TECHNICAL

Programs

- Automotive - Automotive Service Technology, Associate in Applied Science Degree (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/automotive/)
- Automotive - Electrical & Drivability Specialist, Certificate of Achievement (Level II) (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/automotive-electrical-drivability-specialist-level-ii/)
- Automotive - Hybrid Technology Specialist, Certificate of Achievement (Level II) (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/automotive-hybrid-technology-specialist-level-ii/)
- Automotive - Master Automotive Technician, Certificate of Achievement (Level III) (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/automotive-master-automotive-technician-level-iii/)
- Automotive - Under Car Specialist, Certificate of Achievement (Level II) (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/automotive-under-car-specialist-level-ii/)
- Construction Technology - Carpentry Technology, Certificate of Achievement (Level I) (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/construction-technology-carpentry-technology-level-i/)
- Construction Technology - Carpentry Technology, Certificate of Achievement (Level II) (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/construction-technology-carpentry-technology-level-ii/)
- Construction Technology - Construction Management, Associate in Applied Science Degree (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/construction-technology-construction-management/)
- Construction Technology - Electrical Technology, Certificate of Achievement (Level II) (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/construction-technology-electrical-technology-level-ii/)
- Construction Technology - Electrical, Associate in Applied Science Degree (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/construction-technology-electrical/)
- Construction Technology - Facilities Maintenance, Certificate of Achievement (Level II) (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/construction-technology-facilities-maintenance-level-ii/)
- Construction Technology - HVAC/R Technology, Certificate of Achievement (Level I) (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/construction-technology-hvacr-technology-level-i/)
- Construction Technology - HVAC/R, Associate in Applied Science Degree (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/construction-technology-hvacr/)
- Construction Technology - Renewable Energy Technology - Electrical, Certificate of Achievement (Level II) (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/construction-technology-renewable-energy-technology-electrical-level-ii/)
- Construction Technology - Renewable Energy Technology - HVAC/R, Certificate of Achievement (Level II) (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/construction-technology-renewable-energy-technology-hvacr-level-ii/)
- Engineering Technology - Biomedical Technician, Associate of Applied Science (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/engineering-technology-biomedical-technician/)
- Engineering Technology - Computer Technology, Associate of Applied Science (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/engineering-technology-computer-technology/)
- Engineering Technology - Electronics Technology, Associate of Applied Science (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/engineering-technology-electronics-technology/)
- Engineering Technology - General, Associate in Applied Science Degree (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/engineering-technology-general/)
- Engineering Technology - Marine Technology, Associate of Applied Science (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/engineering-technology-marine-technology/)
- Engineering Technology - Programmable Logic Controllers (PLC), Certificate of Achievement (Level I) (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/engineering-technology-programmable-logic-controllers-plc-level-i/)
- Engineering Technology - Robotics & Automation Technology, Associate of Applied Science (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/engineering-technology-robotics-automation-technology/)
- Engineering Technology - Unmanned Aerial Systems Technology, Associate of Applied Science (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/engineering-technology-unmanned-aerial-systems-technology/)
- Freshwater Studies, Associate in Applied Science Degree (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/freshwater-studies/)
- Manufacturing Technology, Associate in Applied Science Degree (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/manufacturing-technology/)
- Marine Technology, Bachelor of Science (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/marine-technology/)
- Surveying, Associate in Applied Science Degree (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/surveying/)
- Welding Technology, Associate in Applied Science Degree (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/welding-technology/)
- Welding Technology, Certificate of Achievement (Level I) (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/welding-technology-level-i/)
- Welding Technology, Certificate of Achievement (Level II) (https://catalog.nmc.edu/archives/2021-2022/programs-az/technical/welding-technology-level-ii/)

Courses
Automotive Technology

AT 100 - Automotive Service Basics
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
This is the first course in the Automotive Service Program. Engine theory, cooling systems, and lube requirements will be covered. Bolts, micrometers and basic specialty tools are integrated into the class. Training in the use of acetylene torch equipment will be taught along with its use in the automotive field. The student will learn general shop organization, types of service, and cost and returns by department. Time will be devoted to employer-employee and customer relations, and instruction in the use of the service manual. Group 2 course.
Recommended Prerequisite(s): ENG 99/108

AT 110 - Automotive Brake Systems
Credit Hours: 5, **Contact Hours: 7**
Division: Technical
This course covers theory, components, nomenclature, and service of automotive brake systems. Students will use standard skills to diagnose hydraulic systems, drum and disk brakes, power assist units and systems. The study and repair of modern ABS systems along with the replacement of associated parts such as wheel bearings will also be covered. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): AT 100-may be taken concurrently

AT 120 - Automotive Electrical I
Credit Hours: 5, **Contact Hours: 8**
Division: Technical
This course covers basic electricity, circuits, testing equipment, and solid state electronics. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): AT 100-may be taken concurrently

AT 130 - Engine Performance I
Credit Hours: 5, **Contact Hours: 8**
Division: Technical
This course is designed to familiarize the student with the theory and operation of the automotive ignition system and fuel system. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): AT 220

AT 140 - Suspension and Steering
Credit Hours: 4, **Contact Hours: 6**
Division: Technical
This course is designed to familiarize the student with the nomenclature, theory, and service techniques for the modern steering and suspension system. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): AT 100-may be taken concurrently

AT 150 - Automatic Transmissions
Credit Hours: 6, **Contact Hours: 9**
Division: Technical
This course is designed to familiarize the student with hydraulic theory, internal transmission powerflow, electronic control and torque converter operation. All aspects of transmission operation will be covered as well as removal, overhaul, and installation procedures. Students will remove, dyno-test, and install actual failed units in the lab. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): Instructor signature required

AT 160 - Engine Repair
Credit Hours: 6, **Contact Hours: 8**
Division: Technical
This course covers the theory, construction, and repair of the four stroke automotive engine. This will include the proper use of compression leakage and test equipment, precision measuring tools, special engine tools and valve grinding equipment. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): AT 100-may be taken concurrently

AT 170 - Heating and Air Conditioning
Credit Hours: 4, **Contact Hours: 6**
Division: Technical
This course covers the principles of refrigeration with emphasis on the particular problems of application to automotive air conditioning. The course also covers automotive heating systems which include heater cores, blower motors, vent systems and the electronic controls for them. The student will learn how to use refrigerant recovery and charging equipment and will have hands-on experience in the lab with that equipment. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): AT 120

AT 180 - Manual Drivetrain and Axles
Credit Hours: 6, **Contact Hours: 9**
Division: Technical
This course covers the basic operating principles, construction, power flow and repair of clutches, manual transaxles, and drive shafts. Differential theory and overhaul will be covered including ring and pinion replacement and set up. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): AT 100-may be taken concurrently

AT 210 - Hybrid Technology
Credit Hours: 5, **Contact Hours: 8**
Division: Technical
This course provides a comprehensive systems overview of the operating principles, maintenance, and service of hybrid electric vehicles. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): AT 130 or Certification in Electrical and Engine Tune Up

AT 220 - Automotive Electrical II
Credit Hours: 5, **Contact Hours: 8**
Division: Technical
This course covers advanced automotive electronics with the emphasis placed on operation, troubleshooting, and repair of lighting, gauges, accessories, and power option circuits. Body hardware is covered including diagnostics of modern systems with body control modules. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): AT 120

AT 230 - Engine Performance II
Credit Hours: 4, **Contact Hours: 6**
Division: Technical
This course covers computerized engine controls including the latest emission control systems. The student will become proficient with the use of scanners, scopes, and the latest engine analyzers. The art of diagnostics and troubleshooting will be stressed. The student will have hands-on experience in this area including practice using the computer as a source of information. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): AT 130

AT 290 - Automotive Internship
Credit Hours: 3, **Contact Hours: 3**
Division: Technical
The purpose of the internship is to provide on-the-job training for the student who wishes to pursue a career in a technical field of study. The internship will be customized to meet the learning needs of the student and the job requirements of the sponsoring firm. Students spend 10-15 hours per week in this paid, supervised on-the-job training experience. In addition to the required 50 hours at a work site, students participate in semi-monthly seminars. Students must apply one month prior to the semester in which they will complete the internship. Group 2 course.
Required Prerequisite(s): 30 credits of program specific courses with a GPA of 2.0 or higher

Carpentry Technology

CAR 100 - Introductory Craft Skills
Credit Hours: 2, **Contact Hours: 3**
This course provides an introduction to essential construction skills. Through structured classroom and hands-on skill building, the student will be introduced to the construction industry, building materials, safety, hand and power tools, print reading, construction math, communication and employability skills. Group 2 course.

CAR 101 - Introduction to Carpentry
Credit Hours: 3, **Contact Hours: 4**
This course provides an introduction to residential carpentry. Through structured classroom and hands-on skill building, the student will learn about the construction industry, building materials, fasteners and adhesives, hand and power tools, introduction to print reading, and floor systems. Group 2 course., and placement into ENG 11/111 or higher, or co-enrollment in the recommended English course.
Required Prerequisite(s): CAR 100, may be taken concurrently

Recommended Prerequisite(s): Placement into MTH 23 or higher, or co-enrollment in the recommended developmental math course

CAR 102 - Intro to Woodworking
Credit Hours: 3, **Contact Hours: 4**
This course is for the student that has a desire to experience woodworking in the area of basic cabinet and furniture. Techniques in the usage and maintaining of basic hand and power tools, understanding of how wood movement will affect design of an assembly, application of basic joinery, adhesives, and fasteners in the woodworking completion of this class establishes a foundation in which the student can build simple furniture and cabinets. Group 2 course.
Recommended Prerequisite(s): Students will greatly benefit from having competency up to MTH111

CAR 103 - Construction Blueprint Reading
Credit Hours: 3, **Contact Hours: 3**
Students will learn the skills needed to read and understand construction drawings, as well as an understanding of manufacturers' literature of component parts used in buildings. Both commercial and residential construction materials and drawings are studied. Problems encountered in design development such as site limitations, zoning restrictions, utility availability, coordination of product specifications, adherence to building codes and life safety are explored. Group 2 course.
Recommended Prerequisite(s): Placement into MTH 111 or co-enrollment in MTH 08 or 23, placement into ENG 111 or co-enrollment in ENG 99/108

CAR 104 - Woodworking Applications I
Credit Hours: 3, **Contact Hours: 4**
This course is for the student with a strong understanding of hand and power tools used in the craft of woodworking. A desire to expand their knowledge in the aspects involved with basic furniture and cabinet building is a must. Students will be constructing projects that, by design, will challenge those of the advanced beginner and intermediate skill abilities. Students will plan and implement the necessary steps to address the projects' hardware and joinery requirements. Group 2 course.
Required Prerequisite(s): CAR 102

Recommended Prerequisite(s): MTH 23

CAR 105 - Foundations and Framing
Credit Hours: 3, **Contact Hours: 4**
Through structured classroom and hands-on skill building, the student will learn foundation design, layout, concrete material forms, and applications. Floor, wall, ceiling and roof framing will be covered, as well as basic stair layout and construction. Group 2 course.
Recommended Prerequisite(s): Placement in MTH 23 or co-enrollment in the recommended developmental Math course, placement into ENG 11/111 or co-enrollment in the recommended English course

CAR 121 - Exterior Construction
Credit Hours: 3, **Contact Hours: 4**
Through structured classroom and hands-on skill building, the student will learn about various roofing materials and applications, window and door installation, siding, cornice design and installation, gutters, downspouts, decks and fences. Group 2 course. Placement into ENG 11/111 or higher, or co-enrollment in the recommended English course.
Recommended Prerequisite(s): Placement into MTH 23 or higher, or co-enrollment in the recommended developmental math course

CAR 125 - Interior Construction
Credit Hours: 3, **Contact Hours: 4**
Through structured classroom and hands-on skill building, the student will learn about drywall products, installation, and finishing, wall panels, tile, suspended ceilings, finish trim, flooring, and cabinet and countertop installation. Group 2 course. Placement into ENG 11/111 or Co-enrollment in the recommended English Course.
Recommended Prerequisite(s): Placement in MTH 23 or co-enrollment in the recommended developmental Math course

CAR 135 - Site Layout and Formwork
Credit Hours: 3, **Contact Hours: 4**
Through structured classroom and hands-on skill building, the student will learn about trenching and excavation, foundations and slab-on-grade, vertical formwork, horizontal formwork and tilt-up wall panels. Group 2 course.

Drafting and Design

DD 101 - Print Reading and Sketching
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
Students will learn to read engineering drawings of products and tooling used in today's manufacturing. Basic drawing format and layout are presented using product, tooling assembly, and tooling detail drawings. Students learn methods of three dimensional shape description, dimensioning and tolerancing. Types of fasteners along with related terminology and manufacturing processes, material specifications, and welding symbols are presented. Students learn the presentation skills of orthographic projection, isometric and oblique pictorial drawings using 2D CAD software. Group 2 course. Critical Thinking - Direct.

DD 110 - Basic Metallurgy
Credit Hours: 3, **Contact Hours: 3**
Division: Technical
This course presents the making and forming of steel and the classification of steel and cast iron. Mechanical and physical properties are presented along with hardness and tensile testing labs. Principles of alloying, crystal structure, and the iron-carbon diagram help students understand how annealing, hardening, and tempering processes alter the mechanical properties of steel. Non-ferrous metallurgy is presented with an emphasis on aluminum. Group 2 course.
Recommended Prerequisite(s): Placement into MTH 23 and ENG 99/108 recommended for entry

DD 160 - Tolerancing and GD&T
Credit Hours: 3, **Contact Hours: 3**
Division: Technical
This course first presents conventional tolerancing terminology, expressions, and accumulations in both inch and metric formats. Next, Geometric Dimensioning and Tolerancing (GD&T) presents an international system of symbols used to dimension products or tooling components. The course is based on the current ASME Y14.5M2009 Dimensioning and Tolerancing standard. Engineers, designers, drafters, cost estimators, machinists, and inspectors must understand this system. Students study actual product drawings and make design sketches of workholding and inspection devices. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): DD 101

DD 170 - CADD/Computer Modeling
Credit Hours: 4, **Contact Hours: 5**
Division: Technical
Graphic communication course using 3D parametric modeling techniques. Topics include 3D modeling using SolidWorks software in an engineering design environment. Students will also develop 2D drafting skills including proper organization and layout of component drawing views, dimensioning and tolerancing, sectioning and detailing, detail descriptive geometry and rapid prototyping. As part of this course, students will earn a CSWA Certified Solidworks Associate certification. Group 2 course. Critical Thinking - Direct.
Recommended Prerequisite(s): Placement into MTH 23 and ENG 99/108

DD 290 - Drafting Internship
Credit Hours: 3, **Contact Hours: 3**
Division: Technical
The purpose of the internship is to provide on-the-job training for the student who wishes to pursue a career in a technical field of study. The internship will be customized to meet the learning needs of the student and the job requirements of the sponsoring firm. Students spend 10-15 hours per week in this paid, supervised on-the-job training experience. In addition to the required 50 hours per credit in a work site, students participate in semi-monthly seminars. Students must apply one month prior to the semester in which they will complete the internship. Group 2 course.
Required Prerequisite(s): 30 credits of program specific courses with a GPA of 2.0 or higher

Construction Management

CMT 107 - Construction Supervision
Credit Hours: 4, **Contact Hours: 4**
Students will learn the skills needed for construction management including: business management, estimating and job costing, design and building science, contracts, liability and risk management, marketing and sales, project management and scheduling, the Michigan Residential Code, MIOSHA construction safety standards, and effective communication for construction project management. As part of this course, students will earn pre-licensure for the Residential Builders/ Maintenance & Alteration Contractors Examination. Group 2 course. Critical Thinking - Direct.
Recommended Prerequisite(s): Students have completed or are co-enrolled in MTH 08 or 23 and ENG 99/108

CMT 207 - Construction Cost Estimating
Credit Hours: 3, **Contact Hours: 3**
In this course students will explore topics pertaining to the processes of construction estimating and bidding techniques. Those topics will include, but are not limited to, the discussion and exploration of the identification and quantification of construction materials, labor, and equipment for the construction bidding process. Some computer estimation programs and/or cost data publications will be used to develop estimates. Group 2 course. Quantitative Reasoning.
Required Prerequisite(s): CAR 103, CMT 107, MTH 111 or higher, CIT 100

Recommended Prerequisite(s): ENG 111-may be taken concurrently, math and reading skills are necessary for success in this course

Electrical Technology

EET 102 - Intro to Engineering Tech
Credit Hours: 2, **Contact Hours: 2**
Division: Technical
This course is designed to give students an overview of Engineering Technology and the career options this profession provides. This course highlights the technical specializations within the Engineering Technology degree at NMC. Course topics also include engineering design methods, project management principles and practices, team work skills, engineering ethics, and the role of engineering in global and environmental issues. Group 2 course. Communications - Direct.
Recommended Prerequisite(s): Placement into MTH 23 and ENG 99/108 or higher

EET 103 - Electrical Studies I
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
Explore the fundamentals of electricity and electronics by developing introductory analysis, construction and troubleshooting techniques for DC and AC circuits. Safe electrical practices will be emphasized throughout the course as the student constructs circuits from schematics and diagrams using proper wiring and soldering techniques. Electrical measurements will be performed using multimeters and oscilloscopes. Group 2 course. Quantitative Reasoning.

EET 161 - Fundamentals of Light & Lasers
Credit Hours: 4, **Contact Hours: 6**
Division: Technical
This course introduces the elements of a laser, operation of a helium-neon gas laser, laser physics, optical-cavities, properties of laser light and a survey of laser systems. Safety procedures concerning lasers and related equipment are presented in this course. Group 2 course. Quantitative Reasoning.
Required Prerequisite(s): MTH 23 or higher

EET 180 - Biomedical Equipment I
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
This course introduces the learner to the field of the biomedical equipment technology and the role of the technician. Safety, patient care, ethics, regulatory requirements, healthcare equipment technology and function will be emphasized. Proper procedures and protocols for the calibration, test and troubleshooting of medical equipment will be developed. Common diagnostic equipment will be used for signal analysis. The course will begin the preparation for the CBET certification exam. Group 2 course.
Required Prerequisite(s): BIO 106, EET 204, HAH 101

EET 190 - Biomedical Internship
Credit Hours: 1, **Contact Hours: 1**
Division: Technical
The purpose of the internship is to provide on-the-job training for the student who wishes to pursue a career in Biomedical Equipment. The internship will be customized to meet the learning needs of the student and the job requirements of the sponsoring firm. Students spend 5-10 hours per week in this, supervised on-the-job training experience. In addition to the required 50 hours per credit in a work site, students participate in three seminars. Students must apply one month prior to the semester in which they will complete the internship. Group 2 course.
Required Prerequisite(s): EET 180

EET 204 - Electrical Studies II
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
A systems level approach to electronics and electrical devices will be used to analyze semiconductor applications including integrated circuits, power supplies, transistors, amplifiers, and digital logic families. Circuits will be bench tested, and integrated with others to meet system requirements. Design modifications, circuit improvements, component protection and application to other areas of engineering technology will be emphasized as designs are developed into working prototypes. Group 2 course. Quantitative Reasoning.
Required Prerequisite(s): EET 103

EET 212 - Elements of Photonics
Credit Hours: 4, **Contact Hours: 5**
Division: Technical
Elements of Photonics builds upon and applies principles presented in Fundamentals of Light and Lasers. The course includes modules on operational characteristics of lasers, specific laser types, optical detectors and human vision, principles of optical fiber communications, photonics devices for imaging, storage and display, and laser welding and surface treatment. Group 2 course. Quantitative Reasoning.
Required Prerequisite(s): EET 161

EET 221 - Industrial Controls
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
This course studies control circuits, electrical schematics and line diagrams. Motor circuits utilizing motor starters, contactors, timers and counters are used to demonstrate control circuitry. Industrial control devices are examined, including solid-state control devices, electro-mechanical relays, proximity sensors, photoelectric sensing devices and programmable logic controllers. Group 2 course.
Required Prerequisite(s): EET 103 or ELE 105 or MNG 234 or MNG 235

EET 232 - Programmable Logic Controllers
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
This course studies programmable logic controllers (PLCs). Basic models and complete applications are applied to control inputs and outputs of PLCs. Ladder logic and device wiring techniques are studied, along with advanced program instructions such as counters, timers, sequencers and integer moves. Input/output devices are used to examine PLC program logic during the control process. Group 2 course.
Required Prerequisite(s): EET 221

EET 233 - PLC Applications I
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
This course is a study of the integration of program styles and components used in industry. Program structures and instructions will be used in lab projects to simulate how PLCs can be used to create a variety of useful functions. A mixture of textbook and component manuals will be used to learn the necessary information to complete these functions. Group 2 course.
Required Prerequisite(s): EET 232, ELE 142

EET 234 - PLC Applications II
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
This course is a continuation of the study of the integration of program styles and components used in industry. Program structure and project development will be studied. Installation of different types of components integrated with PLCs will also be studied. Group 2 course.
Required Prerequisite(s): EET 233, ELE 146

EET 260 - System Engineering in Practice
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
This class introduces students to the practice of system design and development. Students apply specific methodologies for problem-based learning and project management. Technical content from prior courses is applied to address challenges and create solutions. Student teams create prototypes and communicate results with classroom activities supporting teamwork, project planning, requirements analysis, design, development, testing, demonstration, and reporting. Group 2 course.
Required Prerequisite(s): EET 102, EET 103, RAM 155

Recommended Prerequisite(s): AVF 141, RAM 205 or WSI 200

EET 281 - Biomedical Equipment II
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
This course continues the study of biomedical equipment technology and the role of the technician. Healthcare problem solving techniques will be developed through the analysis, testing and troubleshooting of medical equipment. Information technology needs and requirements will be reviewed as they pertain to the healthcare environment as well as anatomy and physiology specific to the field. Students will continue preparing for the CBET certification exam. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): EET 180

EET 290 - Engineering Tech Internship
Credit Hours: 3, **Contact Hours: 3**
Division: Technical
The purpose of the internship is to provide on-the-job training for the student who wishes to pursue a career in a technical field of study. The internship will be customized to meet the learning needs of the student and the job requirements of the sponsoring firm. Students spend 10-15 hours per week in this paid, supervised on-the-job training experience. In addition to the required 50 hours per credit in a work site, students participate in semi-monthly seminars. Students must apply one month prior to the semester in which they will complete the internship. Group 2 course.
Required Prerequisite(s): 30 credits of program specific courses with a GPA of 2.0 or higher

EET 292 - Technical Career Development
Credit Hours: 1, **Contact Hours: 1**
Division: Technical
This course provides the career tools necessary for the student to reach their full professional potential. The student will develop essential career success skills through class activities and direct practice in the technical community. Hands-on assignments in each session will allow the student to research employers; learn about application requirements, practice meeting professionals in their field, and practice successful interviewing techniques. Group 2 course.
Required Prerequisite(s): 30 Technical division program credits

EET 304 - Marine Electronics
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
Marine Electronics focuses on the systems, applications, electronics, and safety requirements specific to the marine and ROV environments. The design, repair and integration of cabling, tether, communication devices, sensors, and components into electrical systems will be emphasized. Students will use test equipment and protocols to develop troubleshooting methods to analyze and integrate this technology. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): EET 104 or EET 204

HVAC/R

HVA 101 - Introduction to HVAC/R
Credit Hours: 3, **Contact Hours: 4**
This course covers safety concerns associated with the HVAC field, identification and use of trade tools and basic blueprint reading. Students are introduced to different types of pipe and tubing used for equipment and will learn threading and soldering techniques. A strong emphasis is placed on electrical theory and application as well as learning how to read electrical diagrams. Group 2 course.
Required Prerequisite(s): CAR 100, may be taken concurrently

Recommended Prerequisite(s): Placement into ENG 111 and MTH 111, both may be taken concurrently

HVA 106 - Fundamentals of Heating
Credit Hours: 3, **Contact Hours: 4**
This course focuses on the variety of heating systems in the HVAC career field. Students are introduced to the principles of combustion and the importance of combustion analysis. Gas furnaces, heating controls, oil fired equipment, humidification and electric heating systems are also explored. Group 2 course.
Required Prerequisite(s): HVA 101, may be taken concurrently

Recommended Prerequisite(s): Placement in ENG 111 and MTH 111

HVA 122 - Refrigeration Fundamentals
Credit Hours: 3, **Contact Hours: 4**
This course introduces students to the relationship between matter and energy as it relates to refrigeration process and discusses the Laws of Thermodynamics and effects of pressures and vacuums on a system. A thorough coverage of the basic refrigeration cycle is discussed along with types of refrigerants and system components they will encounter. Students will also learn basic servicing and testing techniques on refrigeration systems. Group 2 course.
Required Prerequisite(s): HVA 101

Recommended Prerequisite(s): Placement in ENG 111 and MTH 111

HVA 126 - Residential and Commercial A/C
Credit Hours: 3, **Contact Hours: 4**
This course focuses on different types of air conditioning systems, ventilation and de-humidification equipment used in residential and light commercial applications. Students will learn about air source and geothermal heat pumps, mechanical and electrical troubleshooting techniques for air conditioning systems and explore indoor air quality and planned maintenance issues for all types of equipment. Group 2 course.
Required Prerequisite(s): HVA 122 - may be taken concurrently

Recommended Prerequisite(s): Placement in ENG 111 and MTH 111

HVA 132 - Commercial A/C & Refrigeration
Credit Hours: 3, **Contact Hours: 4**
This course focuses on larger commercial systems encountered in the HVAC field for air conditioning and refrigeration applications. Emphasis is placed on chilled water and hydronic heating systems, boilers, air handling equipment and cooling towers. Students will also learn about larger scale refrigeration systems used in supermarket and cold storage applications, ice machine operation and discussion of control systems used throughout the field. Group 2 course.
Required Prerequisite(s): HVA 126 with a grade of 2.5 or higher

Recommended Prerequisite(s): Placement into MTH 111 and ENG 111

HVA 136 - EPA Certification
Credit Hours: 3, **Contact Hours: 3**
This course examines the impact of refrigerants on the environment and focuses on federal regulations regarding their use, recovery and disposal methods. Students are given the opportunity to earn their Type I, Type II or Universal Certification through this course. Upon successful completion of each test, the student will earn levels of certification recognized by the HVAC/R industry nationwide. Group 2 course. Quantitative Reasoning.
Required Prerequisite(s): HVA 126 - may be taken concurrently

Recommended Prerequisite(s): Placement in ENG 111 and MTH 111

Manufacturing Technology

MFG 104 - Fluid Power
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
The Fluid Power course is designed to provide students with a basic understanding of the concepts and applications of fluid power technology and the necessary skills for further study in the field. The course is an overview of fluid power technology applications; the general concept of fluid power systems; an introduction to energy input, energy output, energy control, and systems auxiliary components; as well as the design and function of components. As part of this course, students will earn an IFPS Connector and Conducter certification. Group 2 course. Critical Thinking - Direct, Quantitative Reasoning.
Recommended Prerequisite(s): Placement into MTH 111 and ENG 99/108

MFG 111 - Math for Manufacturing
Credit Hours: 3, **Contact Hours: 3**
Division: Technical
This course will apply principles of mathematics, geometry, and basic trigonometry to applications in manufacturing. Topics will include proportions, calculation of machine speed and feed and geometric relationships of triangles and circles. Problem solving will require the use of the Pythagorean Theorem and the sine, cosine, and tangent functions to solve right triangles. The Law of Sines and Law of Cosines will be used to solve oblique triangle applications. Group 2 course. Quantitative Reasoning.

MFG 113 - Machining I
Credit Hours: 3, **Contact Hours: 5**
Division: Technical
The student will be introduced to measurement and the safe use of layout and bench tools, drill press operations, and basic lathe facing and turning operations. Basic vertical milling operations will also be included. Group 2 course. Students will greatly benefit from having competency up to MTH 111. Critical Thinking - Direct.
Recommended Prerequisite(s): Print reading, precision measurement, basic machining knowledge and skills, competencies in Communications equal to ENG99 and math equal to MTH23

MFG 114 - Machining II
Credit Hours: 3, **Contact Hours: 5**
Division: Technical
This course will introduce students to machining procedures beyond the basic operations. The student should have previously acquired basic machining knowledge and skills. Lathe procedures will include threading and cutting tapers. Milling operations will include the offset boring head, and broaching. Precision grinding of parallel and angular surfaces using gauge blocks and a sine bar will be introduced. Students will study the process and perform hands on operations. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): MFG 113 or MNG 260 Students will greatly benefit from having competency up to MTH 111

Recommended Prerequisite(s): Print reading, precision measurement, basic machining knowledge and skills, competencies in Communications equal to ENG 99/108 and Math equal to MTH 23

MFG 203 - Manuf/Engineering Processes
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
The Manufacturing and Engineering Processes course will provide students with an overview of various processes used in the design and development of new products. Students will be introduced to the engineering steps and processes required to take a product from concept through production. This is a project-based class in which students will design and fabricate a component aligned with their area of interest. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): DD 170, ENG 99/108, MTH 23

MFG 217 - CNC Operations - Lathe
Credit Hours: 4, **Contact Hours: 6**
Division: Technical
This course will introduce students to CNC (Computer Numerical Control) turning machines or CNC lathes. CNC lathe procedures will include set up from a list of guidelines to properly and safely make a part to blueprint specifications. Students will spend lab time going over machine demonstrations with individual practice and support, supplemented with classroom and online learning going over safety procedures and machine set up operations. Group 2 course. Quantitative Reasoning.
Required Prerequisite(s): MFG 113

Recommended Prerequisite(s): MTH 23 or higher

MFG 219 - CNC Mill Operations
Credit Hours: 4, **Contact Hours: 6**
Division: Technical
This course includes the operation of CNC (Computer Numerical Control) mills including calling up programs, loading and unloading parts, part inspection, and monitoring tool wear. This course will provide an introduction to planning and writing programs for CNC mills and using standard G and M codes. Learners will set up work pieces in machines, enter programs, set tool offsets, enter work offsets, and complete part projects. Group 2 course. Quantitative Reasoning.
Recommended Prerequisite(s): MFG 113 or MNG 260

MFG 290 - Manufacturing Tech Internship
Credit Hours: 2-4, **Contact Hours: 2-4**
Division: Technical
The purpose of the internship is to provide on-the-job training for the student who wishes to pursue a career in a technical field of study. The internship will be customized to meet the learning needs of the student and the job requirements of the sponsoring firm. Students spend 10-15 hours per week in this paid, supervised on-the-job training experience. In addition to the required 50 hours per credit in a work site, students participate in semi-monthly seminars. Students must apply one month prior to the semester in which they will complete the internship. Group 2 course.
Required Prerequisite(s): 30 credits of program specific courses with a GPA of 2.0 or higher

MFG 304 - Marine Hydraulics
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
Marine Hydraulics focuses on the systems, applications, hydraulics, and safety requirements specific to the marine and offshore Remote Operated Vehicle (ROV) environments. The design, repair and maintenance of launch and recovery equipment, hoses, sensors and components associated with ROV hydraulics systems will be emphasized. Students will use test equipment and protocols to develop trouble shooting methods to analyze and integrate this technology. As part of this course, students will earn an IFPS Hydraulic Specialist certification. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): MFG 104, MTH 111 or higher, PHY 121

Plumbing

PLU 101 - Introduction to Plumbing
Credit Hours: 3, **Contact Hours: 4**
This course provides an introduction to plumbing. Through structured classroom and hands-on skill building, the student will learn the tools of the trade, plumbing safety, how to solder and braze copper tubing, piping skills and trade mathematics. Group 2 course.
Recommended Prerequisite(s): Placement into MTH 23 and ENG 11/111 or co-enrollment in the recommended developmental Math and English course

PLU 105 - Plumbing Components
Credit Hours: 3, **Contact Hours: 4**
Through structured classroom and hands-on skill building, the student will learn to work with copper pipe and fittings, cast-iron pipe and fittings, carbon steel pipe and fittings, corrugated stainless steel tubing, fixtures and faucets, drain waste and vent systems and water distribution systems. Group 2 course.
Required Prerequisite(s): PLU 101

PLU 121 - Commercial Plumbing
Credit Hours: 3, **Contact Hours: 4**
Through structured classroom and hands-on skill building, the student will learn to read commercial drawings, install hangers, supports, structural penetrations, and fire stopping, installation and testing DWV piping. Group 2 course.
Required Prerequisite(s): PLU 105

PLU 125 - Plumbing Installation
Credit Hours: 3, **Contact Hours: 4**
Through structured classroom and hands-on skill building, the student will learn installation of roof, floor, and drain areas, types of valves, installing and testing water supply piping, installing fixtures, valves, and faucets, basic electricity, installing water heaters, fuel gas systems and servicing plumbing fixtures. Group 2 course.
Required Prerequisite(s): PLU 121

Renewable Energy

EGY 101 - Principles of Renewable Energy
Credit Hours: 3, **Contact Hours: 3**
This course covers the basic principles and history of renewable energy sources. Industry and governmental perspectives on geothermal, wind, solar, biomass, fuel cells, and other energy sources are highlighted. This course is required to achieve a Level II Certificate in Renewable Energy Technology. Group 2 course.
Required Prerequisite(s): EGY 115, may be taken concurrently

Recommended Prerequisite(s): Placement in MTH 23 or co-enrollment in the recommended developmental Math course, placement into ENG 11/111 or co-enrollment in the recommended English course

EGY 105 - Sustainable Building Design
Credit Hours: 3, **Contact Hours: 3**
This course provides a great introduction to sustainable building practices. Through structured classroom activities, the student will learn about the structure of matter and the material world, whole system thinking, site and natural energy mapping, water resources, building orientation, materials and resources, indoor air quality, innovation and design. This course is required to achieve a Level II Certificate in Renewable Energy Technology. Group 2 course.
Recommended Prerequisite(s): Placement in MTH 23 or co-enrollment in the recommended developmental Math course, placement into ENG 11/111 or co-enrollment in the recommended English course

EGY 115 - Residential Energy Efficiency
Credit Hours: 3, **Contact Hours: 3**
This course provides a broad spectrum of information regarding basic residential energy conservation.Through structured classroom and hands-on skill building, the student will learn about the principles of energy, building shell construction, air leakage, insulation, windows and doors, heating, lighting, cooling, water heating, health, and safety. This course, or its equivalency, is a required class for the Renewable Energy Certificate Program. Group 2 course.

EGY 141 - Solar Photovoltaic Tech I
Credit Hours: 3, **Contact Hours: 3**
Through structured lecture and practical skill building, students will become familiar with Solar Photovoltaic applications, solar radiation, basics of a site survey, system components, system sizing, and preparation of a solar installation. Group 2 course.
Required Prerequisite(s): ELE 105

Recommended Prerequisite(s): MTH 23 or placement into MTH 111, ENG 111

EGY 143 - Solar Thermal Technology I
Credit Hours: 3, **Contact Hours: 4**
This course provides an introduction to solar hot water heating systems. Through structured classroom and hands-on skill building, the student will learn the history of solar thermal heating systems, components, drainback systems, glycol systems, start up and maintenance procedures, savings and performance estimates, system control, monitoring and testing and solar space heating design. Group 2 course.
Required Prerequisite(s): PLU 101

Recommended Prerequisite(s): MTH 23 or placement into MTH 111, ENG 111

EGY 145 - Geothermal Technology
Credit Hours: 3, **Contact Hours: 4**
This course introduces the basic principles of geothermal energy production and technology. Essentials on how to utilize geothermal technology as an energy source will be analyzed and demonstrated. Examples of residential and commercial applications will be shown and reviewed. Group 2 course.
Required Prerequisite(s): HVA 105

Recommended Prerequisite(s): MTH 23 or placement into MTH 111, ENG 111

Robotics and Automation

RAM 155 - Microcontroller Programming
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
This course introduces students to microcontroller systems and programming using Python language. Students construct a wheeled robot and learn to program the device. Standard coding structures including statements, loops, and functions are used to control the unit. Debugging and troubleshooting skills are developed as robot capabilities are implemented. The robot is used in subsequent Engineering Technology courses. Group 2 course. Critical Thinking - Direct.
Recommended Prerequisite(s): Basic keyboarding and computer skills

RAM 205 - Microcontroller Systems
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
This course is a continuation of RAM 155 - Microcontroller Programming. Students implement additional abilities for their robot created during RAM 155, utilizing custom sensors, actuators, and interfaces. Activities require the application and extension of both hardware and software skills developed in prerequisite Engineering Technology courses. Students determine requirements, build hardware, code software, troubleshoot, evaluate, and iterate as they create solutions. As part of this course, students will earn the PCEP - Certified Entry-Level Python Programmer certificate. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): EET 103, RAM 155

RAM 255 - Microcontroller Automation
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
This course is an introduction to the Internet of Things (IoT). Students will prototype sensors, actuators, and interfaces to create automated solutions that communicate via the Internet. Students will capture data, apply analytics, and present business value. Group 2 course. Critical Thinking - Direct, Quantitative Reasoning.
Required Prerequisite(s): RAM 155

Welding

WPT 111 - Welding Theory I
Credit Hours: 3, **Contact Hours: 3**
Division: Technical
First level lecture for all students enrolled in a Welding Technology Degree or Certificate Program. Course will cover theory and technique for Shielded Metal Arc Welding, Gas Metal Arc Welding, and Oxy Fuel Processes for welding, brazing, and cutting. Group 2 course. Critical Thinking - Direct.
Corequisites: WPT 112

WPT 112 - Welding Lab I
Credit Hours: 4, **Contact Hours: 8**
Division: Technical
First level lab for all students enrolled in a Welding Technology Degree or Certificate Program. Practical application of Shielded Metal Arc Welding, Gas Metal Arc Welding, and Oxy Fuel Processes for welding, brazing, and cutting. Welds will be performed in all positions and subjected to destructive quality testing. Group 2 course. Quantitative Reasoning.
Corequisites: WPT 111

WPT 113 - Welding Theory II
Credit Hours: 3, **Contact Hours: 3**
Division: Technical
Second level lecture for all students enrolled in a Welding Technology Degree or Certificate Program. Course will cover theory and technique for Pulsed Gas Metal Arc Welding, Flux Cored Arc Welding, Gas Tungsten Arc Welding, and Arc Cutting Processes. Group 2 course. Quantitative Reasoning.
Required Prerequisite(s): WPT 111

Corequisites: WPT 114

WPT 114 - Welding Lab II
Credit Hours: 4, **Contact Hours: 8**
Division: Technical
Second level lab for all students enrolled in a Welding Technology Degree or Certificate Program. Practical application of Shielded Metal Arc Welding, Pulsed Gas Metal Arc Welding, Gas Tungsten Arc Welding, and Plasma Arc Cutting. Welds will be performed in all positions and subjected to destructive quality testing. Group 2 course.
Required Prerequisite(s): WPT 111 and WPT 112

Corequisites: WPT 113

WPT 161 - Welding Qualification Prep
Credit Hours: 3, **Contact Hours: 4**
Division: Technical
Students will learn performance qualification according to American Welding Society (AWS) standards. As part of this course, students may earn various qualifications according to AWS standards adhering to D1.1 (steel) and D1.2 (aluminium) covering multiple processes. Group 2 course. Prerequisites: None. Critical Thinking - Direct.

WPT 210 - Welding Fabrication and Repair
Credit Hours: 3, **Contact Hours: 5**
Division: Technical
This course provides students an opportunity to apply the process specific welding skills that they have previously mastered to complete fabrication and repairs projects. In addition to welding, students will learn shop metal identification, how to setup and operate shop metal prep and fabricating equipment as well as plan, sketch, order and prepare for a variety of projects. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): WPT 121 or WPT 131 or WPT 141 or WPT 142 with a 2.0 or higher or extensive welding experience, verified by welding skill demonstration test

WPT 211 - Welding Fabrication I
Credit Hours: 3, **Contact Hours: 5**
Division: Technical
First level fabrication class for all students enrolled in the Welding Technology A.A.S. program. Students will learn to apply manufacturing principles and techniques in order to complete assemblies to print specifications. Proper use of common industrial tools and machinery, including CNC cutting table, will be stressed. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): WPT 113, WPT 114

WPT 212 - Welding Fabrication II
Credit Hours: 3, **Contact Hours: 5**
Division: Technical
Second level fabrication class for all students enrolled in the Welding Technology A.A.S. program. Students will take control of a fabrication project from the planning to finishing stages. Emphasis on design, project planning, and efficient execution. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): WPT 211

WPT 213 - Weld Quality Testing
Credit Hours: 3, **Contact Hours: 5**
Division: Technical
Class to cover theory and practical use of common methods of non-destructive examination. Processes include dye penetrant, ultrasonic, magnetic particle, and radiographic testing. Familiarity with prevalent codes and standards will be emphasized. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): WPT 211

Recommended Prerequisite(s): DD 101, DD 110

WPT 260 - Intro to Welding Automation
Credit Hours: 3, **Contact Hours: 5**
Division: Technical
This course provides students an opportunity to learn the theory behind common forms of automation utilized throughout the welding industry. Lab assignments will focus on equipment set-up and operations along with analysis of results. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): WPT 113, WPT 114

WPT 290 - Welding Internship
Credit Hours: 2-4, **Contact Hours: 2-4**
Division: Technical
The purpose of the internship is to provide on-the-job training for the student who wishes to pursue a career in a technical field of study. The internship will be customized to meet the learning needs of the student and the job requirements of the sponsoring firm. Students spend 10-15 hours per week in this paid, supervised on-the-job training experience. In addition to the required 50 hours per credit at a work site, students participate in semi-monthly seminars. Students must apply one month prior to the semester in which they will complete the internship. Group 2 course. Communications - Direct.
Required Prerequisite(s): 30 credits of program specific courses with a GPA of 3.0 or higher