in troubleshooting and repair of circuits, distribution systems, and electrical equipment.

David Cusatis, Instructor
MS: Oklahoma State University
BS: University of Maryland
AAS: Luzerne County Community College: Fire Science
IBEW Joint Apprenticeship and Training Committee (JATC)
AAS: Penn College of Technology: Electrical Construction

Evan Ducko, Instructor
AA: Bucks County Community College PDE
C&T Instructional I Electrical Occupations Electrical Apprenticeship: BCTHS
C-TECH: Fiber Optic/Copper-Based Systems Network Cabling Specialist

Model Schedule for Construction and Maintenance Certificate

Semester 1	
ECM 106: AC-DC Fundamentals	**5**
ECM 111: Residential Wiring	**5**
ECM 116: Electrical Construction Safety	**2**
ENG 106: Composition I	**3**
MATH 126: Technical Math I (or higher)	**3**
Semester 2	
***ECM 156: Commercial/Industrial Wiring**	**5**
ECM 162: National Electrical Code	**4**
ECM 166: Blueprint Reading: Electrical	**3**
General Studies Elective	**3**
General Studies Elective	**3**
TOTAL CREDITS	**36**

** Prerequisite or Co-requisite Required. See Course Description.*

ECM 106 (5 credits) AC/DC Fundamentals
This course presents basic principles, laws, and formulas which relate to alternating (AC) and direct current (DC) circuit applications in electricity. Topics include electron theory, Ohm's Law, series, parallel and combination circuit theory. In addition, capacitive and inductive reactive circuitry (RE, RC, RLC) are discussed.

ECM 111 (5 credits) Residential Wiring
This course is an introduction to residential wiring practices and techniques. Topics cover basic residential symbols, blueprint reading, wire diagramming, and the use of applicable National Electrical Codes (NEC). Lab work and projects enable students to develop an understanding of basic residential circuits.

ECM 116 (2 credits) Electrical Construction Safety
This course presents Occupational Safety and Health Administration (OSHA) general safety requirements for specific electrical and construction environments. Topics include ladders, scaffolds, lockout and tagging, personal protective equipment (PPE), temporary wiring, harness techniques, and confined spaces.

ECM 156 (5 credits) Commercial and Industrial Wiring
Basic theory and laboratory assignments in safety, wiring practices, blueprint reading, and the National Electrical Code (NEC) as it applies to commercial and industrial wiring techniques. Labs enable students to gain practical experience installing and troubleshooting single- and three-phase distribution, transformers, motors, and motor control circuits. *Prerequisite: ECM 111*

ECM 162 (4 credits) National Electrical Code
The student will locate, analyze and interpret National Electrical Code (NEC) tables and codes to determine appropriate distribution equipment, conduit and conductor sizes, overcurrent protection, load demands and branch circuit requirements for residential, commercial and industrial facilities.

ECM 166 (3 credits) Blueprint Reading: Electrical
This course is an introduction to basic blueprint reading skills and techniques. Topics cover lines and symbols, pictorial and orthographic diagrams, specifications, scales, prints, and plans. Classwork enables students to develop a basic understanding of construction drawings.

Computer Integrated Machining Certificate

What is the General Machine Certificate?

The General Machine certificate program offers a broad training experience that prepares individuals for entry-level employment in the machining industry. Through a combination of classroom study and assigned lab activities, students acquire essential background information, develop trade skills, and become familiar with production methods and standards common to the industry. Within the lab setting, emphasis is on the practical application of skills. Students will learn to operate a variety of conventional machine tools and computer numerical control (CNC) machines, interpret industrial drawings/blueprints, and use precision measuring and inspection instruments.

Students enrolled in the certificate program may enroll in the associate degree program upon completion of the certificate program. Graduates of the General Machine certificate program are employed as machine operators, machinists, CNC operators, and quality control inspectors.

A Graduate of this Program will be able to:

- Demonstrate safe work habits and be conscious of safety when working with machinery.
- Read blueprints, interpret drawings, understand specifications, and establish tolerances.
- Apply mathematics in machine tool technology (speeds, feeds, thread measurement, sine bar, etc.)
- Operate basic machine tools and demonstrate knowledge of their construction in relation to the metal industry.
- Operate abrasive cutting machinery; select and plan machining operations on this equipment.
- Demonstrate skills in quality control, inspection, gauging methods, and production control as they relate to manufacturing design and production.

Kyle Young, Asst Professor
AAS: Thaddeus Stevens College of Technology

Model Schedule for
Computer Integrated Machining Certificate

Semester 1	
CIM 106: Blueprint Reading and Related Math	**3**
CIM 110: Manufacturing Processes	**2**
CIM 115: Measurement Systems	**2**
CIM 118: Lathe and Vertical Milling Machine I	**4**
CIM 161: Metallurgy	**2**
MATH 137: Intermediate Algebra (or higher)	**3**
CIS 105 Drawing with AutoCAD	**3**
Semester 2	
***CIM 158: Lathe and Vertical Milling Machine II**	**3**
***CIM 166: Manufacturing Processes II**	**2**
***CIM 176: Computer Numerical Control I**	**4**
***CIM 222: CAD/CAM I**	**3**
***MATH 141: Trigonometry (or higher)**	**3**
ENG 106: English Composition	**3**
TOTAL CREDITS	**37**

** Prerequisite or Co-requisite Required. See Course Description.*

CIM 106 (3 credits) Blueprint Reading and Related Math

This course will introduce the student to industrial drawings, basic sketching, and applied mathematics. Interpretation of title blocks, orthographic projection, dimensioning and tolerancing, assemblies, and the elementary application of Geometric Dimensioning & Tolerancing (GD&T) will be covered throughout this course. The skills and knowledge obtained through CIM 106 will prepare the student for application in the machine lab to manufacture machined components.

CIM 110 (2 credits) Manufacturing Processes

Students will learn laboratory safety and material handling. The physics of metal cutting, and the machinability of metals are introduced. Semi-precision and precision measuring instruments are introduced and practiced. Precision layout, bench grinding, surface grinding and power sawing operations will also be introduced and exercised.

CIM 115 (2 credits) Measurement Systems

This course will introduce the student to basic metrology including precision layout. The use of indirect and direct measurement instruments including micrometers, calipers, indicators, and various gages will be utilized. Blueprint reading skills, including elementary GD&T, will be necessary for completion of this course.

CIM 118 (4 credits) Lathe and Vertical Milling Machining I

This course will introduce the student to procedures used on the vertical milling machine and lathe. Course content will include a wide variety of operations including, milling, turning, facing, drilling, reaming, tapping, and calculations related to set up. *Corequisite: CIM 106*

CIM 158 (3 credits) Lathe and Vertical Milling Machining II

This course will introduce the student to advanced techniques and procedures used on the vertical milling machine and lathe. Course content will include offset boring, cutting slots and pockets, taper turning, and thread cutting. An emphasis on workholding will be integrated into this course.
Prerequisites: CIM 106, CIM 110, CIM 115, CIM 118 and MATH 137

CIM 161 (2 credits) Metallurgy

This course covers the basic principles related to metallurgy. Many industrial processes are clarified as the student gains an understanding of quenching, annealing, case hardening, tempering, and crystallization. In addition, students will see how these changes occur through heat treating projects in the lab. Students will also experience real world applications through industry visits.

CIM 166 (3 credits) Manufacturing Processes II

This is a lab intensive course which provides students with extensive hands-on training. Assigned projects aid students in gaining critical experience contributing to a well-rounded machining education.
Prerequisites: CIM 106, CIM 110, CIM 115, CIM 118, CIM 161 and MATH 137

CIM 176 (3 credits) Computer Numerical Control (CNC) I

CIM 176 introduces the student to basic CNC concepts such as word-address programming, machine set-up, and program proofing. This course serves as an introduction to CNC machines and CNC programming methods and techniques.
Prerequisites: CIM 106, CIM 110, CIM 118 and MATH 137

CIM 222 (3 credits) CAD/CAM I

This course introduces the use of Computer Aided Drafting & Computer Aided Manufacturing (CAD/CAM) as a tool for defining part geometry and generating Computer Numerical Control (CNC) machine code. Two-axis and three-axis applications are demonstrated, along with the use of the CAD/CAM applications.
Prerequisites: CIM 106, CIM 110, CIM 115, and MATH 137

Masonry Construction Certificate

What is the Masonry Construction Certificate?

The Masonry Construction certificate provides the opportunity to develop the basic skills of a mason and is designed as an introduction to the trade. Students will focus on basic tool skills, trade materials, safety procedures and terminology. Emphasis is placed on brick and block skill sets. These skills are developed through hands-on projects, which are preceded by theory lectures and demonstrations. Special emphasis is placed on the appreciation of the beauty and permanence of brickwork and on the development of pride in workmanship.

Students successfully completing the Masonry Construction certificate program find employment in the field as mason tenders and masons with experience and further education as forepersons or superintendents. Many masons are self- employed.

All students completing the certificate program may enroll in the associate degree program.

A Graduate of this Program will be able to:

- Operate masonry tools and equipment safely and effectively.
- Use masonry terminology.
- Read blueprints to estimate materials quantity and pricing.
- Lay out and construct footings.
- Lay out and build a block foundation.
- Apply brick veneering to a structure.
- Construct a masonry arch.

Michael T. Gardner, Instructor
AAS: Thaddeus Stevens College of Technology

Model Schedule for Masonry Construction

Semester 1	
MASN 101: Intro to Tools, Safety, and Equipment	**3**
MASN 105: Introduction to Masonry Construction	**3**
MASN 110: Development of Masonry Materials	**3**
MASN 116: Chimney Construction	**3**
MATH 126: Technical Math I (or higher)	**3**
Semester 2	
MASN 155: Block Construction, Bearings & Anchoring Systems	**4**
MASN 158: Adhered Concrete Masonry Veneer	**2**
MASN 162: Masonry Hardscaping Patios & Retaining Walls	**2**
MASN 167: Masonry Restoration & Building Maintenance	**3**
MASN 171: Concrete Sidewalks	**1**
ENG 106: English Composition	**3**
Health and Physical Education Elective	**1**
TOTAL CREDITS	**31**

MASN (3 credits)
Introduction to Tools, Safety, and Equipment Students will be introduced to the tools required for the masonry trade, understand safety standards and practices, and receive training and certifications on various equipment used on a job site.

MASN 105 (3 credits)
Introduction to Masonry Construction
This course will teach the fundamentals of the masonry trade. This will include spreading mortar and striking full joints, laying brick and block to the line, bonding the length and height of a wall, building leads, and hanging a corner pole.

MASN 110 (3 credits)
Development of Masonry Materials
History and the manufacturing of masonry materials. In the manufacturing of materials, there are many different types of brick and block. Students will learn the various names and where the material should be used in a wall. Portland cement comes in different forms and how to properly mix the different types. Students will learn what the different strengths of cement and where they should be used.

MASN 116 (3 credits)
Chimney Construction
Students will understand the difference between and be able to construct properly a single and double flue chimney.

MASN 155 (4 credits)
Block Construction, Bearings, and Anchoring Systems
Students will learn terminology; the placement of anchor bolts, bearing plates, setting lintels, cutting in electrical boxes and door ties. They will be working around conduit, duct work and rebar reinforcement. They will also build a composite wall using block and brick.

MASN 158 (2 credits)
Adhered Concrete Masonry Veneer
Students will learn to use the tools and equipment for installing veneer stone; to apply hanging wire, scratch coat, flashings, vapor barriers, and drain mats; to hang stone; and to point the mortar joints. Students will learn the different types of patterns stone can be laid in.

MASN 162 (2 credits)
Masonry Hardscaping Patios & Retaining Walls
The proper use of masonry products in an outdoor environment. Understand the process to build an outdoor patio and retaining walls using masonry materials.

MASN 167 (3 credits)
Restoration and Building Maintenance
Cover the various materials that go along with masonry products. These would be caulking, waterproofing, patching, repointing, cutting out and repairing damaged areas, and cleaning of masonry. This course will focus on preventative maintenance to stop any further damage of the masonry structure.

MASN 171 (1 credit)
Concrete Sidewalks
Students will learn how to build forms and how to place concrete for a sidewalk.

Small Business Management & Entrepreneurship Certificate

What is the Small Business Management and Entrepreneurship Certificate?

The Small Business management and Entrepreneurship Certificate is a one-year program designed for current and aspiring small business owners/operators who want to start, grow, or strengthen a successful business. This program blends practical business fundamentals with real-world entrepreneurial skills, focusing on what it actually takes to operate a small business in today's market.

The Thaddeus Stevens College Small Business Management & Entrepreneurship Certificate is convenient and can work while managing your other responsibilities. Class are 100 percent online, full- or part-time enrollment is available, and classes feature a blend of synchronous and asynchronous courses to give you flexibility while still providing real-time support for more in-depth topics.

A Graduate of this Program will be able to:

- How to plan, launch, and grow a small business with a clear, actionable business plan, scaling over time.
- Managing cash flow, pricing, budgets, and operational finances to keep your business profitable.
- How to use accounting software and financial reports to make smarter business decisions.
- Marketing your business effectively, building your brand, and attracting both new and returning customers.
- Navigating legal, HR, and compliance issues common to small businesses.

Bronwyn Laugher, Ph.D, Instructor
Ph.D: Robert Morris University (Pittsburgh)
MBA: Bloomsburg University
BA: Lycoming College

Danielle Fox, Associate Professor
MBA: LaSalle University
BBA: Temple University

Model Schedule for Small Business Management & Entrepreneurship

Semester 1	
SBME 105: Entrepreneurial Finance	**3**
SBME 110: Law for Small Business	**3**
SBME 115: Accounting for Small Business	**3**
SBME 120: Business Applications and Decision Making for Small Business	**3**
MATH 111: Business Math	**3**
BUSN 106: Small Business Management	**3**
Semester 2	
SBME 150: Small Business Planning and Strategy	**3**
SBME 155: Small Business Marketing	**3**
SBME 160: Human Resources for Small Business	**3**
SBME 165: Communication for Small Business	**3**
SBME 170: Small Business Accounting Software	**3**
ENG 106: English Composition	**3**
TOTAL CREDITS	**36**

SBME 105 Entrepreneurial Finance (3 credits)
This course equips aspiring and current small business owners with essential financial knowledge and tools to successfully launch, manage, and grow their ventures. It emphasizes practical financial decision-making, strategic funding options, and the development of financial fluency necessary for navigating the entrepreneurial landscape.

SBME 110 Law for Small Business (3 credits)
This course introduces the key legal principles every small business owner should know, including contracts, sales, warranties, product liability, consumer protection, property law, landlord–tenant issues, and professional liability. Students will learn to apply these concepts to real-world situations to manage risk, ensure compliance, and make informed business decisions.

SBME 115 Accounting for Small Business (3 credits)
This course introduces key accounting principles and practices essential for managing small business finances. Students will learn how to analyze and record transactions, adjust accounts, and prepare financial statements. Topics include merchandising operations, inventory, internal controls, payroll, and accounting for partnerships. The course also covers plant assets, current liabilities, and the statement of cash flows, equipping students with practical skills for real-world application.

SBME 120 Business Applications and Decision Making for Small Business (3 credits)
This course provides students with essential skills in business productivity tools and foundational data analytics, using Microsoft Office applications—Word, Excel, and PowerPoint. Students will learn to create professional documents, develop dynamic presentations, and perform data-driven analysis to support decision-making in business environments. Emphasis is placed on Excel for data manipulation, visualization, and introductory analytics techniques. The course integrates real-world business scenarios to enhance problem-solving, critical thinking, and communication skills.

SBME 150 Small Business Planning and Strategy (3 credits)
This course provides students with a comprehensive understanding of how to develop, evaluate, and implement effective business plans and strategic initiatives. Students will learn how to conduct strategic analysis using tools such as SWOT, PESTEL, and Porter's Five Forces. Students will learn how to analyze market opportunities, define competitive advantages, and align organizational resources to achieve long-term goals. Students will build and present a complete business plan tailored to their business goals.

SBME 155 Small Business Marketing (3 credits)
This course offers an examination of traditional marketing including understanding your buyer, target market selection, the 4 Ps, marketing analysis and decision making. It also covers current trends in digital and social media marketing, focusing on the needs of the small business.

SBME 160 Human Resources for Small Business (3 credits)
This course provides small business owners and managers with practical strategies for managing people effectively and in compliance with employment laws. Topics include workforce planning, recruiting, staffing, training, performance management, compensation, benefits, labor relations, and employee support programs. Emphasis is placed on applying HR principles to create productive, engaged, and legally compliant workplaces.

SBME 165 Communications for Small Business (3 credits)
This course explores the principles and practices of effective business communication in today's diverse and dynamic workplace. Students will build skills in interpersonal communication, emotional intelligence, and the use of digital tools such as email, collaboration platforms, and social media. The course covers inclusive communication strategies, persuasive and bad news messaging, navigating difficult conversations, and effective team interactions. Students will also learn how to create and deliver professional presentations and develop employment-related materials.

SBME 170 Small Business Accounting Software (3 credits)
This course provides hands-on instruction in QuickBooks, the leading accounting software for small and medium-sized businesses. Students will learn how to set up and manage company files, record financial transactions, track income and expenses, handle payroll, generate reports, and perform basic bookkeeping tasks. Designed for beginners, the course builds practical skills needed to manage business finances efficiently and accurately using QuickBooks Online.

Welding Technology Certificate

What is the Welding Technology Certificate?

The Welding Technology certificate program provides the opportunity to develop skills necessary to be skilled entry- level welders in the welding industry. There is an increasing demand for welders in a variety of industries including light and heavy construction, automobile, aircraft, gas and oil, railroad, machinery and manufacturing industries. These skills are developed through theory and hands-on application Into various welding specialties including blueprint reading and advanced computer-aided design, oxy-fuel welding and related processes, basic shielded metal arc welding, basic gas metal arc welding, and basic gas tungsten arc welding.

Students find employment in a wealth of industries related to construction, machinery, manufacturing oil and gas, and transportation industries. Graduates with entry-level certifications will find challenging jobs with opportunity for rapid advancement.

A Graduate of this Program will be able to:

- Interpret welding blueprints
- Cut and Weld carbon steel using the Oxy-Fuel torch
- Weld carbon steel with the shielded metal arc welding process
- Weld carbon steel, aluminum and stainless steel with the gas metal arc welding process
- Weld carbon steel, aluminum and stainless steel with the gas tungsten arc welding process

Andrea Biesecker, Assistant Professor
AAS: Thaddeus Stevens College of Technology
BS: Eastern Mennonite University

Samuel Darley, Instructor
AAS: Thaddeus Stevens College of Technology
BS: Penn College of Technology

Model Schedule for Welding Technology Certificate Program

Semester 1	
WELD 106: Welding Blueprint Reading	**4**
WELD 110: Oxy-Fuel Welding and Related Processes	**3**
WELD 121: Shielded Metal Arc Welding I	**4**
WELD 150: Introduction to Safety	**1**
†^MATH 126: Technical Math I (or higher)	**3**
ENG 106: English Composition	**3**
Semester 2	
WELD 155: Gas Metal Arc Welding I	**3**
***WELD 160: Gas Metal Arc Welding II**	**3**
WELD 165: Gas Tungsten Arc Welding I	**3**
***WELD 170: Gas Tungsten Arc Welding II**	**3**
***MATH 136: Technical Math II (or higher)**	**3**
***ENG 216: Technical Report Writing**	**3**
TOTAL CREDITS	**36**

WELD 106 (4 credits)
Welding Blueprint Reading
A study of industrial blueprints. Emphasis on terminology, symbols, graphic description, and welding processes, including systems of measurement and industry standards. Interpretation of plans and drawings used by industry.

WELD 110 (3 credits)
Oxy-Fuel Welding and Related Processes
Provides a course that covers the oxygen-acetylene welding/cutting process. Topic includes the assembly and disassembly of an oxy-fuel torch setup, the correct settings required to flame-cut carbon steel as well as a basic introduction to the oxyfuel welding process. Safety around using an oxy-fuel torch is covered extensively to ensure the safe operation of the process. Plasma Arc Cutting (PAC) is reviewed as modern alternative to using oxyfuel to cut carbon steel. The safe and correct operation of the process is covered.

WELD 121 (4 credits)
Shielded Metal Arc Welding I
This course develops skills in shielded metal arc welding. Students will learn applications, set-ups, operations, and troubleshooting of these processes. Significant hands-on practice is provided.

WELD 150 (1 credit)
Introduction to Safety
This course provides the fundamentals of safety in conducting welding operations and provides safety training using Organization Safety Health Administrations (OSHA) standards that apply to the programs of study at Thaddeus Stevens College of Technology. The training received covers all topic areas required by the OSHA Outreach Training Program for industry recognized ten hour certification in General Industry Safety.

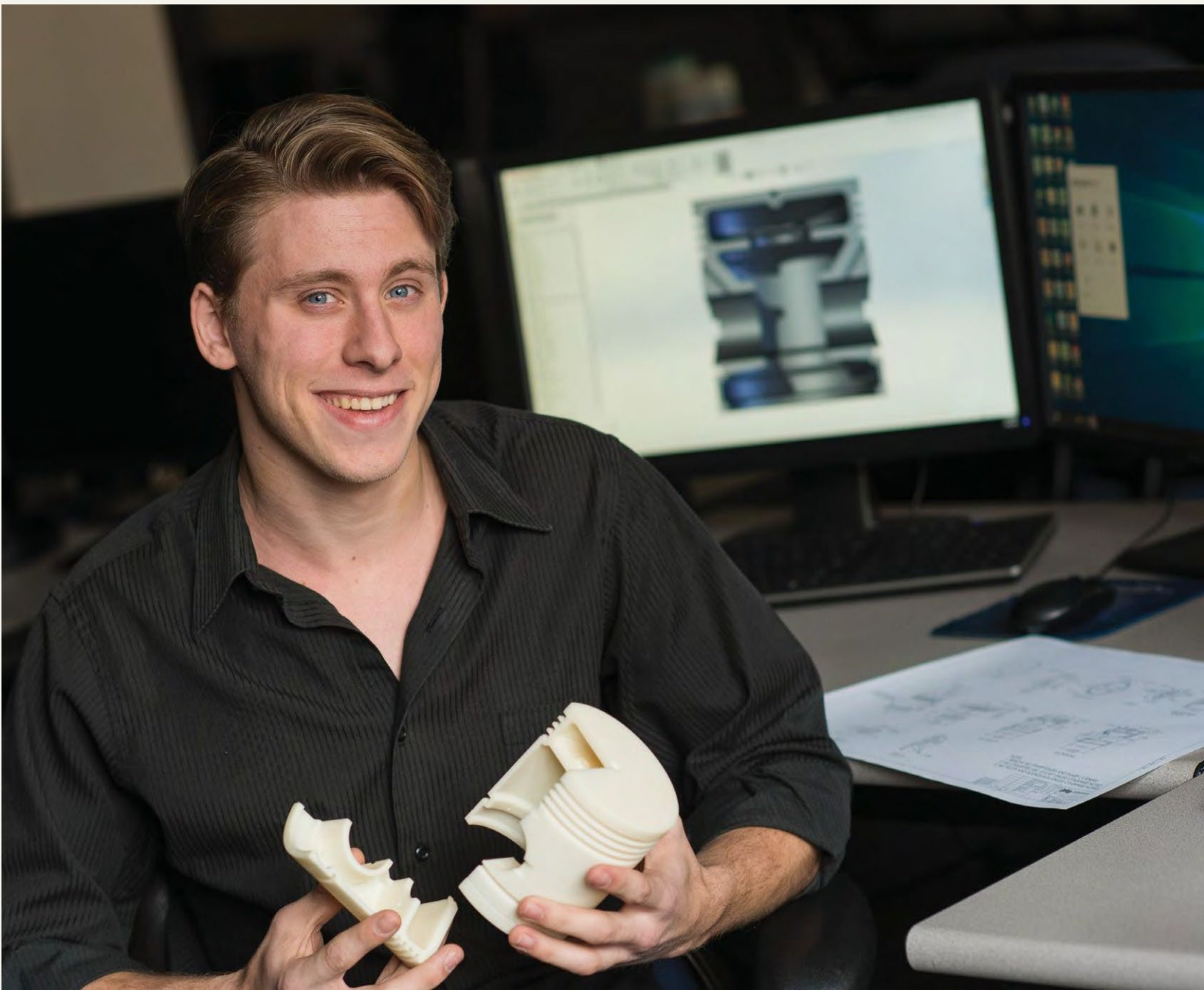
WELD 155 (3 credits)
Gas Metal Arc Welding
This course develops skills in gas metal arc welding (GMAW). Students will learn applications, set-ups, operations, and troubleshooting of these processes. Significant hands-on practice is provided.

WELD 160 (3 credits)
Gas Metal Arc Welding 2
This course further develops skills in gas metal arc welding (GMAW). Students will learn applications, set-ups, operations, and troubleshooting of these processes. Significant hands-on practice is provided.
Prerequisite: WELD 155

WELD 165 (3 credits)
Gas Tungsten Arc Welding
The course develops skills in gas tungsten arc welding (GTAW). Students will learn applications, set-ups, operations, and troubleshooting of these processes. Significant hands-on practice is provided.

WELD 170 (3 credits)
Gas Tungsten Arc Welding 2
The course develops skills in gas tungsten arc welding (GTAW). Students will learn applications, set-ups, operations, and troubleshooting of these processes. Significant hands-on practice is provided in advanced skills.
Prerequisite WELD 165

General Education



Computer Information Systems Courses

Tara Faro, Instructor
MS: The Pennsylvania State University
BS: West Chester University

Kelsey Haldeman, Instructor
AAS: Thaddeus Stevens College of Technology

CIS 105 (3 credits)* Drawing with AutoCAD®

Provides an introduction to the use of computer software used to draw. Students learn introductory AutoCAD® commands used to create basic geometric shapes and editing functions used to modify geometry. Measuring and distance specifications for objects is taught along with text creation for use in notes and specifications. Students also learn to use image transfer software that converts pictures and images into line geometry.
**ARCH and MET students may not take this course without consent of their respective program faculty members. ECAD students may also NOT take.*

CIS 111 (3 credits)* Introduction to Computer Applications

Introduction to applications for use in the professional and college environment. Students obtain skills in the latest business software. Activities consist of hands-on exercises using the operating system, word processing, spreadsheet, database management, and presentation programs.
**BUAD students may not take. PreMajor students may not take until the completion of DSOC 010 & DSOC 011.*

CIS 211 (3 credits)* Microsoft Excel

This is a comprehensive course in Excel®. It contains everything from basic introductory material to complex business formulas and mapping procedures. Students upon completion will be prepared to take the Microsoft Office User Specialist (MOUS) exam for Excel® certification. *BUAD students may not take.*

English and Humanities Courses

Marla Bucy, Associate Professor
MA: Temple University
BS: Millersville University

Dr. Sarah D'Stair, Assistant Professor
Ph.D: University of Massachusetts
MA: San Jose State University
B.A: San Jose State University

Laura Malone, Instructor
Adv. Cert Post Masters: SBL, SDL: Hunter College, C.U.N.Y.
MS: Pace University
BA: University of Richmond

Lisa-Marie Middendorf EdD, Assistant Professor
EdD: University of Pennsylvania
MA: SUNY Brockport
BS: St. John Fisher College

Melissa Weathers, Instructor
MS: Lincoln University
BS: West Chester University

ENG 100 (1 credit) English Composition Workshop

This 1hr, once weekly workshop aims to compliment and provide a work space for English 106 Composition I. Students who have passed DENG 099 with a C grade (73%) or higher are required to enroll in ENG 100: English Composition Workshop the same semester they are enrolled in English 106. Students will engage in one-on-writing writing tutorials, writing workshops, peer reviews and whole-class writing, grammar, and citation instruction. The work flow will mirror the assignments required in English 106 Composition I.
Prerequisite: DENG 099 with a grade of C or better
Corequisite: ENG 106

ENG 106 (3 credits) English Composition I

This course teaches students to write well-crafted texts through engagement in the drafting and revision process. The course also covers skills for writing effective, precise, and grammatically correct prose. Students also learn to think critically about texts and other media they encounter. **Corequisite: ENG 100 for any student who passed DENG 099.*

ENG 116 (3 credits)* Short Story and Poetry (HSS)

Analysis of a variety of short stories and poems with an emphasis on developing interpretive skills. Special attention given to individual presentations and class discussion. technique, symbolism, irony, style, and social significance. **Prerequisite: ENG 106 with a minimum grade of "C" or instructor permission*

(HSS) denotes course fulfills Humanities/Social Sciences requirement or may be used as a General Education elective

ENG 206 (3 credits)* Reading and Writing Creative Nonfiction (HSS)

This course is an introduction to the genre of Creative Nonfiction and includes a variety of approaches to the genre, both in content and form. Specific content approaches include food writing, travel writing, sports writing, music writing, environmental/place writing, pop culture writing, and immersive journalism. Specific form approaches include vignette, freeform, podcast, blog form, among other non-traditional forms. Students are introduced to these approaches through various shared texts, and students practice these approaches through difference writing activities and assignments. *Prerequisite: ENG 106 with a minimum grade of "C" or better *instructor permission.*

ENG 216 (3 credits)* Technical Report Writing

Presents technical subject matter with emphasis on intensive practice in the various methods of expository writing. Attention given to various technical forms, including instruction, proposal, progress, and feasibility reports. **Prerequisite: ENG 106 or instructor permission*

ENG 221 (3 credits) Public Speaking

Course includes modes of speech communication, such as demonstration, information, persuasion, and interview.

ENG 222 (3 credits)* African American Literature (HSS)

Course includes a survey of African American literature from slave narratives to the pan-African experience of the 21st Century. **Prerequisite: ENG 106 with a minimum grade of "C" or instructor permission*

ENG 238 (3 credits)* Film Appreciation (HSS)

This course introduces students to the art and craft of film. Students will learn about important film genres and become fluent in basic elements of cinema such as narrative style, character development, cinematography, setting, editing, and sound. In addition to studying the technical language of film, students will learn to appreciate film as an art form that expresses a society's values and conflicts. The course is designed to give students who enjoy film the tools to make substantive arguments about the movies they watch.
**Prerequisite: ENG 106 with a minimum grade of "C" or instructor permission*

PHL 150 (3 credits)* Introduction to Ethics (HSS)

This course introduces students to the branch of philosophy that deals with concepts of right and wrong. Students will explore the origin of morality and identify several approaches to moral decision-making, including duty, virtue, utility, and social agreement. Students will also explore theories of justice and what makes "the good life". The course is designed to help students develop greater awareness of how and why they make moral decisions in everyday life.
**Prerequisite: ENG 106*

***(HSS) denotes course fulfills Humanities/Social Sciences requirement or may be used as a General Education elective*

History Courses

HIST 106 (3 credits) American History I (HSS)

This course surveys American history from the colonial period to the Reconstruction period following the American Civil War. Students gain an understanding of the major events that have shaped American history; learn how American cultural values and character have developed as a result of these events; understand how myths and stereotypes about American history affect our perception of the past and present; and analyze and understand how economics, politics, society, religion, and geography are interrelated and impact on history.

HIST 111 (3 credits) American History II (HSS)

This course surveys American history from the Reconstruction period following the American Civil War to the Vietnam War. Students gain an understanding of the major events that have shaped American history; learn how American cultural values and character have developed as a result of these events; understand how myths and stereotypes about American history affect our perception of the past and present; and analyze and understand how economics, politics, society, religion, and geography are interrelated and impact on history.

HIST 160 (even years)/HIST 165 (odd years) Study Abroad Immersion: Global Perspectives in History and Culture (HSS)

Students will experience the art, architecture, and culture of an international destination as part of an in-person immersion experience. Lectures and assignments are designed to build knowledge of a selected location and understand its contribution to art and architecture. Studying these subject areas on a global scale exposes students to the social, political, economic, and technological histories of the world.
Note: An international field trip is required for this course. Additional fees will apply.

Health and Physical Education Courses

HEAL 106 (1 credit) Fitness and Wellness

Offers information that enables students to take control of their personal health and lifestyle habits so as to make a continuous, deliberate effort to stay healthy and to achieve well-being. Students learn to develop personal lifetime programs that promote fitness, preventative health care, and personal wellness.

HEAL 111 (1 credit) Basic First Aid

Provides individuals in the workplace the knowledge and skills necessary to recognize and provide basic first aid care for injuries and sudden illnesses until advanced medical personnel arrive and take over.

Mathematics Courses

Any student who takes Pre-Calculus (MATH 207) or Calculus (MATH 213) instead of the two required math courses in their program must take an additional 3-credit general education elective to meet their general education requirements.

Renee M. Alshouse, Instructor
MEd: Millersville University
BS: Drexel University

Nasser Bogale, Ph.D., Professor
Ph.D - University of the Cumberlands
MEd - Millersville University
MA - University College Dublin
BSc - Addis Ababa University

Trina Hess, Professor
MA: Villanova University
BS: The Pennsylvania State University

Nora Othman, EdD, Professor
EdD; MS: West Virginia University
BS: University of Miami

Mary Phillips, Instructor
MEd: Millersville University
BSEd: Shippensburg University

MATH 103 (1 credit)* Technical Math Workshop

This one hour, once weekly workshop aims to complement the learning in Technical Math I. Students who have demonstrated a need for additional practice, as determined by the Math Department, are required to enroll in Math 103**:** Technical Math Workshop the same semester they are enrolled in Math 126. Students will engage in arithmetic operations with and without the use of a calculator. The workflow will mirror the assignments required in Math 126 Technical Mathematics I. *Corequisite: MATH 126*

MATH 105 (1 credit)* Algebra Workshop

This one hour, once weekly workshop aims to complement the learning in Intermediate Algebra. Students who have demonstrated a need for additional practice, as determined by the Math Department, are required to enroll in Math 105**:** Algebra Workshop the same semester they are enrolled in Math 137. Students will engage in arithmetic operations with and without the use of a calculator. The workflow will mirror the assignments required in MATH 137 Intermediate Algebra. Corequisite: MATH 137

MATH 111 (3 credits)* Business Mathematics

Mathematics skills necessary to do calculations and procedures to operate a successful office or small business. Percentage and simple interest, credit, business ownership, compound interest, payroll and taxes, insurance, mortgages, and home ownership are covered.

MATH 126 (3 credits)* Technical Mathematics I

This course is an introduction to the mathematics required of students in technical programs. Designed for students whose academic background does not emphasize algebra or geometry. Includes a review of arithmetic, signed numbers, basic algebra, plane geometry, and other topics. Emphasis is on problem solving.
**Prerequisite: Satisfactory Score on Math Placement Exam*

MATH 132 (3 credits)* Elementary Geometry

This course is designed for students whose academic background did not emphasize geometry. It covers plane geometry topics, which include basic concepts, parallel lines, triangles, quadrilaterals, and circles. Theorems and postulates are included but emphasis is on measurement and constructions. This course is intended to substitute for Technical Mathematics II for those students who are not required to take General Physics I. It covers the practical geometry that is used in construction majors. **Prerequisites: MATH 126 (C or above) or MATH 137*

MATH 136 (3 credits)* Technical Mathematics II

This course covers solving linear and quadratic equations, functions, graphing linear quadratic equations, polynomials, solving trigonometric ratios, solving right triangles and interpreting basic statistics.
**Prerequisites: MATH 126 (C or above) or MATH 137*

MATH 137 (3 credits)* Intermediate Algebra

This course reviews the structure and use of algebra through a combination of topics including polynomials, first-degree equations, quadratic equations, exponents, radicals, and systems of linear equations. Graphing first and second- degree equations is emphasized.
**Prerequisite: DMAT 030 (C or above) or satisfactory score on placement test, or permission of Math Department*

MATH 141 (3 credits)* Trigonometry

This course shows how mathematics can be applied in a physical setting. The theoretical foundations will be established and explored but emphasis will be placed on practical applications. Highlighted are the trigonometric functions used to solve right triangles, solving oblique triangles using the Law of Sines and the Law of Cosines, and the graphs of the trigonometric functions.
**Prerequisite: MATH 137 (C or above)*

MATH 150 (3 credits)* Elements of Statistics

Covers measures of central tendency and variability; probability and normal curve; and sampling and hypothesis testing. Students need to possess mathematical skills necessary to do calculations and derivation of basic formulas. **Prerequisite: Math 126 with a C or above or higher*

MATH 207 (4 credits)* Pre-Calculus

Designed to prepare students for continuation into MATH 213: Calculus. Develops the concepts and proficiencies necessary to work successfully in the areas of elementary functions, theory of equations, inequalities, trigonometry and analytic geometry.
**Prerequisites: MATH 137 & MATH 141 (C or above in both)*

MATH 213 (4 credits)* Calculus

Introduces the concepts and techniques of calculus beginning with functions and limits. Major emphasis is on theory and applications of the derivative, antiderivative, indefinite integral and definite integral, including introductory calculus of trigonometric, exponential and logarithmic functions. **Prerequisites: MATH 137 & MATH 141 (C or above in both) OR MATH 207 (C or above) or instructor permission.*

Science Courses

David W. Manning, Professor
MA: The Pennsylvania State University
BA: Slippery Rock University

Patricia A. McKinney, Ph.D., Professor
Ph.D: Harvard University Graduate School of Arts & Sciences
BS: Eastern Nazarene College

BIO 210 (4 credits)* General Biology I

This course explores the processes fundamental to life. Laboratory activities reinforce classroom theoretical content. Topics covered include biochemical principles, cell structure and function, intracellular and intercellular transport and communication, metabolic pathways including cellular respiration and photosynthesis, cell reproduction, Mendelian genetics, inheritance patterns and laws, DNA replication and repair, RNA transcription and processing, protein synthesis, regulation of gene expression, biotechnology and key structural and reproductive characteristics of viruses, bacteria, and protists.
**Prerequisites: High school biology and chemistry strongly recommended. Students must be matriculated in an approved TSCT program of study or obtain instructor permission.*

CHEM 100 (3 credits) Conceptual Chemistry

This course explores inorganic chemistry principles at the conceptual level. Intermittent in-class laboratory activities reinforce theoretical content. Special emphasis is placed on relating chemical principles to industry, the environment, and everyday events. Topics covered include the atomic structure and classification of matter, the periodicity of elements and their properties, intramolecular and intermolecular bonding, chemical reactions including oxidation-reduction reactions, thermochemistry, solutions, acids/bases, water chemistry, gases, and nuclear chemistry.

CHEM 110 (4 credits)* General Chemistry I

This course explores the fundamental principles of inorganic chemistry. Laboratory activities reinforce classroom theoretical content. Topics covered include the physical states and properties of matter, scientific measurement, problem solving, periodicity of elements, atomic structure, early and modern atomic theory, electron configuration, nomenclature, chemical composition, chemical equations and stoichiometry, chemical reactions, thermochemistry, chemical bonding and molecular geometry, gas laws, and solutions.
Prerequisites: MATH 137 (C or above) or instructor permission

PHYS 101 (3 credits) How Things Work

This is an introductory physics course that focuses on the ideas, concepts, and engineering behind everyday objects. The history of these objects and their relationships to physical laws are examined. Enrolled students create simple projects to demonstrate their understanding. Only basic mathematical skills are required.

PHYS 106 (3 credits) Physics for Everyday Life

Brief overview of physics. Includes motion, work, power, energy, and properties of matter, sound, and light. Electrodynamics, atomic physics, and nuclear physics are also discussed. Basic mathematical and algebra skills utilized.

PHYS 113 (3 credits)* Statics

Elementary, analytical, and practical approach to the principles and physical concepts of statics. Topics include force systems, principles of equilibrium, structural analysis of trusses and frames, friction, centroids, and moments of inertia.
Prerequisites: MATH 137 (C or above) and MATH 141 or instructor permission.

PHYS 207 (3 credits)* Statics and Strength of Materials

Students will learn how forces and moments acting on rigid and deformable bodies affect reactions both inside and outside the bodies. Students will study the discipline of statics as well as the stresses and strains caused by associated internal forces and deformations, the discipline of strength of materials. Topics include force systems, principles of equilibrium, structural analysis of trusses and frames, centroids, stress and strain, and mechanical properties of materials.
Prerequisites: MATH 137 and Math 141 with a C or higher or MATH 207 or instructor permission

PHYS 213 (4 credits)* General Physics I

This course is a four-credit, algebra-based physics course in which one of the credits is devoted toward lab work. The course is an in-depth study of statics, kinematics, dynamics, work, power, energy, and the properties of matter.
Prerequisites: MATH 137 and MATH 141 (Both with a C or above) or instructor permission

SCI 107 (3 credits)* Environmental Science

This course is a comprehensive, multidisciplinary overview of environmental issues and the integral role humans plan in shaping our natural surroundings. Topics covered include energy flow, biotic and abiotic factors in ecosystems, environmental law, terrestrial biomes and aquatic ecosystems, population dynamics, renewable and nonrenewable resources, fossil fuels and alternative energy sources, water resources and pollution, air pollution, ozone depletion, climate change, waste disposal, land and food resources, conservation, and sustainable living.
Prerequisite: ENG 106 or instructor permission

SCI 110 (3 credits) Introduction to Astronomy

Beginning with an understanding of what astronomy studies, the bulk of the course is organized into three main categories: 1) investigating planets in and out of our solar system 2) the life and death of stars and 3) galaxies and black holes/quasars. Students will also learn a few constellations and study the life of the universe and the Big Bang Theory.

Social Sciences Courses

Heriberto Arjona, Assistant Professor
MBA: Universidad Inter-Americana de Costa Rica
BA: Indiana University of Pennsylvania

Vincent E. Miles, Ph.D., Professor
Ph.D, MA: Indiana University of Pennsylvania
BA: Mansfield University of Pennsylvania
AAS: Thaddeus Stevens College of Technology

ECON 230 (3 credits) Principles of Microeconomics (HSS)
This course introduces students to foundational principles of microeconomic theory, with an emphasis on economic decisions made at the individual or firm level. It describes and analyzes the interaction of supply and demand and the behavior of the prices of goods and services. It explains the determinations of costs, output, strategic pricing, and purchasing decisions under various market structures in a global economy. In addition, it describes the supply and demand for factors of production with an emphasis on graphical formatting.

ECON 240 (3 credits) Principles of Macroeconomics (HSS)
This course covers ideas, models and concepts to give students a better understanding of our nation's and global economies. We will use references from real-world corporations, government policies, and current events, and explore how events and policies change the market equilibrium. Students will analyze macroeconomic data using equations and conceptual graphs.

PSY 116 (3 credits) Introduction to Psychology (HSS)
Students learn the major specialties of the field and assumptions upon which they are based. Techniques used by psychologists are discussed.

SOC 106 (3 credits) Principles of Sociology (HSS)
Provides a systematic interpretation of major elements of sociology, including social dynamics, deviant behavior, social and cultural change, and developing major social trends.

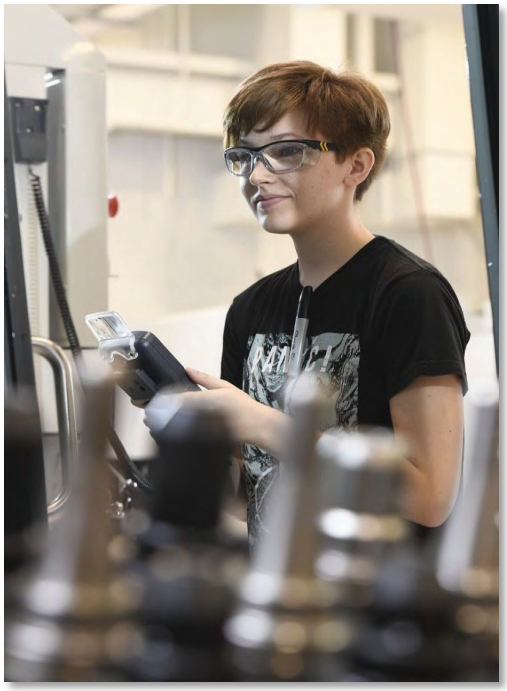
SOC 121 (3 credits) Critical Thinking (HSS)
Provides an introduction to critical reading, writing, and thinking. Encourages students to pose questions at appropriate times and to have a generally critical attitude toward advertising and other aspects of popular culture.

(HSS) denotes course fulfills Humanities/Social Sciences requirement or may be used as a General Education elective

SOC 206 (3 credits) Sociology of Deviant Behavior (HSS)
Deviant social behavior are discussed. Topics include development of deviant individual's personality; deviant careers; conflicts between the deviant's and the normative social world. Social techniques and patterns used to resolve such conflicts are also covered.

SOC 216 (3 credits) Multiculturalism (HSS)
Introduction to general issues regarding cultural diversity. A focus on complex and diverse group activities in the contemporary workplace with an emphasis on coping skills with persons from different ethic, gender, religious, and professional backgrounds and perspectives.

SOC 221 (3 credits) Marriage and the Family (HSS)
Contemporary American marriage and family patterns are discussed. Topics include historical and cross-cultural perspectives, current trends toward urbanization and changing value systems; and cultural, psychological, and social factors involved in the changing American family.



Business and Applied Arts Courses

Heriberto Arjona, Assistant Professor
MBA: Universidad Inter-Americana de Costa Rica
BA: Indiana University of Pennsylvania

ART 106 (3 credits) Intro to Digital Photography

An introduction to digital photography using digital single lens reflex cameras and basic image editing software. This course includes print production for making black-and-white and color photographs and studio techniques that include portrait lighting and still life photography. No prior photography experience is required. Students use digital photography for the production of a photographic portfolio.

BUSN 106 (3 credits) Small Business Management

Focuses on the world of small business, including getting involved as an entrepreneur; selecting business opportunities; and keeping the business afloat.

FIN 102 (3 credits) Personal Finance

The course is primarily concerned with the management of money from the viewpoint of the individual. Topics to be covered include consumer's credit, borrowing, saving and investments, purchase of insurance, real-estate and other major items, the problem of taxation and wills, and controlling expenditures through the use of a budget.

Special Courses

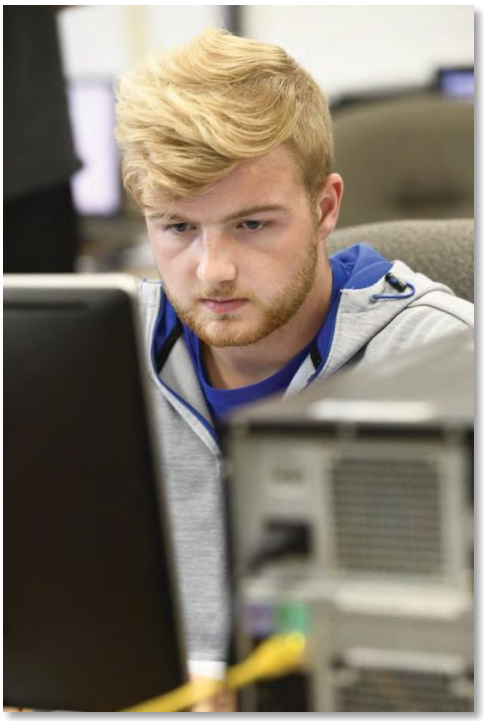
ST 100–105 (1–5 credits) Special Topics

Special topics are selected. The topic to be studied is determined by the instructor and approved by the vice president for academic affairs. Credits earned are applicable either as free electives in the program or as credits used for graduation (with the approval of the vice president for academic affairs.)

TECH 100, 199, 200, or 299 (1–3 credits) Internships

Representing a possibility of four semesters, internships are designed to provide credit for supervised on-the-job work experience directly related to a student's major. Credit varies based upon the total hours worked. The credit-to-work hour ratio is 1 credit = 50 work hours.

These courses include employer supervision and evaluation.



PreMajor Program

Rob Sealover, Instructor
Master's Equivalency +45 credits: PA Department of Education
Bachelor of Science: Millersville University

Students may need to complete one or more courses at a foundational level before entering a specific program of study. Students are required to earn at least a "C" grade in all PreMajor courses. Students must also pass College Success testing requirements or demonstrate academic excellence in required PreMajor Literacy (DENG 099) and Math (DMAT 010 and DMAT 030) courses with grades of "B" or higher.

These courses may not be used to meet graduation requirements.

CP 011^ (3 credits) Career Preparation I

Students are introduced to eight different areas of technology, drafting, electronics, graphics, woodworking, engineering, plastics, ceramics, and metals. By exposing students to these eight different areas, students gain a better understanding of each area and how it may apply to them specifically.

^Must obtain a grade of "C" or higher for successful completion.

CP 012*^ (3 credits) Career Preparation II

This is a continuation of CP 011, where students apply advanced concepts to eight different areas of technology, drafting, electronics, graphics, woodworking, engineering, plastics, ceramics, and metals.
**Prerequisite: CP 011.*
^Must obtain a grade of "C" or higher for successful completion.

DENG 099 (3 credits) Integrated Reading and Writing

Integrated Reading and Writing, a one semester course, focuses on applying critical reading skills for organizing, analyzing, and retaining material and developing written work appropriate to the audience, purpose, and length of the assignment.
^Must obtain a grade of "C" or higher for successful completion.

DMAT 010^ (3 credits) Fundamentals of Mathematics

Development and improvement of math skills. Fundamentals of Mathematics covers whole numbers, fractions, decimals, percent, measurement, and various other essential topics. For students whose test scores indicate the need for development and/or improvement in fundamental math skills, course must be taken before MATH 126: Technical Mathematics I or MATH 111: Business Mathematics; students may be required to complete DMAT 010 prior to enrollment in DMAT 030. DMAT 010 may not be used to meet certificate or degree requirements.

^Must obtain a grade of "C" or higher for successful completion.

DMAT 030*^ (3 credits) Introduction to Algebra

Develops fundamental algebra skills necessary in vocational/ technical occupations. Topics include real numbers, solving first degree equations, exponents, polynomials, and factoring. This course may not be used to meet degree requirements.
**Prerequisite: DMAT 010 or by entrance exam*
^Must obtain a grade of "C" or higher for successful completion.

DSOC 010^ (3 credits) Success Strategies

Encourages students to live healthy lifestyles, develop academic skills, foster habits of punctuality, and maintain good attendance records in all classes. Time management, positive attitude, and goal orientation are also covered. Included in this course is a 2.5 hour lab for developing academic technology skills.
^Must obtain a grade of "C" or higher for successful completion.

DSOC 011^ (1 credit) Success Strategies Lab

Provides students with an opportunity to acquire fundamental computer skills and practical knowledge in applications needed for success in college coursework. Hands-on topics include use of the College portal for access to College and course materials, email guidelines, Internet research methods, file management and organization, and software for assisting in compiling research ideas and notes. In addition, exercises will be completed related to word processing (outlining tools, tables and columns to organize lists, report formatting), spreadsheet fundamentals (calculating GPA, budgets, measurement conversions and formulas, timesheets) and presentation software (developing projects).
^Must obtain a grade of "C" or higher for successful completion.

ACADEMIC INFORMATION AND POLICIES

1. Admissions and Enrollment

1.1 Admissions

Non-Discrimination Statement

The College does not discriminate in admissions, employment, or in any of its educational programs or activities on the basis of race, color, ethnic or national origin, religion, sex (including pregnancy), disability, age (as applicable), veterans' status, genetic information, or any other legally protected classification. For more information, refer to the Non-Discrimination Policy.

Admissions

You must apply directly to a specific program of study. The College does not offer an "undecided" major or allow you to pursue multiple majors simultaneously. If you are unsure which program to pursue, you are encouraged to visit the College's website for information on available options.

The College receives many applications each year. At times, meeting the minimum requirements will not be sufficient for admission. Majors are limited in the seats provided.

Admissions Criteria

To be eligible for admission, you must meet the following requirements:

- You must have lived in Pennsylvania for at least one year
  - If you have lived in Pennsylvania for less than one year, you may request an appeal.
  - Exceptions may be made for active-duty military members, veterans, and their families.
- You must have a high school diploma or equivalent.
- You must have earned a minimum GPA of 2.0 to be considered.

Academic Review

- **High School Diploma Applicants**
  After your transcript is evaluated:
  1. If your high school GPA is 2.8 or higher, your application will move directly to review.
  2. If your GPA is 2.79- 2.0, you are required to take the entrance exam.
  3. If your GPA is below 2.0, you are not eligible for admission.
- **High School Equivalency Applicants**
  You are required to take the entrance exam.

Transfer Applicants

If you are a transfer applicant, you may waive the entrance exam by completing College-level English and Math courses with a grade of C or higher.

Readmit Students

Readmission applications are reviewed in accordance with College policy and may require additional documentation or review.

Second Degree

If you are a current student interested in pursuing a second degree, you must complete a readmission application.

Change of Major

If you wish to change your program of study, you must apply through the Admissions Office and meet all applicable admission requirements.

Non-matriculating Students

If you are a non-matriculating student, enrollment is limited to faculty, staff, and their dependents, and is subject to space availability.

Application Process

To be considered for admission, you must submit a completed application, application fee (or approved fee waiver), and official high school transcript or equivalent credential. Additional requirements may apply based on your educational background or program of interest. Current application procedures, deadlines, and submission instructions are available on the Admissions webpage.

Admissions Decisions

After review of all required application materials, you will receive one of the following admissions decisions:

Direct Admission to a Program of Study

If you meet the admission requirements and are academically prepared for your selected program, you may be admitted directly to the major.

Admission to the PreMajor Program

If you require additional preparation in reading, writing, and/or mathematics, you may be admitted to the PreMajor Program. Successful completion of PreMajor requirements is necessary before entering a technical program.

Denial of Admission

If you do not meet admission requirements, you may be denied admission.

1.2 Credit for Prior Learning and Advanced Placement

Thaddeus Stevens College of Technology may award academic credit for prior learning, education, training, or demonstrated competency. Credit may be awarded through methods including Advanced Placement (AP) examinations, standardized examinations, departmental examinations, portfolio assessment, military training, apprenticeship training, articulation agreements, and other approved assessment methods.

Credit awarded through prior learning assessment is subject to College policy and academic department approval. Credits awarded through these methods do not carry a letter grade and are not included in the calculation of your cumulative grade point average.

A maximum of 50% of the credits required for a credential may be earned through nontraditional credit methods.

See the Credit for Prior Learning Policy for details on eligibility, assessment methods, and the application process.

1.3 PreMajor Program

If your placement evaluation indicates that you need to strengthen foundational skills in reading, writing, and/or math, you must successfully complete PreMajor courses before being admitted to a technical program. Success in a PreMajor course is defined as earning a grade of "C" or better and meeting the required entrance test scores. If you do not meet the required test score thresholds, you may request a waiver based on demonstrated academic achievement at the college level.

1.4 Veteran and Military Information

Thaddeus Stevens College of Technology supports veterans, active-duty military personnel, reservists, National Guard members, and eligible dependents who use federal or state educational benefits.

If you seek to use veterans' educational benefits, you must comply with applicable federal and state requirements and provide required documentation to the College. Information regarding eligibility, certification procedures, available benefit programs, and required forms is available through the College's Veterans and Military Information webpage.

Military leave and educational benefits are administered in accordance with applicable federal and state laws and College policy.

Refer to the Veterans and Military Information webpage and applicable College policies for additional information.

1.5 Transfer Credits

If you want to transfer credits to Thaddeus Stevens College of Technology, the courses must meet the criteria outlined in the Transfer Credit Policy.

- Credits must be earned at a college accredited by a recognized accrediting agency.
- Only courses with a grade of “C” or higher are considered for transfer.
- Courses must be equivalent in content and credit hours to those offered at Thaddeus Stevens College of Technology.
- Coursework completed more than 10 years ago will be evaluated on a case-by-case basis.

1.6 Enrollment

Full-Time Status: You are considered a full-time student if you are enrolled in at least 12 credits during a semester.

Part-Time Status: You are considered a part-time student if you are enrolled in fewer than 12 credit hours during a semester.

Maximum Credits Hours: A typical full-time course load is approximately 18 credit hours. If you wish to enroll in more than 21 credit hours, you must complete a Semester Credit Overload Request Form prior to registration.

1.7 Registration Groups

Registration priority is based on your academic status and classification. Registration dates are established by the Registrar's Office and published in the Academic Calendar.

1.8 Credit Hours and Course Numbers

Credit Hours

A credit hour represents the amount of instructional and student work required to achieve the learning outcomes of a course. Credit hours are awarded in accordance with federal regulations and College policy. Online, hybrid, laboratory, internship, and accelerated courses meet equivalent credit hour requirements. Refer to the Credit Hour Policy for additional information.

Course Numbers

Courses are identified by a subject code and number (e.g., WELD 125). Courses numbered 001–099 are developmental courses. Courses numbered 100 and above are college-level courses.

1.9 Course Add/Drop Period

You may add or drop courses according to the following schedule:

- Within the first five business days of a full semester course (16 weeks)
- Within the first 2 business days of the First Subterm (First 8 weeks)
- Within the first 2 business days of the Second Subterm (Second 8 weeks)

Refer to the Registration: Enrollment, Registration and Changes to Registration Policy for more information.

1.10 Maximum Credit Hours

A typical full-time course load is approximately 18 credits per semester. Enrollment in more than 21 credits requires approval through the College's credit overload process.

1.11 Course Withdrawal

You may withdraw from a course after the add/drop period and before the published withdrawal deadline.

- Full-semester (16-week) courses: Through the 14th week of the semester.
- Eight-week courses: Through the 6th week of the term.

A course withdrawal will result in a grade of "W" on your academic transcript and will not affect the cumulative grade point average. You are encouraged to consult with your academic advisor and Financial Aid Office prior to withdrawing from a course. Refer to the Registration: Enrollment, Registration and Changes to Registration Policy for more information.

1.12 College Withdrawal

You may withdraw from the College in accordance with College policy. Refer to the Registration: Enrollment, Registration and Changes to Registration Policy for more information.

2. Academic Standards and Progress

2.1 General Education Requirements

General education courses are required for all degree programs at Thaddeus Stevens College of Technology. These courses support academic success, career readiness, and personal development. If you are pursuing an associate degree, you must successfully complete a

minimum of 25 general education credits. General education coursework includes Liberal Arts and Science Core courses and General Education Applied courses.

2.1.1 Liberal Arts and Science Core

You must complete at least 18 credits from the Liberal Arts and Science Core, including coursework in each of the following areas:

- Mathematics (MATH)
- English (ENG)
- Science (BIO, CHEM, PHYS, SCI)
- Humanities and Social Sciences (ECON, HIST, PHL, PSY, SOC, and designated ENG courses)

2.1.2 General Education Applied Courses

You may apply up to seven (7) credits of approved General Education Applied coursework toward graduation requirements. Applicable courses may include Business (BUSN), Computer Information Systems (CIS), and Health (HEAL) coursework.

General education courses may be offered in-person, online, or hybrid formats.

You should consult your program curriculum and academic advisor regarding specific general education requirements applicable to your program of study. Specific general education requirements for each program are listed within the program curriculum section of this catalog.

2.2 Academic Standing

You are in good academic standing if you:

- Maintain a minimum cumulative grade point average (GPA) of 2.0 and
- Maintain a minimum cumulative GPA of 2.0 in your technical major.

Refer to the Academic Standing, Probation, and Dismissal Policy for more information.

2.3 Satisfactory Academic Progress (SAP)

If you are receiving financial aid, you must maintain Satisfactory Academic Progress (SAP) in accordance with federal regulations and College policy. SAP standards include qualitative (GPA), quantitative (pace of completion), and maximum timeframe requirements. If you fail to meet SAP standards, you may lose eligibility for financial aid. Refer to the Satisfactory Academic Progress Policy for complete requirements and appeal procedures.

2.4 Academic Probation

- If you do not maintain an overall 2.0 cumulative GPA and a 2.0 cumulative GPA in the major at the end of the semester, you shall be placed on academic probation for the following semester.
- If you are on probation, you must adhere to the requirements established by the Dean of Student Success.
- You must achieve a semester GPA of 2.0 or higher.
- If you fail to meet the conditions of probation, you may remain on probation or be dismissed from the College.

- If you earn less than a 1.49 GPA overall or less than a 1.49 GPA in your major during a semester, you may be dismissed without a period of probation.

Refer to the Academic Standing, Probation, and Dismissal Policy for more information.

2.5 Academic Dismissal

If you fail to meet the conditions of Academic Probation, you may be subject to Academic Dismissal. You may also be dismissed for severe academic deficiency as outlined in College policy.

Refer to the Academic Standing, Probation, and Dismissal Policy for more information.

2.5.1 Appeal of Academic Dismissal

If you are academically dismissed, you may appeal the dismissal in accordance with College policy. Appeals must be submitted within the timeframe established by the College and will be reviewed by the appropriate academic administrator. The decision of the appeal authority is final.
Refer to the Academic Standing, Probation, and Dismissal Policy for more information.

3. Attendance and Academic Integrity

3.1 Attendance

You are expected to attend and actively participate in all courses. Excessive absences may result in warnings, removal from a course, or dismissal from the College. Attendance requirements vary by course format. Refer to the Attendance policy for complete attendance standards and consequences.

3.2 Non-Attendance

If you fail to attend a course or participate in required academic activities, you may be administratively removed from the course. If you fail to attend or participate in any registered courses may be administratively withdrawn from the College. Refer to the Attendance policy for additional information.

3.3 Academic Integrity

You are expected to uphold the highest standards of academic honesty and integrity in all coursework and academic activities.
Academic integrity violations include, but are not limited to:

- Cheating
- Plagiarism
- Unauthorized collaboration
- Fabrication or falsification of information or data
- Assisting others in committing academic misconduct

Violations of academic integrity may result in academic and/or disciplinary sanctions, including assignment failure, course failure, probation, suspension, or dismissal from the College.
You have the right to request a review of academic integrity findings in accordance with College procedures. Refer to the Academic Integrity Policy for complete definitions, procedures, sanctions, and appeal processes.

4. Grading and Academic Records

4.1 Grading Scale

Grades describe your level of academic achievement at the end of each term. Final grades are recorded on your transcript. This grade scale has been approved for the College and is in all credit-bearing courses.

The College's grading scale is:

GRADE	POINT ALLOCATION	% SCALE
A	4.0	93 and above
A-	3.7	90-92
B+	3.3	87-89
B	3.0	83-86
B-	2.7	80-82
C+	2.3	77-79
C	2.0	73-76
C-	1.7	70-72
D+	1.3	67-69
D	1.0	63-66
D-	0.7	60-62
F	0.0	59 and below
I	NA	Incomplete
W	NA	Withdrawal
WS	NA	Withdrawal from School

4.2 Incomplete Grades

An Incomplete ("I") grade may be assigned when circumstances beyond your control prevent completion of course requirements by the end of the term. Coursework must be completed by the end of the fourth week of the following semester (or the second week following an eight-week term). If the work is not completed by the deadline, the grade will convert to an "F" unless an exception is approved in accordance with College policy. Refer to the Grading Policy for additional information.

4.3 Grade Change

Grade changes may be made to correct errors or to replace an incomplete grade in accordance with College policy. Refer to the Grading Policy for procedures and deadlines.

4.4 General Course Repeat Policy

You may repeat a course to earn a passing grade or improve a previously earned grade. When a course is repeated, only the highest grade earned will be included in the cumulative GPA calculation.

4.4.1 Developmental Courses

Developmental courses may be repeated once. You must successfully complete developmental courses with a grade of "C" or better to continue into a program of study.

4.4.2 College-Level Courses

College-level courses may be repeated a maximum of two times (three total attempts). If you are unable to successfully complete courses required for graduation, you should consult with your academic advisor regarding academic options.

4.4.3 Appeals

You may appeal exceptions to the Course Repeat Policy in accordance with College policy.

Refer to the Course Repeat Policy for more information.

4.5 Dean's List

If you earn a semester GPA of 3.25 or higher and have no incomplete grades, you are eligible for the Dean's List.

4.6 Grade Appeal

If you believe a final grade was assigned in error or inconsistent with the course syllabus, you may appeal the grade in accordance with College policy. Grade appeals are reviewed through the academic appeal process. Refer to the Grading Policy for complete procedures and deadlines.

4.7 Transcripts

The College maintains grade and transcript records in accordance with institutional record retention requirements. Official transcripts may be requested through the National Student Clearinghouse by completing the Online Transcript Order Form.

5. Graduation Requirements

5.1 Graduation Requirements

Academic advisors assist you in planning course selections, but the final responsibility for meeting graduation requirements rests with you. Departures from these requirements must be approved by the Registrar.

1. To be considered a candidate for graduation, you must achieve the minimum required passing grade in all major and general education courses.
2. You must earn a minimum 2.0 cumulative GPA and a minimum 2.0 technical GPA.
3. Failure in any course must be remedied by repeating and earning the required grade. Refer to the Course Repeat Policy for additional details.
4. Degrees are awarded three times a year, at the conclusion of the Fall, Spring and Summer semesters.

5.2 Residency and Transfer Requirements

1. Associate of Applied Science Degree: You must complete at least 30 credits at the College to be eligible for graduation.
2. Certificate: You must complete at least 15 credits at the College to be eligible for graduation.
3. If you have a minimum 2.00 GPA overall and in the major, you may transfer in remaining general education course requirements from another accredited postsecondary institution. You must earn a "C" or higher for courses to be eligible for transfer.

5.3 Participation in Commencement Ceremony

If you are near completion of degree requirements, you may be permitted to participate in Commencement prior to degree conferral. Participation in Commencement does not constitute graduation.

5.4 Withholding Diplomas and Official Records

The College may withhold diplomas, transcripts, or other official records until all financial obligations to the College have been satisfied.

5.5 Graduation Honors

Based on your final GPA, if you have earned exemplary grades, you will be recognized for your achievements with the designation of graduation honors. Your College transcript will carry the appropriate honors designation as follows:

- 3.95 – 4.00 summa cum laude
- 3.65 – 3.94 magna cum laude
- 3.35 – 3.64 cum laude
- 3.25 – 3.34 honors

Refer to the Graduations Requirements and Honors Policy for more information.