

# TECHNICAL & INDUSTRIAL DIVISION

## Contact Information

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Programs in the Technical & Industrial Division provide students with the technical knowledge, specialized skills, proper attitudes and safe work habits to enter the labor market. Programs are structured to accommodate the goals of students seeking entry-level employment, career advancement, or career change. Students work with the equipment and theoretical concepts used in their trade. The Division's programs monitor current industry needs to anticipate future changes and instructional requirements. Most faculty in the Division have achieved mastery level recognition in their trades and hold national certification.

Employers are requiring increased communication skills, personal and public relations skills, and computation skills. These competencies are taught in the General Education Core courses required for an AAS degree and delivered with relevancy to technical training.

## Program Admission Requirements

Each Technical and Industrial Division Program has individual program entrance requirements, please carefully review the program degree information for which you are seeking.

### Placement Test Scores

Program Name	Writing Placement Exam	ALEKS Math
Auto Mechanics Technology	2	14
CNC Machining Technology	2	30
Collision Repair Technology	2	14
Diesel Technology	2	14
Engineering Technology	2	30
Heating, Venting, Air Conditioning, and Refrigeration Technology	2	14
Industrial Electronics Technology	2	30
Industrial Maintenance Millwright	2	30
Information Systems	2	30
Welding Technology	2	30

## Prior Learning Assessment

Students who have a strong background of work experience or education may challenge courses with the permission of program advisors.

## Assessment

The Division emphasizes skills which are critical to functioning on the job, and instruction is based on specific competencies. Input from the Advisory Committees aids in ensuring that programs are current with the needs of business and industry. All programs in the Technical and Industrial Division undergo program reviews as required by LCSC. An annual follow-up assessment is performed to determine the employment of graduates.

## Advising

Advising of students is a high priority. Once the student is admitted into the program, he/she will be advised by faculty in that program for the duration of their course of study.

## Attendance Policy

Technical & Industrial Division standards for attendance reflect those policies adhered to in each program's related business and industry. Compliance with the attendance policy is the student's responsibility. The effect of attendance on the student's grade is determined by the faculty member teaching the course.

No distinction will be made between an "excused" and "unexcused" absence. It is the student's responsibility to arrange with the instructor for the completion of assigned classroom and laboratory work. Absences in a program are counted in hours and are inclusive of all time missed in the program. In the case of courses set up in eight-week rotations, absences by students will be cumulative between courses in the same semester.

The Division's policy includes three steps in the following sequence:

- **Step One: 12 hours absence**

When the student reaches 12 hours of absence, the Division sends a letter to the student to express concern about the student's ability to successfully complete the required coursework. A recommendation is made that the student schedule an appointment to meet with the advisor/faculty member to discuss the attendance.

- **Step Two: 20 hours absence**

When the student reaches 20 hours of absence, the Division sends a letter to the student requiring the student to schedule an appointment with the advisor/faculty member and the Division Chair to discuss the attendance problem. The purpose of the meeting is to discuss any extenuating circumstances relating to the absences and to inform the student of his/her responsibilities required to remain in the program. Additional terms may be developed which are required of the student due to excessive absences, and will be written in the division's absences-contract. A copy of the contract will be provided for signatures of the student, advisor/faculty member, and Division Chair. If the student refuses to sign the contract, indicating noncompliance, he/she will not be allowed to re-enroll in courses in the Technical and Industrial Division for at least one semester.

- **Step Three: 30 hours absence**

When the student reaches 30 hours of absence and/or fails to comply with arrangements made in step two, the Division sends a notice to the Registrar barring the student from registration in courses in the Technical and Industrial Division the following semester.

If the student meets the terms of the contract, is allowed to re-enroll and the attendance problem recurs, the advisor/faculty member may recommend that the student not be enrolled in a Technical and Industrial program for at least one semester. If the student wishes to appeal decisions reached through this procedure, he/she may

1. request a review by the Vice President of Student Affairs, and/or
2. request a review by the Student Hearing Board.

## Drug - Alcohol Policy

The Technical and Industrial Division abides by Lewis Clark State College's drug and alcohol policy. Please refer to the Student Code of Conduct (<http://www.lcsc.edu/student-counseling/substance-abuse-assistance/alcoholdrug-information/>) webpage.

## Clubs

Student clubs are active in Auto Mechanics Technology; CNC Manufacturing Technology; Collision Repair Technology; Diesel Technology; HVACR; and Information Technology play a major role in the students' learning experience.

### **AMFTI-110 MACHINING THEORY I 2.00 Credits**

This course is designed to impart technical knowledge and skills for the use of manufacturing equipment and procedures. The knowledge and skills mastered in this class are an introduction to design and production in the machining operation process to include lathe operations. Introduction to history, theory and uses of simple cutting tools, hand tools, hand held power tools, grinders, and machine tools with focus on lathes. Measuring and layout of parts using precision scales, squares, calipers and micrometers. Material knowledge of metals and synthetics to relate to the machining process. Machine cutting tools and their designed use including speeds and feeds. Knowledge of work holding as it relates to machine shop equipment which include jigs and fixturing and correct machining order.

### **AMFTI-111 MACHINING THEORY 3.00 Credits**

Introduction to the machine shop environment to include but not limited to safety in work place and use of tools safely. Introduction to history, theory and uses of simple cutting tools, hand tools, hand held power tools, machine tools with focus on lathes, milling machines and grinders. Measuring and layout of parts using precision scales, squares, calipers and micrometers. Material knowledge of metals and synthetics to relate to the machining process. Machine cutting tools and their designed use including speeds and feeds. Knowledge of work holding as it relates to machine shop equipment which include jigs and fixturing and correct machining order.

**AMFTI-112 MACHINING THEORY II 2.00 Credits**

Machine Tool Theory II is designed to impart technical knowledge and skills for the use of manufacturing equipment and procedures. The knowledge and skills mastered in this class are an extension of Machining Theory I, to design and produce in the machining process to include milling operations. Uses of simple cutting tools, hand tools, hand held power tools, grinders, and machine tools with focus on milling. Measuring and layout of parts using precision scales, squares, calipers and micrometers. Material knowledge of metals and synthetics to relate to the machining process. Machine cutting tools and their designed use including speeds and feeds. Knowledge of work holding as it relates to machine shop equipment which include jigs and fixturing and correct machining order.

**AMFTI-121 INTRODUCTION TO CAD 3.00 Credits**

An introduction to the engineering graphic principles and the use of drafting tools to include; line work, lettering, applied geometry, dimensioning and orthographic projections. The student will, upon completion of this course, be able to create, using Computer Aided Drafting (CAD), 2-D construction, using advanced commands, sketching and orthographic views. Pre-requisite/Co-requisite: MTHPT-103/MTHPT-123.

**AMFTI-122 ENGINEERING GRAPHICS WITH AUTOCAD 4.00 Credits**

Applying engineering graphic principles using CAD for sectional views, auxiliary views, dimensions, tolerances, threads, fasteners, working drawings, gears, bearings, and cams. This course in CAD will emphasize visualization and spatial relations. The student will define and draft orthographic & isometric projections & other pictorial drawings; develop auxiliary views; determine points of intersections; draft developments and working drawings. Construction principles, input schemes, command structures and data management will be studied and combined into a design project at course conclusion. Pre-requisite: MTHPT-103 or appropriate math placement score.

**AMFTI-123 ENGINEERING GRAPHICS USING AUTOCAD 3.00 Credits**

Applying engineering graphic principles using CAD for sectional views, auxiliary views, dimensioning, tolerancing, geometric tolerances, threads and fasteners, working drawings, and gears, bearings and cams. This course in CAD will emphasize visualization and spatial relations. Construction principles, input schemes, command structures and data management will be studied and combined into a design project at course conclusion. Pre-requisite: MTHPT-103/MTHPT-123.

**AMFTI-124 APPLIED BLUEPRINT READING 2.00 Credits**

Interpreting Blueprints in an introduction to identifying blueprint information, needed to produce a machined part, through the interpretation of lines, symbols, and numbers as shown on two and three view orthographic drawings. During the discussion of tolerances, Geometric Dimensioning and Tolerancing will be introduced. Pre-requisite: MTHPT-103.

**AMFTI-125 ENGINEERING GRAPHICS APPLICATIONS 3.00 Credits**

An advanced course using engineering graphic principles with AutoCAD to include: fundamentals of 3D drawing, surface modeling, solid modeling, and descriptive geometry. Upon completion of this course, the student, using CAD will be able to create the fundamental concepts to produce 3D drawings and create 3D objects using surface modeling and solid modeling. The student will be able to apply precision dimensioning and development to working drawings and technical illustrations. Pre-requisite/Co-requisite: MTHPT-103/MTHPT-123.

**AMFTI-141 MACHINING LAB I 3.00 Credits**

This course provides practical hands-on application of manual machine processes: drilling, tapping, milling, grinding, turning, boring and the study of material machining methodology. The second section provides the students with the knowledge for lab operation of machining special attachments, bench work, layout, heat-treating, hardness testing, layout inspection, jig and fixture setup, and tool design. Pre-requisite: AMFTI-110.

**AMFTI-143 MACHINING LAB II 3.00 Credits**

This course provides the students with the knowledge for lab operation of machining, special attachments, bench work, layout, heat-treating, hardness testing, layout inspection, jig and fixture setup, tool design. The final section of this course is designed to provide the students with the development of machining plans for the efficient machining of moderately complex parts. Individualized laboratory practice will integrate the textbook, reference manuals and technical tools placing emphasis on the production of moderately complex products using production machines, setups, and fixtures. Pre-requisite: AMFTI-112.

**AMFTI-145 INTRODUCTION TO NC AND CNC 3.00 Credits**

This course will cover the introduction to numerical controls for x, y, and z-axis application, tool controls for hole and milling operations, blueprint reading for NC and CNC programming, and Geometric Dimensioning and Tolerancing for NC programming. Programming will include hole operation, linear profiles, circular profiles, cutter diameter compensation, and programming with subprograms. Pre-requisite: AMFTI-143.

**AMFTI-161 QUALITY CONTROL 1 METROLOGY 3.00 Credits**

This class explores methods of ensuring quality in manufacturing through application of codes and standards, sampling techniques, control charts and implementation of documented quality assurance programs. Pre-requisite: MTHPT-103 or higher.

**AMFTI-190 DS:AUTOMATED MANUFACTURING TECHNOLOGY 1.00-12.00 Credits**

This course offers the opportunity to learn advanced skills in an area mutually agreed upon and related to the manufacturing field by the student and instructor. The student and instructor will develop a set of objectives and time guidelines to complete a specialized project or course of study and a plan to achieve these objectives.

**AMFTI-232 GD&T APPLICATION & INTERPRETATION 3.00 Credits**

This is a study in Geometric Dimensioning and Tolerancing as related to design, manufacturing, and inspection. This study will adhere to ASME Y14.5-2018 standard. This course will explore and emphasize symbology, size tolerances, form controls, datums, datum references, orientation, positioning, runout and profile tolerancing, as well as practical and project based applications. These skills will be used in application on both 2D drawings and 3D cad models as well as manufacturing documentation. Pre-requisite: AMFTI-145.

**AMFTI-241 INTRODUCTORY CAD AND CAM 3.00-4.00 Credits**

This course will teach the elementary principles of Computer Aided Machining (CAM) and Computer Numerical Controlled (CNC) machining. The course introduces the manufacturing or engineering student to the world of turning a virtual object into an actual object, (going from Art to Part). Students taking the course for 4 credits will be required to complete a 2-D project and written report. Pre-requisite: AMFTI-145.

**AMFTI-243 ADVANCED CAD AND CAM 3.00-4.00 Credits**

A continuation in the study of G and M codes from AMFTI 241. The emphasis will be in transforming 3-D models (including wire frame, surface, and solid models) into 3-D tool path definitions. Students taking the course for 4 credits will be required to complete a 3-D project and written report. Pre-requisite: AMFTI-241.

**AMFTI-245 CNC MACHINING PROCESSES 3.00 Credits**

This course will cover techniques and fixed cycles for CNC lathe programming, modern computer-aided parts programming, elements of the computer-controlled factory, and verifying part programs. Pre-requisite: AMFTI-241.

**AMFTI-261 QUALITY CONTROL 3.00 Credits**

This class explores methods of ensuring quality in manufacturing through application of codes and standards, sampling techniques, control charts and implementation of documented quality assurance programs. Pre-requisite: MTHPT-103 or instructor's permission.

**AMFTI-263 PROJECT PLANNING 3.00 Credits**

Analysis and planning of manufacturing procedures in the development of a project plan, schedule and control of the project. This will include material and process for manufacturing utilizing ISO 9000 guidelines for documentation of the part(s) developed for the project. Pre-requisite/Co-requisite: AMFTI-261.

**AMFTI-265 MANUFACTURING PROJECT 6.00 Credits**

A project emphasizing the initiative of the student. Decisions by the student/manufacturing entity are made after evaluation of all factors related to the project. The role of the instructor is that of a consultant after each proposed project is approved. Pre-requisite/Co-requisite: AMFTI-261.

**AMFTI-290 DS:AUTOMATED MANUFACTURING TECHNOLOGY 1.00-10.00 Credits**

This course offers the opportunity to learn advanced skills in an area mutually agreed upon and related to the manufacturing field by the student and instructor. The student and instructor will develop a set of objectives and time guidelines to complete a specialized project or course of study and a plan to achieve these objectives.

**AMFTI-292 DIRECTED SPECIAL PROJECTS 1.00-10.00 Credits**

Opportunity to learn additional skills in specific area of study for the manufacturing technology program. Student and instructor develop a set of objectives and time guidelines to complete advanced skills in the course registered for and a plan to achieve these objectives. Pre-requisite: Instructor's permission.

**AMFTI-294 IN: AUTOMATED MANUFACTURING TECHNOLOGY 1.00-12.00 Credits**

Work experience in business related to student career goal. Student is under the supervision of the employer and program coordinator. Registration only with instructor's approval. Pre-requisite: Instructor's permission.

**AMFTI-390 DIRECTED STUDY IN AUTOMATED MANUFACTURING TECHNOLOGY 1.00-12.00 Credits****AMFTI-394 IN: AUTOMATED MANUFACTURING TECHNOLOGY 1.00-12.00 Credits**

Work experience in business related to the student career goal. Student will be working under the supervision of employer and program coordinator. Registration only with instructor's approval. Pre-requisite: Instructor's permission.

**AMFTI-490 DIRECTED STUDY IN AUTOMATED MANUFACTURING TECHNOLOGY 1.00-12.00 Credits****AMFTI-492 DIRECTED SPECIAL PROJECTS 1.00-10.00 Credits**

Opportunity to learn additional skills in specific area of study for the manufacturing technology program. Student and instructor develop a set of objectives and time guidelines to complete advanced skills in the course registered for and a plan to achieve these objectives. Pre-requisite: Instructor's permission.

**AMFTI-494 INTERNSHIP IN AUTOMATED MANUFACTURING TECHNOLOGY 1.00-12.00 Credits****AUTMC-190 DIRECTED STUDY IN AUTO MECHANICS TECHNOLOGY 1.00-6.00 Credits**

Individually prescribed instruction and self-study to meet specific training objectives. May be repeated. Credits earned may not directly apply to degree or certificate.

**AUTMC-200 HVAC AND ACCESSORIES 4.00 Credits**

Students will learn the basic laws of physics governing heating and air conditioning systems, how to safely handle and dispose of refrigerants, lubricants, solvents, and coolants used in automotive HVAC systems. Students will become versed in federal laws and practices and use of equipment in servicing HVAC systems, including information about differing refrigerants and refrigerant lubricants used in industry, how to properly identify, evacuate, charge air conditioning systems, diagnose system failures, perform repairs and services on heating and cooling systems as needed. Care and use of proper tool usage is stressed. Topics will include other electrical devices found in vehicles such as blowers and other power devices. Other projects may be assigned to fit individual needs including the study of climate control management systems and drive motors, heated/cooled seats, anti-theft system operation, cruise control, audio and visual systems, supplemental restraints, power and heated mirrors, heated glass, basic vehicle communication networks, body control modules and related circuitry, basic audio and visual systems as well as an overview of the latest technology.

**AUTMC-209 AUTOMATIC TRANSMISSION REPAIR/DIAGNOSIS 6.00 Credits**

In-depth study of theory, service, and repair of modern automatic transmission, and tools and instruments required. Automotive practices used in automatic transmission, and drive train diagnosis, repairs, and rebuilding.

**AUTMC-212 AUTOMOTIVE TUNE-UP AND DRIVABILITY 6.00 Credits**

Consists of theory of automotive tune-up. Students obtain in-depth knowledge of engines and related systems, control systems, and relationship to overall engine performance. Drivability diagnosing emphasized to develop orderly process of locating faults and analysis of various electronics systems. Live shop process where acquired skills from theory portion are practiced. Use of electronics testing tools and automobile manufacturers' service manuals emphasized to guide each job to a successful completion. Successful completion of all jobs verified by instructor.

**AUTMC-225 ADVANCED COMPUTERIZED FUEL SYSTEMS 6.00 Credits**

Provides technical information necessary to diagnose and maintain computerized fuel systems. Consists of half theory, lecture, and demonstrations, and half internship placement at local business to complete assigned competency list.

**AUTMC-227 AUTOMOTIVE PARTS COUNTER PERSON 1.00-6.00 Credits**

Obtain an understanding of parts management; store operation and personal duties; catalog use and the importance of the computer in the parts industry. Students will learn how to deal with customers one-on-one as well as the use of proper telephone etiquette, inventory control, and parts pricing. Students will be expected to process parts requisitions, control incoming inventory, and order parts using the computer and the telephone.

**AUTMC-290 DIRECTED STUDY IN AUTO MECHANICS TECHNOLOGY 1.00-6.00 Credits**

Directed Study in Auto Mechanics Technology.

**AUTMC-294A IN:AUTOMATIC TRANSMISSIONS REPAIR 1.00-6.00 Credits**

Advanced on-the-job training in automatic transmissions. Student is a paid employee under employer's immediate supervision. Program coordinator works with employer to establish and maintain educational goals.

**AUTMC-294B IN:AUTOMOTIVE MECHANICS 1.00-6.00 Credits**

Advanced on-the-job training with emphasis on automobile electronics. Program coordinator works with employer to establish and maintain training goals.

**AUTMC-294C IN:AUTOMOTIVE AIR CONDITIONING 1.00-6.00 Credits**

On-the-job training in automotive accessories and electrical circuits. Student is employee of local business and under their immediate supervision. Program coordinator works with employer to establish and maintain training goals.

**AUTMC-394 IN: AUTO REPAIR 12.00 Credits**

Individually prescribed instruction and self-study to meet specific training objectives. May be repeated.

**CRPTI-110 INTRODUCTION TO COLLISION REPAIR 6.00 Credits**

Provides a good understanding of the basic operations of a collision repair facility, and the development of safe work habits. The student will understand vehicle design and be familiar with the tools, equipment, and fasteners used in the repair of damaged vehicles.

**CRPTI-110A SAFETY & POLLUTION PREVENTION 2.00 Credits**

The orientation and application of tool safety, shop practices, and shop equipment theories. Industry needs and standards will be addressed. Students will gain knowledge of proper use of equipment, tools, and safety that meet or exceed industry standards. Pre-requisite: Must have a valid driver's license and permission from the instructor.

**CRPTI-110B MINOR COLLISION REPAIR THEORY/LAB 3.00 Credits**

Basic theory in metal finishing and minor body repair. This includes straightening and prepping sheet metals, the proper use of plastic body fillers, abrasives, sanding techniques and air tools. Remove and install necessary trim and hardware to facilitate repair procedures. Practical application of metal finishing and minor body repair. Pre-requisite: Must have a valid driver's license and permission from the instructor.

**CRPTI-110C BASIC COLLISION REPAIR LAB 1.00 Credit**

This course is designed to build a frame-work of basic knowledge to help the student fully understand more advanced units taught later in the program. It provides more lab time for the student to apply basic skills for prepping vehicles for repair. Successful completion of CRPTI-110A and CRPTI-110B are required to take this course.

**CRPTI-120 NON-STRUCTURAL REPAIRS I 6.00 Credits**

The student will be able to demonstrate basic metal straightening techniques, proper use of body fillers, correct procedures used to replace, align, and bolt-on body panels, and a knowledge of working with trim and hardware. The student will learn to perform these tasks at industry standard levels.

**CRPTI-140 NON-STRUCTURAL REPAIRS II 6.00 Credits**

The student will be able to demonstrate the basic steps used to replace welded and bonded body panels. The student will have a thorough understanding of working with movable glass and its hardware, and be able to create a repair estimate on damaged vehicles.

**CRPTI-150 STRUCTURAL REPAIRS I 6.00 Credits**

Analyze structural damage through proper measuring techniques. The student will be able to anchor vehicles to frame equipment and straighten or realign structural members and will perform all welding tasks that are used in collision repair, to industry standards.

**CRPTI-190 DIRECTED STUDY IN COLLISION REPAIR 1.00-6.00 Credits**

Individualized instruction and self-study to meet specific training objectives. Projects are provided to give specialized training for advanced students. Objectives are established with advisor at registration. Credits are earned based on difficulty and scheduled clock hours. A minimum of two hours per week is required for each credit. Final grades are based on effort, project results, and detailed written report of project.

**CRPTI-194 INTERNSHIP IN COLLISION REPAIR 1.00-6.00 Credits**

Individually prescribed instruction and self-study to meet specific training objectives. May be repeated.

**CRPTI-210 STRUCTURAL REPAIRS II 6.00 Credits**

Apply knowledge of replacing complete or partial structural members of damaged automobiles. The student will demonstrate how to restore factory corrosion protection, and how to replace and service stationary glass, and passenger restraint systems to industry standards. Pre-requisite: CRPTI-110 or CRPTI-110A and CRPTI-110B and valid driver's license.

**CRPTI-210A INTRO TO WELDING FOR COLLISION REPAIR THEORY/LAB 3.00 Credits**

After completing this unit of instruction, the student will be able to apply his/her knowledge of replacing complete or partial structural members using industry approved welding techniques. Prepare students to perform basic welding processes and techniques including the application of mild steel, wire feed welding, automotive sheet metals, basic oxyacetylene, MIG welding, plasma air arc cutting. Students will gain knowledge and proper use of equipment, tools, and safety that meet or exceed industry standards. Pre-requisite: CRPTI-110 or CRPTI-110A and CRPTI-110B and valid driver's license.

**CRPTI-210B STRUCTURAL INTEGRITY 3.00 Credits**

Apply knowledge of replacing complete or partial structural members of damaged automobiles. The student will demonstrate how to restore factory corrosion protection, and how to replace and service stationary glass, and passenger restraint systems to industry standards. Pre-requisite: CRPTI-210A and a valid driver's license.

**CRPTI-220 MECHANICAL REPAIRS 6.00 Credits**

Provides the basic knowledge to diagnose and replace or repair automotive mechanical systems including, steering and suspension, electrical systems, brake systems, air conditioning and cooling systems, drive trains, fuel, intake and exhaust systems, and passenger restraint systems.

**CRPTI-230 REFINISHING I 6.00 Credits**

Properly prepare a vehicle surface for undercoat and topcoat systems, apply knowledge in using and maintaining paint booths, spray guns and related refinishing equipment, and demonstrate proper spraying techniques.

**CRPTI-240 REFINISHING II 6.00 Credits**

After completion of this unit of study, the student will be able to properly prepare a vehicle surface for undercoat and topcoat systems, apply knowledge in using and maintaining paint booths, spray guns and related refinishing equipment, and will demonstrate proper spraying techniques. Pre-requisite: CRPTI-110 or CRPTI-110A/CRPTI-110B and valid driver's license.

**CRPTI-240A DETAILING AND POLISHING 2.00 Credits**

This course covers the practical application of detailing and polishing fundamentals including that of pre-wash, paint defect identification, exterior polishing, interior renovation, environmental hazards, proper use of detailing equipment and PPE. Gain knowledge of general safety and health practices, including the use of chemicals and detailing products. Pre-requisite: CRPTI-110 or CRPTI-110A and CRPTI-110B, valid driver's license, and permission from the instructor.

**CRPTI-240B COLOR MATCHING 4.00 Credits**

After completion of this unit of study, the student will be able to properly prepare a vehicle surface for undercoat and topcoat systems, apply knowledge in using and maintaining paint booths, spray guns and related refinishing equipment, and will demonstrate proper spraying techniques. Pre-requisite: CRPTI-240A valid driver's license, and permission from the instructor.

**CRPTI-290 DIRECTED STUDY IN COLLISION REPAIR 1.00-6.00 Credits****CRPTI-292 SPECIAL TOPICS IN COLLISION REPAIR 1.00-6.00 Credits****CRPTI-294 INTERNSHIP IN COLLISION REPAIR 1.00-6.00 Credits**

Individually prescribed instruction and self-study to meet specific training objectives. May be repeated.

**CRPTI-394 IN: COLLISION REPAIR 1.00-6.00 Credits**

Individually prescribed instruction and self-study to meet specific training objectives. May be repeated.

**DSLTC-101 INTRODUCTION TO DIESEL TECHNOLOGY 2.00 Credits**

Introduction of basic skills needed to perform many repair tasks in a diesel-related repair environment. The student will complete tasks, in a competency-based program, that entry-level technicians will perform in the workplace.

**DSLTC-102 ELECTRICAL SYSTEMS 6.00 Credits**

The student will be introduced to basic electrical theory and practice as it applies to the heavy equipment and transport technology industries. The student will complete tasks in a competency based program that emulate the skills performed in the workplace. Topics include basic electricity fundamentals, starting and charging systems, batteries, trouble shooting, and lighting systems.

**DSLTC-102A INTRODUCTION TO ELECTRICAL SYSTEMS 1.00 Credit**

The student will be introduced to basic electrical theory and practice as it applies to the heavy equipment and transport technology industries. The student will complete tasks in a competency based program that emulate the skills performed in the workplace. Topics include basic electricity theory and basic electrical system formulas.

**DSLTC-102B ELECTRICAL SYSTEMS I 3.00 Credits**

The student will be introduced to basic electrical theory and practice as it applies to the heavy equipment and transport technology industries. The student will complete tasks in a competency based program that emulate the skills performed in the workplace. Topics include basic electricity fundamentals, starting and charging systems, batteries, trouble shooting, and lighting systems. Pre-requisite: DSLTC-102A.



**DSLTC-102C ELECTRICAL SYSTEMS II 2.00 Credits**

Troubleshooting and repair procedures for heavy-duty electrical systems, including electrical principles as they relate to the components used in trucks and heavy equipment, writing schematics, and lighting along with the associated testing and repair procedures for each system. Topics include basic electricity fundamentals, starting, and charging systems, batteries, troubleshooting, and lighting systems. Pre-requisite: DSLTC-102B.

**DSLTC-103 POWER TRAINS LECTURE AND LAB 6.00 Credits**

Study of various types of manual transmissions and transaxles, drivelines, clutches, flywheels, rear axles, and differentials found in modern automobiles and light trucks. Operation and repair of various components of power trains and their interrelationships provided.

**DSLTC-105 DIESEL ENGINES 6.00 Credits**

Teaches the basics on how to identify, repair, and/or replace diesel engines. The student will learn two-stroke and four-stroke combustion engine theory as well as engine performance criteria. The student will learn proper disassembly, measuring, and reassembly procedures and will gain understanding in the operation and basic principles of the various engine components and their respective systems on a diesel engine.

**DSLTC-126 SAFETY 2.00 Credits**

General principles are needed to foster a safe attitude and work environment. Topics covered include hazardous materials, safe use of equipment and tools, an introduction to the occupation, and health and safety concerns in the work place. Students are required to take first aid and CPR training.

**DSLTC-190 DIRECTED STUDY IN DIESEL TECHNOLOGY 1.00-12.00 Credits****DSLTC-200 SHOP SKILLS AND CLIMATE CONTROL 6.00 Credits**

Basic shop skills including basic climate controls, welding and fabrication practices as applied to the heavy equipment and transport technology industries. The student will complete tasks in a competency based program that emulates the skills performed in the workplace. Topics include basic air conditioning fundamentals, stick, MIG and acetylene welding techniques along with acetylene/plasma torch cutting techniques. Students will acquire a Class B CDL through class study as well as a driving competency-based evaluation.

**DSLTC-210 HYDRAULICS 6.00 Credits**

Introduction to basic hydraulic principles and theory. The student will complete a task list in a competency-based program that emulates the skills performed in the workplace. Topics include hydraulic system maintenance, fluid analysis, system familiarization, and troubleshooting procedures will be outlined as it applies to modern diesel equipment.

**DSLTC-220 DIESEL ENGINE FUEL SYSTEMS AND TUNE-UP 6.00 Credits**

Introduction to diesel engine fuel system theory and practice as it applies to modern diesel equipment repair. The student will apply the principles introduced in the classroom in the format of laboratory sessions. The student will complete tasks in a competency-based program that emulates the skills performed in the workplace. Topics include diesel engine maintenance, direct and indirect fuel injection systems, testing, adjusting and troubleshooting diesel engine fuel systems.

**DSLTC-230 POWER TRAINS 6.00 Credits**

Provides instruction and practice on the interrelationship and the operation of various heavy-duty power train systems of agricultural, industrial, and on-highway vehicles. Topics include transmissions, clutches, differentials, final drives, drive lines, testing, adjusting and troubleshooting of power train systems.

**DSLTC-240 CHASSIS, SUSPENSION AND AIRBRAKES 6.00 Credits**

Introduces basic theory and practice of chassis, suspension, and airbrake systems of all types of diesel equipment, on-highway trucks, and agriculture equipment. Laboratory sessions will reinforce and apply the knowledge learned in the classroom.

**DSLTC-290 DIRECTED STUDY IN DIESEL TECHNOLOGY 1.00-6.00 Credits****DSLTC-292 DIRECTED SPECIAL PROJECTS 1.00-6.00 Credits****DSLTC-294 INTERNSHIP IN DIESEL TECHNOLOGY 1.00-6.00 Credits**

Advanced on-the-job training in diesel technology.

**DSLTC-390 DIRECTED STUDY IN DIESEL TECHNOLOGY 1.00-12.00 Credits**

Advanced on-the-job training in diesel technology.

**DSLTC-394 INTERNSHIP IN DIESEL TECHNOLOGY 1.00-6.00 Credits**

Advanced on-the-job training in diesel technology.

**DSLTC-490 DIRECTED STUDY IN DIESEL TECHNOLOGY 1.00-12.00 Credits**

Advanced on-the-job training in diesel technology.

**DSLTC-494 Internship in Diesel Technology 12.00 Credits**

Advanced on-the-job training in diesel technology.

**ENGTE-105 DRAFTING PRINCIPLES 9.00 Credits**

Includes line work, lettering, applied geometry, dimensioning, orthographic projection, and the use of drafting tools. Emphasis on various methods of drafting views of objects including auxiliary views, revolutions, intersections, developments, technical illustration, precision dimensioning, working drawings and reproductions of drawings. Traditional and CAD drafting tools used.

**ENGTE-106 DRAFTING FUNDAMENTALS 6.00 Credits**

Includes geometric construction, measuring and scaling techniques, conventional drafting practices, dimensions and annotations, hand sketching techniques, and the use of drafting tools. Emphasis on various methods of drafting views of objects including multi-view drawings using orthographic projection, section views, auxiliary views, pictorials, pattern development, working drawings and prints. Traditional drafting tools and computer-aided drafting software used. Co-requisite: ENGTE-154.

**ENGTE-107 ENGINEERING TECHNOLOGY DISCIPLINES 2.00 Credits**

Explores Engineering Technology careers, job opportunities and educational requirements for specific careers. Emphasis on disciplines related to mechanical, electrical, architectural, structural, geographic information systems, civil and surveying.

**ENGTE-125 3D CAD MODELING I 3.00 Credits**

This is a study in Basic 3D CAD modeling concepts and procedures to develop and design three dimensional parts, assemblies, and drawings from sketches and real parts. Emphasis will be on the creation and use of 3-D primitives, surface modeling, basic solids modeling, shading techniques, and the use of rendering and animation software. Exercises will include rendered output to ink jet type printers and plastic 3D Printers. Pre-requisite: ENGTE-106 and ENGTE-154.

**ENGTE-130 COMPUTER AIDED MACHINE DRAFTING 9.00 Credits**

Application of computer aided drafting skills using AutoCAD software on increasingly complex drawings. Emphasis is on drafting technician's position as a designer and detailer for support of engineered and manufactured products. Techniques of dimensioning and tolerancing detail drawings for manufacturing covered. Current manufacturing techniques and engineering product design processes also covered. Pre-requisite: ENGTE-105.

**ENGTE-131 MECHANICAL DRAFTING 4.00 Credits**

Application of computer aided drafting skills using AutoCAD software for the creation of detailed working drawings using dimensions, tolerancing, and other specifications for machine tool, fabrication and/or welding processes. Introduction to three-dimensional modeling using AutoCAD and assembly drawings with bill of materials. Pre-requisites: MTHPT-137, ENGTE-106, and ENGTE-154.

**ENGTE-135 APPLIED PHYSICS 4.00 Credits**

Combines lectures, classroom discussion and problem solving to teach fundamentals of physics. Topics include uniform linear and circular motion, uniform acceleration, projectiles, Newton's First, Second, and Third Laws of Motion, curvilinear motion, forces in rotation, elasticity, friction, work, momentum, rotational motion, mechanical properties of materials, vibrations and waves, sound and fluid mechanics, energy, and properties of materials. Pre-requisite: MTHPT-137.

**ENGTE-154 INTRODUCTION TO COMPUTER DRAFTING 4.00 Credits**

Teaches basic computer skills using various CAD software. Learning centers around these components and how they send and receive information. Basic understanding of computer hardware, software, and disk operating systems. Uses basic drafting skills learned from traditional drafting courses to create simple dimensioned drawings.

**ENGTE-171 INTRODUCTION TO GEOSPATIAL TECHNOLOGIES 2.00 Credits**

Introduction to geospatial technologies and underlying science. Develops concepts for understanding geographic information systems, global positioning systems, coordinate systems, satellite and unmanned aerial systems imagery, cartography, and ways to communicate results.

**ENGTE-190 DIRECTED STUDY IN ENGINEERING TECHNOLOGY 1.00-10.00 Credits**

Opportunity to learn advanced skills in areas agreed upon by student and instructor. Objectives developed to complete a specialized project or course of study and a plan to achieve these objectives.

**ENGTE-194 INTERNSHIP IN ENGINEERING TECHNOLOGY 12.00 Credits**

Work experience in business related to the student's career goal. Student is a paid, part-time employee working under supervision of employer and program coordinator. Registration only with the approval of program coordinator.

**ENGTE-201 CIVIL DRAFTING 3.00 Credits**

Combines lectures, assignments and lab work to give the student a basic understanding of civil technology including civil drafting and design and mapping procedures. The student will develop skills in the use of AutoCAD and Civil 3D for civil design and drafting applications. Covers basics of mapping including contours, symbols, topography, curve geometry, and curve data. Practical problems given in cross-sections and profiles, cuts and fills, grades, earthwork, horizontal alignment layout and site plans. Pre-requisites ENGTE-105, ENGTE-106, ENGTE-154, and MTHPT-137.

**ENGTE-204 CIVIL TECHNOLOGY 9.00 Credits**

Combines lectures, assignments and lab work to give the student a basic understanding of civil technology including civil drafting, basic surveying, and mapping procedures. The student will develop skills in the use of AutoCAD Civil 3D for civil design and drafting applications as well as the use and maintenance of survey equipment. Covers basics of mapping including contours, symbols, topography, curve geometry, and curve data. Methods of calculating angles, bearings, distances, areas, quantities, and slope. Practical problems given in cross-sections and profiles, cuts and fills, grades, earthwork, and horizontal alignment layout and simple curve layout. Concepts of survey, leveling procedures, traverse closures and areas, triangulation, construction surveys, and computations by various methods. Mastery of correct methods of note-taking and electronic data collection. Pre-requisites: ENGTE-105, ENGTE-154, and MTHPT-137.

**ENGTE-205 ADVANCED CIVIL DRAFTING AND DESIGN 5.00 Credits**

The student will, be prepared to perform basic civil design functions, such as surface and contour creation, grading and drainage plans, alignment layout, profiles, pipe networks, detail drawings and survey data management. Upon completion of this course, the student will prepare a complete set of civil engineering drawings. Pre-requisite: ENGTE-105, ENGTE-130, ENGTE-145, and ENGTE-204.



**ENGTE-206 RESIDENTIAL ARCHITECTURAL DRAFTING 5.00 Credits**

This course is designed to introduce the student to the concepts, practices, standards, and drafting techniques needed for architectural design. The student will learn fundamental architectural drafting methods and organization. Coursework covers foundation plans, floor plans, elevations, stair details, floor and roof framing plans, interior elevations, and window and door schedules developed. Includes residential architectural drawings. Pre-requisites: ENGTE-105 and ENGTE-154.

**ENGTE-207 STRUCTURAL DRAFTING 4.00 Credits**

The student will learn entry-level drafting and job skills in the four basic types of structural drafting. Coursework is organized to cover and prepare students for drafting experience in structural steel, poured-in-place concrete, precast and wood. Includes engineering drawings, and shop drawings. Pre-requisites: ENGTE-105 and ENGTE-154.

**ENGTE-208 ARCHITECTURAL AND STRUCTURAL DRAFTING 9.00 Credits**

Fundamental architectural drafting methods taught. Site plans, foundation plans, floor plans, elevations, construction details, lighting and wiring, stair details, floor and roof framing plans, interior elevations drafted, and window and door schedules developed. Prepares students to draft structural steel, precast and poured-in-place concrete, and structural wood projects. Includes engineering drawings and shop drawings. Pre-requisite: ENGTE-154 or instructor's permission.

**ENGTE-209 SURVEYING 5.00 Credits**

This course is the second of a two-part introductory sequence in plane surveying, including the measurement of distances, elevations, angles and directions. Principles and field use of traditional and modern surveying instruments are covered in lecture and practiced in lab. The student will learn and use fundamental surveying concepts and practices utilizing electronic, land-base, surveying equipment to solve real world surveying problems. Students will also learn about topographic surveying and mapping, boundary surveys, construction surveying, route surveying, earthwork and volumes, and global positioning systems. Pre-requisite: ENGTE-204.

**ENGTE-225 3-D CAD MODELING II 4.00 Credits**

This is a study in intermediate 3D CAD modeling concepts and procedures to expand on solids, surfaces, multibodies, configurations, drawings, sheet metal and assemblies. Pre-requisite: ENGTE-125 or instructor's permission.

**ENGTE-227 CAD/CAM 3.00 Credits**

Students will be trained in the use of SolidWorks integrated cam software. This will integrate parametric feature based machining into projects students will carry over to other areas of study. SolidWorks will be used to design projects based on solving "real world" problems. These projects may originate with the student, or from local area businesses that require assistance implementing solutions to their production problems. Prerequisite ENGTE-225.

**ENGTE-231 GD&T APPLICATION & INTERPRETATION 3.00 Credits**

This is a study in Geometric Dimensioning and Tolerancing as related to design, manufacturing, and inspection. This study will adhere to ASME Y14.5-2018 standard. This course will explore and emphasize symbology, size tolerances, form controls, datums, datum references, orientation, positioning, runout and profile tolerancing, as well as practical and project based applications. These skills will be used in application on both 2D drawings and 3D cad models as well as manufacturing documentation.

**ENGTE-237 APPLIED PHYSICS II 3.00 Credits**

Covers basic engineering principles necessary for a draftsman to communicate on a technical level with designers. Covers temperature and heat, thermal properties of materials, fundamentals of thermodynamics, electrostatics, capacitance and dielectrics, current resistance, power, basic DC circuits, magnetism, electromagnetic induction, basic AC circuits, electrons and solid state physics, light and illumination, mirrors and lenses, and vision and optical instruments. Pre-requisite: ENGTE-135 or GENTC-133.

**ENGTE-241 INTRODUCTION TO MACHINING 3.00 Credits**

Intro to the designing, programming, editing, setup, and operation of CNC lathes and milling machines. Students will produce parts from 2-D CAD files. Topics studied will include: G and M control codes, importing and exporting CAD files, using CAM software to manipulate geometry, using CAM software to produce various toolpaths such as engraving, contouring, and pocketing paths, island avoidance, proper setup and sequence of operations while machining, and setting tool radius and height offsets. Pre-requisite: ENGTE-154.

**ENGTE-243 ADVANCED MACHINING 3.00 Credits**

This course provides the engineering students with the knowledge for lab operation of machining, special attachments, bench work, layout, heat-treating, hardness testing, layout inspection, jig and fixture setup, tool design. This course is designed to provide the students with the development of manufacturing plans for the efficient manufacturing of moderately complex products. Individualized laboratory practice will integrate the textbook, reference manuals and technical tools placing emphasis on the production of moderately complex products using production machines, setups, and fixtures. A continuation in the study of G and M codes from ENGTE 241. The emphasis will be in transforming 3-D models (including wire frame, surface, and solid models) into 3-D tool path definitions. Pre-requisite: ENGTE-241.

**ENGTE-246 CONSTRUCTION AND MANUFACTURING TECHNOLOGY 2.00 Credits**

Gives students an understanding of legal aspects and practical applications of surveying techniques. Civil engineering terminology, engineering methods in the construction of roads, bridges, and other structures, practical understanding of methods industry uses to work metals, basic metallurgy and effects of heat treatment, methods of forging and casting, followed by overview of general metal working and inspection techniques.

**ENGTE-261 3-D ASSEMBLIES & AUTOMATION 3.00 Credits**

This is a study in advanced Solidworks tools and techniques. Will include preparation for the Certified Solidworks Professional Exam. Emphasis will be on the comprehensive coverage and integration of parts, surfaces, simulationXpress, sheet metal, top-down assemblies, core and cavity molds, and their application in a design and manufacturing environment. A portfolio of large assemblies with exploded drawings and manufacturing documentation will prepare students to excel in the mechanical drafting and design environment. Pre-requisite: ENGTE-225.

**ENGTE-290 DIRECTED STUDY IN ENGINEERING TECHNOLOGY 1.00-10.00 Credits**

Opportunity to learn advanced skills in areas agreed upon by student and instructor. Objectives developed to complete a specialized project or course of study and a plan to achieve these objectives.

**ENGTE-292 SPECIAL TOPICS IN ENGINEERING TECHNOLOGY 1.00-10.00 Credits**

Offers opportunity to learn advanced skills for students who are progressing at faster than normal pace.

**ENGTE-294 INTERNSHIP IN ENGINEERING TECHNOLOGY 1.00-10.00 Credits**

Work experience in business related to the student's career goal. Student is a paid, part-time employee working under supervision of employer and program coordinator. Registration only with the approval of program coordinator.

**ENGTE-305 ADVANCED SURVEYING DRAFTING & DESIGN 5.00 Credits**

Consists of lecture and lab work pertaining to typical highway, bridge, storm drainage, sewer, and land development design. Lab work performed by CAD, field trips made to observe on-going projects. Pre-requisite: ENGTE-204.

**ENGTE-306 STRENGTH/MATERIAL/MECH 4.00 Credits****ENGTE-310 SURVEYING LAW AND BOUNDARY DESCRIPTIONS 3.00 Credits**

This course was designed to give the student a basic understanding of the different types of boundary descriptions in common use and the correct way to prepare a boundary description. They will acquire basic knowledge in many of the problems they will encounter in description. The student will gain a basic knowledge in Survey Law and how to apply it to their job. Pre-requisites: ENGTE-204, ENGTE-205, and ENGTE-209.

**ENGTE-312 PUBLIC LAND SURVEYING 3.00 Credits**

This course was designed to give the student a basic understanding of the different types of surveys done in the United States. They will cover metes and bounds surveys done by the English, French, and Spanish along with the current Public Land Survey Systems (PLSS); be able to explain each type of survey and understand where to look for information on the different types of surveys. Pre-reqs: ENGTE-204, ENGTE-205, and ENGTE-209.

**ENGTE-313 SURVEYING AND SOFTWARE APPLICATIONS 3.00 Credits**

This course was designed to give the student a basic understanding of different survey programs and how to use each one. The student will use these programs to develop surveying projects and preparing final drawings. Pre-requisites: ENGTE-204, ENGTE-205, and ENGTE-209.

**ENGTE-314 SURVEYING RESEARCH AND EVIDENCE 3.00 Credits**

This course was designed to give the student a basic understanding of survey research and evidence. Student will become familiar with places to research, where to start, what to collect, how to evaluate what is found, and how to evaluate evidence. Pre-requisites: ENGTE-204, ENGTE-205, and ENGTE-209.

**ENGTE-315 SURVEY ADJUSTMENTS 3.00 Credits**

Studies matrix inverse; solution of linear equation by matrices, theory, and computation of least squares adjustments, coordinate transformation, error ellipses, and statistical testing. Pre-requisite: AAS degree.

**ENGTE-317 SUBDIVISION PLANNING & PLATTING 3.00 Credits**

This course deals with land use planning; governmental regulations and permits as applied to subdivisions; subdivision planning, computations and preparation of subdivision plats. Pre-requisites: AAS degree.

**ENGTE-390 DIRECTED STUDY IN ENGINEERING TECHNOLOGY 1.00-5.00 Credits**

Opportunity to learn advanced skills in areas agreed upon by student and instructor. Objectives developed to complete a specialized project or course of study and a plan to achieve these objectives.

**ENGTE-394 INTERNSHIP IN ENGINEERING 1.00-12.00 Credits**

Work experience in business related to the student's career goal. Student is a paid, part-time employee working under supervision of employer and program coordinator. Registration only with the approval of program coordinator.

**ENGTE-409 ADVANCED SURVEYING 5.00 Credits**

Expands on topics taught in the basic survey course. Consists of lectures, lab and field trips. Topics presented on plane surveying, topographics, public land, construction staking, geodetic, hydrographic and land development. Discussion presented on geographics information and global position systems. Pre-requisite: ENGTE-204.

**ENGTE-410 PROJECT MANAGEMENT 4.00 Credits**

Lecture and field trips to construction projects. Estimating, contracts, contract administration, construction materials, and equipment management and productions covered.

**ENGTE-411 GEODESY 3.00 Credits**

The objective of this course is to give the student an introduction to the principles of geodesy, particularly geometric geodesy, astronomic geodesy, and principles of map projections. Pre-requisites: ENGTE-204, ENGTE-205, and ENGTE-209.

**ENGTE-415 SURVEY OFFICE PRACTICE 3.00 Credits**

The student will have a basic understanding of how the business operates and many of the considerations that a business manager must deal with. They will get an appreciation of the problems encountered by the managers and will be able to understand their problems and help make work a better place. Pre-requisites: ENGTE-204, ENGTE-205, and ENGTE-209.

**ENGTE-490 DIRECTED STUDY IN ENGINEERING TECHNOLOGY 1.00-12.00 Credits**

Opportunity to learn advanced skills in area agreed upon by student and instructor. Objectives developed to complete a specialized project or course of study and a plan to achieve these objectives.

**ENGTE-492 SPECIAL TOPICS IN ENGINEERING TECHNOLOGY 1.00-5.00 Credits****ENGTE-494 IN:ENGINEERING TECHNOLOGY 1.00-12.00 Credits**

Work experience in business related to the student's career goal. Student is a paid, part-time employee working under supervision of employer and program coordinator. Registration only with the approval of program coordinator.

**GENMC-100 BASIC AUTOMOTIVE SYSTEMS 2.00 Credits**

Provides an overview of automotive system operations, maintenance, and basic repair procedures. Subjects discussed include time management, proper use of tools, use of sealants and lubricants, belts and hoses, starting and charging systems, braking and suspension systems, engine theory, transmissions, and comprehensive vehicle inspections.

**GENMC-102 ELECTRICAL 6.00 Credits**

Instruction covers basics of components and the technical aspects of repair and overhauling instrumentation, ignition, charging, and starting systems. Demonstration and hands-on experience to diagnose and repair automotive electrical systems and wiring diagrams will be covered in a laboratory environment. Components will be tested and repaired to manufacturers' specifications. Quality, cleanliness, and work attitude are stressed.

**GENMC-102A BASIC ELECTRICAL 3.00 Credits**

Basic electrical theory, wiring diagrams, test equipment, diagnosis, repair, replacement of electrical components, including battery, starting, charging, and lighting systems. Upon successful completion, the student should be able to properly use wiring diagrams and test equipment to diagnose, test, and repair wiring and lighting in accordance with Automotive Service Excellence (ASE) standards.

**GENMC-102B ADVANCED ELECTRICAL 3.00 Credits**

Instruction covers basics of components and the technical aspects of repair and overhauling instrumentation, ignition, charging, and starting systems. Demonstration and hands-on experience to diagnose and repair automotive electrical systems and wiring diagrams will be covered in a laboratory environment. Components will be tested and repaired to manufacturers' specifications. Quality, cleanliness, and work attitude are stressed. This is the applied portion of this course. Pre-requisite: GENMC-102A.

**GENMC-103 POWER TRAINS LECTURE AND LAB 6.00 Credits**

Study of various types of manual transmissions and transaxles, drivelines, clutches, flywheels, rear axles, and differentials found in modern automobiles and light trucks. Operation and repair of various components of power trains and their interrelationships provided.

**GENMC-105 ENGINES LECTURE AND LAB 6.00 Credits**

Study of principles and practical application in the repair and overhaul of the engine block, cylinder heads and valve train including camshaft, timing gears and chains, identification and replacement of defective parts, and operation of related machine tools. Technical materials are related to components used in engine blocks, cylinder heads, valve trains or similar mechanized applications.

**GENMC-105A BASIC ENGINES 3.00 Credits**

Theory, construction, inspection, diagnosis, and repair of internal combustion engines and related systems. Topics include fundamental operating principles of engines and diagnosis, inspection, adjustment, and repair of automotive engines using appropriate service information. Upon successful completion, student should be able to perform basic diagnosis, measurement and repair of automotive engines using appropriate tools, equipment, procedures and service information in accordance with Automotive Service Excellence (ASE) standards.

**GENMC-105B ADVANCED ENGINES 3.00 Credits**

Study of principles and practical application in the repair and overhaul of the engine block, cylinder heads and valve train including camshaft, timing gears and chains, identification and replacement of defective parts, and operation of related machine tools. Technical materials are related to components used in engine blocks, cylinder heads, valve trains or similar mechanized applications. This is the applied portion of the course. Pre-requisite: GENMC-105A.

**GENMC-115 CHASSIS, SUSPENSION, AND BRAKES LEC/LAB 6.00 Credits**

Chassis, suspension alignment and repair, theory and service of power and manual steering gears, wheel and tire diagnosis and balance, and all types of brakes and controls found in the modern automobile and light truck. Shop experience in suspension and steering adjustment, repair and alignment, power steering service, tire and wheel balancing, brakes and controls, and the care and use of related tools, instruments and equipment. Other shop projects may be assigned to fit individual needs.

**GENMC-126 SAFETY 2.00 Credits**

General principles are needed to foster a safe attitude and work environment. Topics covered include hazardous materials, safe use of equipment and tools, an introduction to the occupation, and health and safety concerns in the work place. Students are required to take first aid and CPR training.

**GENMC-190 DIRECTED STUDY IN GENERAL MECHANICS 1.00-12.00 Credits**

Individual instruction and self-study established to meet specific training objectives. May be repeated. Credits earned may not be directly applicable to degree or certificate.

**GENMC-194A INTERNSHIP IN ENGINE 1.00-6.00 Credits**

Advanced on-the-job training in engines. Program coordinator works with the employer to establish and maintain training goals.

**GENMC-194B INTERNSHIP IN POWER TRAINS 1.00-6.00 Credits**

Continuation of GENMC 194A. Advanced on-the-job training in power trains. Coordinator works with the employer to establish and maintain training goals.

**GENMC-194C INTERNSHIP IN CHASSIS SYSTEMS AND BRAKES 1.00-6.00 Credits**

Continuation of GENMC 194B. Advanced on-the-job training in auto mechanics in chassis/suspension and brakes. Coordinator works with the employer to establish and maintain training goals.

**HVAC-100 HVAC THEORY IA 3.00 Credits**

This class provide apprentices an introduction to the basics of HVAC. Subject matter includes basic math; basic safety; hand tools; power tools; fuel gas piping and venting; Idaho code/administrative rules; International Mechanical Code; energy sources; basic systems; HVAC/R applied science; and customer service. See attached curriculum outline for specific details and objectives.

**HVAC-101 HVAC THEORY IB 3.00 Credits**

This class (continued from semester one) provide apprentices an introduction to the basics of HVAC. Pre-requisite: HVAC 100.

**HVAC-102 HVAC THEORY IIA 3.00 Credits**

Year two subject matter includes appliance installation; blueprints/specifications; basic electricity; indoor air quality; and residential load calculation.

**HVAC-103 HVAC THEORY IIB 3.00 Credits**

This class is a continuation from HVAC-102 Theory IIA. Pre-requisite: HVAC-102.

**HVAC-104 HVAC YEAR I 10.00 Credits**

This practicum consists of 2000 hours of on the job training with an HVAC journeyman. Students take the knowledge learned in the didactic content, and apply it through actual field experience(s).

**HVAC-105 HVAC YEAR II 10.00 Credits**

This practicum consists of 2000 hours of on the job training with an HVAC journeyman. Students take the knowledge learned in the didactic content from Years 1 - 2, and apply it through actual field experience(s).

**HVAC-200 HVAC THEORY IIIA 3.00 Credits**

Year three subject matter includes basic controls; system air flow and duct sizing; basic air conditioning and refrigeration; introduction to Hydronics; basic sheet metal; and introduction to service.

**HVAC-201 HVAC THEORY IIIB 3.00 Credits**

This class is a continuation from HVAC-200 Theory IIIA. Pre-requisite: HVAC-200.

**HVAC-202 HVAC THEORY IVA 3.00 Credits**

Year four subject matter includes introduction to testing and balancing; introduction to HVAC control strategies; advanced air conditioning and heat pump systems; advanced service; system integration and design; International Fuel Gas Code; International Mechanical Code; National Electrical Code; and project management. See attached curriculum outline for specific details and objectives.

**HVAC-203 HVAC THEORY IVB 3.00 Credits**

This class is a continuation from HVAC 202 Theory IVA. pre-requisite: HVAC-202.

**HVAC-204 HVAC YEAR III 10.00 Credits**

This practicum consists of 2000 hours of on the job training with an HVAC journeyman. Students take the knowledge learned in the didactic content from Years 1 - 3, and apply it through actual field experience(s).

**HVAC-205 HVAC YEAR IV 10.00 Credits**

This practicum consists of 2000 hours of on the job training with an HVAC journeyman. Students take the knowledge learned in the didactic content from Years 1 - 4, and apply it through actual field experience(s).

**HVACR-115 BASIC ELECTRICITY 5.00 Credits**

The student will learn basic electricity principles including how to measure voltage, current, resistance, and wattage. Troubleshooting various types of motors (single-phase and three phase) along with capacitance and inductance measures will be taught. Further, the course will explain how various controls are used in HVAC-R and other maintenance fields as well as their applications. Shaft alignment and various motor mounting is taught. Cross-listed with IMMTI-115.

**HVACR-120 HVAC PRINCIPLES 5.00 Credits**

Teaches the proper handling procedures of refrigerants, brazing techniques, the evacuation and charging processes, the proper usage of tools specific to this trade, installation requirements, heat transfer, and familiarizes the student with a typical refrigeration cycle. Plastic, copper, and steel tubing as well as piping usage are taught. Students learn how to work with others on team building exercises.

**HVACR-130 TRADE SKILLS 5.00 Credits**

Introduces skills needed in construction/manufacturing/industrial trades. Subjects include blueprint reading, construction documents, hand tools, fasteners/anchors, construction equipment, safety, resume building, teamwork, leadership, and trade accounting. Cross-listed with IMMTI-130.

**HVACR-140 MECHANICAL SYSTEMS MAINTENANCE 5.00 Credits**

Emphasis on skills needed for millwrights and maintenance personal including proper bearing installation, lubrication methods, alignment of motor and other equipment installation needs, pneumatic and hydraulic systems, and seal installation will be included. Pumps and compressor maintenance and control devices are taught. Proper rigging procedures for lifting heavy and awkward equipment will be emphasized. Cross-listed with IMMTI-140.

**HVACR-225 REFRIGERATION THEORY 5.00 Credits**

Study of the operation and service of commercial refrigeration systems to include evaporators, condensers, compressors, and metering devices. Defrost systems and commercial ice making are also covered. Electrical control systems, pressure control systems, and other devices specific to refrigeration systems will be taught. The course will also prepare students to take the ESCO Refrigerant Certification for handling all refrigerants as required by the EPA.

**HVACR-230 ADVANCED HVACR CONTROLS 5.00 Credits**

Understanding a sequence of operations and enhancing skills to troubleshoot electrical circuits. Introduction to programmable logic controllers (PLC's) and building automation systems as used in the HVACR industry, along with pneumatic system and integration strategies.

**HVACR-235 A/C SYSTEM DESIGN AND INSTALLATION 6.00 Credits**

Service and operation of air conditioning systems to include evaporators, condensers, compressors, and metering devices. Air distribution and comfort/psychometrics will be taught. All-weather systems will be worked on including heat pumps. Defrost systems will also be taught. Requirements to prepare students for the low voltage certification as required by Washington State will also be covered.

**HVACR-240 DUCT FABRICATION 2.00 Credits**

Duct design, selection and fabrication of materials to create duct systems for proper air delivery. Students will learn to size systems for various installation needs.

**HVACR-250 GAS CODE REVIEW 2.00 Credits**

The study and understanding of properly installing and sizing venting systems as well as pipe sizing for correct combustion for gas heating appliances. This 60-hour course uses the International Fuel Gas Code to prepare students for the Idaho HVAC Journeyman License. This course relates subject matter taught in HVACR-255 Heating Systems.

**HVACR-255 HEATING SYSTEMS 6.00 Credits**

Learn basic operation and service of heating systems to include electric, gas, oil, hydronic, solar, and heat pump systems. Study of the controls used in these systems and troubleshooting techniques will be taught as well as venting and piping requirements as used on these products.

**HVACR-260 MECHANICAL AND ELECTRICAL CODE REVIEW 2.00 Credits**

Capstone course preparing students for the Idaho HVAC Journeyman License. The study of the International Mechanical Code to familiarize the student with subject matter taught in HVACR-120 HVACR Principles. In addition, the National Electrical Code (NEC) along with revisiting HVACR-115 Basic Electricity, will be used to prepare students for the Washington 06a Low-Voltage certification.

**HVACR-265 HYDRONIC SYSTEMS 2.00 Credits**

Provides basic knowledge of water heating systems to include gas, and electric hot water heaters as well as gas and oil hydronic heating systems. The student will learn basic operation and service of water heating systems, study controls used in these systems, trouble-shooting techniques, and determine venting/piping requirements as used on these products. Chillers are also discussed as well as the pumps used for circulation.

**HVACR-290 DS:HEAT/VENT/AC/REF TECH 1.00-8.00 Credits**

Directed Study in Heating, Venting, Air Conditioning and Refrigeration.

**HVACR-294 INTERNSHIP 2.00-8.00 Credits**

This is a capstone course. The student will relate on the job experience to the material covered in Trade Skills. This will include communication skills, research skills, critical thinking, team building, and leadership. This will be a blended course in which the student will need to access, participate and complete tasks through an online forum. Cross-listed with IMMTI-294.

**HVACR-390 DS:HEAT/VENT/AC/REF TECH 12.00 Credits**

Directed Study in Heating, Venting, Air Conditioning and Refrigeration.

**HVACR-394 IN:HEAT/VENT/AC/REF TECH 1.00-12.00 Credits**

This is a capstone course. The student will relate on the job experience to the material covered in HVACR-130: Trade Skills. This will include communication skills, research skills, critical thinking, team building, and leadership. This will be a blended course in which the student will need to access, participate and complete tasks through an online forum. Cross-listed with IMMTI-294.

**IETTI-101 BASIC DC CIRCUIT THEORY 4.00 Credits**

The principles of basic electricity and DC circuit theory will be covered. Topics covered will include related technical math, safety procedures, components, and the principles of electrical circuit analysis including voltage, current, resistance, and related laws. Students will be required to demonstrate competency with working in groups and demonstrating appropriate interpersonal relationships. Pre-requisite: MTHPT-103 with a grade of C or better or satisfactory placement score into MTHPT-137.

**IETTI-102 DIGITAL ELECTRONICS 4.00 Credits**

Industrial electronics technicians work with many types of digital electronic systems. This course introduces the student to the theories and applications of digital electronic devices, circuits and systems. The learner will be required to demonstrate mastery of all the course objectives.



**IETTI-103 INTRODUCTION TO MICROCONTROLLERS 4.00 Credits**

An introductory course to construction, programming, and alignment of microcontrollers and their applications. Students learn how to program, assemble, and perform software and electronics modifications on various microcontroller systems.

**IETTI-104 ADVANCED ELECTRICAL PRINCIPLES 4.00 Credits**

Students learn a variety of advanced AC electrical and electronic topics including AC power generation and distribution, three phase systems, and high power transformers. The learner will be required to demonstrate mastery of all the course objectives. A good understanding of basic algebra is needed to be successful in this course.

**IETTI-105 SOLID STATE DEVICES 4.00 Credits**

Solid state devices, also known as semiconductors, comprise most known integrated circuits; they are also found as discrete devices on printed circuit boards and other electronic equipment. This course introduces the student to the theories and applications of solid state devices as they are used in these applications. The learner will be required to demonstrate mastery of all the course objectives.

**IETTI-106 EMBEDDED SYSTEMS 4.00 Credits**

This is a project-based course where students design, prototype, construct, test, and document practical electronic systems based on embedded controller (microprocessor and microcontroller) technology. Project scope and functional criteria are defined by the instructor with input from the student. In cases where the project is built for an external client, feedback from the client helps determine the project grade. Pre-Requisite: MTHPT-137.

**IETTI-108 INTRODUCTION TO PLC'S 4.00 Credits**

Today's electronic technicians must be familiar with programmable logic controllers (PLC's) as they are widely used in the industry. The course begins with an introduction to programmable logic controller hardware, memory, I/O modules, numbering systems, and programming devices. The learner will then gain experience working with PLC wiring diagrams, PCL setup configuration, and ladder logic programming. Pre-requisite: IETTI-101 or IMMTI-115, and MTHPT-103 or instructor permission. Cross-listed with IMMTI-108.

**IETTI-110 BASIC DC CIRCUIT LAB 2.00 Credits**

Students will construct, analyze, predict and measure DC circuits while selecting and using appropriate test equipment. Project reports require design concepts, theoretical application, and demonstration of principles and practices learned in math, field practice and laboratory. Students will learn to adhere to safe work practices and demonstrate the proper techniques of soldering and de-soldering circuit components. Students will be required to demonstrate competency with working in groups and demonstrating appropriate interpersonal relationships. Pre-requisite: IETTI-101.

**IETTI-112 AC CIRCUIT ANALYSIS 3.00 Credits**

This course is designed to provide students with a foundation in the use of phasor and vector analysis for analyzing alternating current circuits. This course will also introduce logarithms, binary number systems, and Boolean algebra. Pre-requisite: MTHPT 103 or MATH 025, or permission of instructor.

**IETTI-190 DIRECTED STUDY IN INDUSTRIAL ELECTRONICS TECHNOLOGY 1.00-12.00 Credits**

Required study in area agreed upon by the student and the instructor. Might include specialized devices, new products, or advanced troubleshooting.

**IETTI-201 INTRO TO INSTRUMENTATION 4.00 Credits**

Industrial electronics technicians work with equipment that sense and control pressure, temperature, flow and level. These technicians must also calibrate and service these systems. This course also covers OP-AMPS, analog-digital conversion circuits, and PID controllers.

**IETTI-204 PROGRAMMING HUMAN MACHINE INTERFACES (HMI) 4.00 Credits**

This course will introduce the student to software and hardware that allows machine operators to interface with PLC control systems.

**IETTI-205 ELECTRIC MOTORS, DRIVES AND CONTROLS 4.00 Credits**

This course will introduce the student to DC and AC motors, electrical diagrams, motor starters, motor control circuits, three phase power, ac and dc motor drives, and motor maintenance. Cross-listed with IMMTI-205.

**IETTI-207 PROGRAM AND TROUBLESHOOT PLC'S 4.00 Credits**

Today's electronic technician must be familiar with programmable logic controllers (PLC's) as they are widely used in industry. This course continues the ladder logic programming started in IETTI 108. The learner will also be exposed to the types of PLC communications and troubleshooting with a PLC.

**IETTI-208 PLC'S SYSTEMS APPLICATIONS 4.00 Credits**

Today's electronic technician must be familiar with programmable logic controllers (PLC's) as they are widely used in industry. This course will give the learner additional training in programming and networking PLCs. It will also introduce him/her to motion control and operator interface devices and provide him/her with more hands-on experience. Pre-Requisite: IETTI-101, IETTI-104, and IETTI-108.

**IETTI-211 ADVANCED INSTRUMENTATION 4.00 Credits**

This course will continue to present the theories, applications and procedures for process control and instrumentation introduced in IETTI-201. Instrument technicians calibrate and service equipment that sense and control pressure, temperature, flow, and level for process control systems. Pre-requisite: IETTI-101 with a grade of C or better and permission from the instructor.

**IETTI-220 ADVANCED DIGITAL DESIGN 4.00 Credits**

This is a project-based course where students design, prototype, construct, test, and document practical electronic systems based on combinational and state-based digital logic. Project scope and functional criteria are defined by the instructor with input from the student. In cases where the project is built for an external client, feedback from the client helps determine the project grade. Pre-Requisite: MTHPT-137.



**IETTI-221 C COMPUTER PROGRAMMING 4.00 Credits**

This course teaches the application of electronic principles learned in IETTI-222 (Advanced Electronics I) by way of project design and construction, circuit modeling using the C programming language, skill demonstrations, and troubleshooting faulted projects. Mastery standards applied to all experimental and diagnostic steps guarantee attainment of learning outcomes. Pre-Requisite: MTHPT-137.

**IETTI-222 ADVANCED ELECTRONICS I 4.00 Credits**

This course reviews fundamental circuit theory while introducing principles of programming in the C language, then builds on that foundation to explore analog amplifier circuits (both discrete-transistor and operational amplifier), principles of RF and radio systems, and state-based digital logic. Mastery-style written exams guarantee attainment of conceptual learning outcomes, while oral presentations and Socratic dialogue demonstrate communicative learning outcomes.. Pre-Requisite: MTHPT-137.

**IETTI-223 ADVANCED ELECTRONICS II 4.00 Credits**

This course introduces microprocessor theory - including programming in both assembly language and C - and also explores serial data communication, advanced RF topics (e.g. modulation, mixers, Smith charts, VNAs), signal conditioning, and closed-loop PID control. Mastery-style written exams guarantee attainment of conceptual learning outcomes, while oral presentations and Socratic dialogue demonstrate communicative learning outcomes. Pre-Requisite: MTHPT-137.

**IETTI-224 ADVANCED ELECTRONICS III 4.00 Credits**

This course is an introduction to the transient response analysis of RLC circuits. First, the computation of the transient response through classical differential equation techniques is covered. Next, Laplace transform techniques are studied, unifying both the transient and frequency response techniques. Then, Fourier analysis techniques are introduced to familiarize the students with the fundamentals of signal analysis. Finally, the State Variable technique is used to compute the transient response of RLC networks. Throughout the course, the lectures are supported by experimental work that make use of the hardware and computer-aided facilities available in the program. Prerequisite: MATH-170 and instructor approval.

**IETTI-225 INTRODUCTION TO PROGRAMMABLE DEVICES 4.00 Credits**

This course teaches the application of electronic principles learned in IETTI-223 (Advanced Electronics II) by way of project design and construction, skill demonstrations, and troubleshooting faulted projects. Mastery standards applied to all experimental and diagnostic steps guarantee attainment of learning outcomes. Pre-Requisite: MTHPT-137.

**IETTI-226 ELECTRONICS CIRCUIT TROUBLESHOOTING 3.00 Credits**

Electronics Engineering Technicians work with analog and digital electronic systems. In this course, students will learn what to do when these systems don't work. Students will be introduced to basic troubleshooting techniques including test equipment, component identification, fault isolation, and documentation. The learner will be required to demonstrate mastery of all the course objectives.

**IETTI-290 DIRECTED STUDY IN INDUSTRIAL ELECTRONICS TECHNOLOGY 1.00-10.00 Credits**

Required study in area agreed upon by the student and the instructor. Might include specialized devices, new products, or advanced troubleshooting.

**IETTI-292 DIRECTED SPECIAL PROJECTS 3.00 Credits****IETTI-294 INTERNSHIP IN INDUSTRIAL ELECTRONICS 1.00-12.00 Credits**

Work experience in business related to student's career goals. Student is a paid part-time employee working under the supervision of the employer and program coordinator.

**IETTI-390 DIRECTED STUDY IN INDUSTRIAL ELECTRONICS TECHNOLOGY 12.00 Credits**

Required study in area agreed upon by the student and the instructor. Might include specialized devices, new products, or advanced troubleshooting.

**IETTI-394 INTERNSHIP IN INDUSTRIAL ELECTRONICS 12.00 Credits**

Work experience in business related to student's career goals. Student is a paid part-time employee working under the supervision of the employer and program coordinator.

**IMMTI-108 INTRODUCTION TO PLC'S 4.00 Credits**

Today's electronic technicians must be familiar with programmable logic controllers (PLC's) as they are widely used in the industry. The course begins with an introduction to programmable logic controller hardware, memory, I/O modules, numbering systems, and programming devices. The learner will then gain experience working with PLC wiring diagrams, PCL setup configuration, and ladder logic programming. Pre-requisite: IETTI-101 or IMMTI-115, and MTHPT-103 or instructor permission. Cross-listed with IETTI-108.

**IMMTI-115 BASIC ELECTRICITY 5.00 Credits**

The student will learn basic electricity principles including how to measure voltage, current, resistance, and wattage. Troubleshooting various types of motors (single-phase and three phase) along with capacitance and inductance measures will be taught. Further, the course will explain how various controls are used in HVAC-R and other maintenance fields as well as their applications. Shaft alignment and various motor mounting is taught. Cross-listed with HVACR-115.

**IMMTI-130 TRADE SKILLS 5.00 Credits**

Introduces skills needed in construction/manufacturing/industrial trades. Subjects include blueprint reading, construction documents, hand tools, fasteners/anchors, construction equipment, safety, resume building, teamwork, leadership, and trade accounting. Cross-listed with HVACR-130.

**IMMTI-140 MECHANICAL SYSTEMS MAINTENANCE 5.00 Credits**

Emphasis on skills needed for millwrights and maintenance personal including proper bearing installation, lubrication methods, alignment of motor and other equipment installation needs, pneumatic and hydraulic systems, and seal installation will be included. Pumps and compressor maintenance and control devices are taught. Proper rigging procedures for lifting heavy and awkward equipment will be emphasized. Cross-listed with HVACR-140.

**IMMTI-150 WELDING POWER SOURCES 2.00 Credits**

Introduces various basic power sources used in welding industry. Students learn construction of power sources, how to obtain optimum performance from a power source, and how to troubleshoot a power source. Cross-listed with WLDC-150.

**IMMTI-155 BASIC WELDING PROCESSES LAB 7.00 Credits**

To develop employable skills for combination welder (DOT 812.844). This involves welding with the SMAW and GMAW process in all positions, single and multi-pass. Includes gas welding, brazing and flame cutting. Cross-listed with WLDC-155.

**IMMTI-165 ADVANCED WELDING PROCESSES 7.00 Credits**

To further develop employable skills for arc welder (DOT810.884) and combination line welder (DOT 812.844). This involves welding with the SMAW process in all positions, single and multi-pass, using DC equipment and covered electrodes. Covers welding with the GTAW process on thin gauge mild steel, stainless steel, and aluminum in all positions using both direct and alternating current. Pre-requisite: IMMTI-155. Cross-listed with WLDC-165.

**IMMTI-194 IN:INDUSTRIAL MAINTENANCE/MILLWRIGHT 2.00-8.00 Credits**

This is a capstone course. The student will relate on the job experience to the material covered in HVACR 130: Trade Skills. This will include communication skills, research skills, critical thinking, team building, and leadership. This will be a blended course in which the student will need to access, participate and complete tasks through an online forum.

**IMMTI-205 ELECTRIC MOTORS, DRIVES AND CONTROLS 4.00 Credits**

This course will introduce the student to DC and AC motors, electrical diagrams, motor starters, motor control circuits, three phase power, ac and dc motor drives, and motor maintenance. Cross-listed with IETTI-205.

**IMMTI-251 BLUEPRINT READING 2.00 Credits**

To give the student a basic working knowledge of blue print reading as it applies in today's welding/millwright industries. This includes welding symbols, nondestructive testing symbols, and methods of dimensioning drawings. Pre-requisite: MTHPT-137. Cross-listed with WLDC-251.

**IMMTI-261 BENCHWORK FOR WELDERS 2.00 Credits**

Familiarizes student with basic hand and machine tools, measuring devices, and shop and tool safety. Cross-listed with WLDC-261.

**IMMTI-262 DISTORTION CONTROL 2.00 Credits**

Trains students in the correct method of distortion control in welded fabrications. Gives basic guidance to assist student in overcoming and understanding some difficulties inherent when working metals where heat input is involved. Cross-listed with WLDC-262.

**IMMTI-270 DIRECTED WELDING PROJECTS 1.00-8.00 Credits**

This course is designed for students who desire to specialize in one field of the welding industry. The student will learn how to safely operate and optimize the performance of various welding machines and how to operate welding shop equipment. They will also acquire additional knowledge of welding theory concerning specific processes or applications, and welding skills appropriate to the area of interest. Cross-listed with WLDC-270.

**IMMTI-294 INTERNSHIP 2.00-8.00 Credits**

This is a capstone course. The student will relate on the job experience to the material covered in Trade Skills. This will include communication skills, research skills, critical thinking, team building, and leadership. This will be a blended course in which the student will need to access, participate and complete tasks through an online forum. Cross-listed with HVACR-294.

**IMMTI-394 IN:INDUSTRIAL MAINTENANCE/MILLWRIGHT 1.00-12.00 Credits**

This is a capstone course. The student will relate on the job experience to the material covered in IMMTI-130: Trade Skills. This will include communication skills, research skills, critical thinking, team building, and leadership. This will be a blended course in which the student will need to access, participate and complete tasks through an online forum. Cross-listed with HVACR-294.

**ISATI-126 INTRODUCTION TO CYBERSECURITY 4.00 Credits**

This course introduces students to basic knowledge and skills needed to protect computers and networks from increasingly sophisticated cybersecurity threats. Reading, writing, and computer intensive. Pre-requisite: Satisfactory placement score into ENGL-101 without ENGL-103 as a required co-requisite or completion of ENGL-101 with a grade of C or better and MTHPT-103 with a grade of C or better.

**ISATI-127 COMPTIA SECURITY+ 4.00 Credits**

This course assists students in developing vendor-neutral IT cybersecurity knowledge and skills. This course can potentially lead to CompTIA Security + certification. Reading, writing, and computer intensive. Pre-requisite: ISATI-126 with a grade of C or better.

**ISATI-229 ADVANCED CYBERSECURITY AND PENTESTING 4.00 Credits**

This course exposes students to the world of penetration testing (pentesting). This course can potentially lead to CompTIA Cybersecurity Analyst (CSA+) certification. Reading, writing, and computer intensive. Pre-requisite: ISATI-230 with a grade of 'C' or better.

**ISATI-230 COMPTIA LINUX+ 4.00 Credits**

This course assists students in developing a working knowledge of the graphical and command-line interfaces of major Linux distributions. This course is intended for experienced computer users who have prior exposure to Linux operating systems. This course can potentially lead to CompTIA Linux+ certification. Reading, writing, and computer intensive. Pre-requisite: ISATI-127 with a grade of 'C' or better.

**WLDC-120 INTRODUCTION TO WELDING 1.00-3.00 Credits**

This course helps the student develop confidence and skills in the fundamentals of basic welding concepts. This involves welding with the SMAW and GMAW processes, gas welding, brazing, and flame cutting.

**WLDT-150 WELDING POWER SOURCES 2.00 Credits**

Introduces various basic power sources used in welding industry. Students learn construction of power sources, how to obtain optimum performance from a power source, and how to troubleshoot a power source. Cross-listed with IMMTI-150.

**WLDT-151 WELDING CODES FOR CERTIFICATIONS 1.00-2.00 Credits**

Teaches working knowledge of various welding codes and welder certifications in common use in industry today. Students work from the AWS D1.1 to write a welding procedure qualification record, a prequalified welding procedure, a welding procedure specification, and a welder qualification record form. This will also assist student to take the Associate Certified Welding Inspector Exam.

**WLDT-152 QUALITY CONTROL FOR WELDING INSPECTION 1.00-2.00 Credits**

Introduces students to quality control and inspection techniques common in industry. Quality assurance and quality control are covered from employer and employee points of view. Weld inspection is approached through destructive and non-destructive methods as prescribed in AWS D1.1, Unit 6.

**WLDT-153 BASIC ACETYLENE WELDING LAB 4.00 Credits**

Shop practice in basic oxygen acetylene welding.

**WLDT-155 BASIC WELDING PROCESSES LAB 7.00 Credits**

To develop employable skills for combination welder (DOT 812.844). This involves welding with the SMAW and GMAW process in all positions, single and multi-pass. Includes gas welding, brazing and flame cutting. Cross-listed with IMMTI-155.

**WLDT-155A SMAW PRACTICAL 4.00 Credits**

SMA welding to include fillet and groove welds in all positions to the AWS standards. Successfully completing this course may lead to certification.

**WLDT-155B BASIC OXYACETYLENE AND GMAW 3.00 Credits**

To develop employable skills for combination welder (DOT 812.844). Lab practice in basic oxyacetylene welding and cutting and basic gas metal arc welding. Application of SMAW learned in WLDT-155A SMAW Practical. Pre-requisite: WLDT-155A.

**WLDT-156 BASIC SMAW LAB 4.00-8.00 Credits**

Weld with the SMAW process in all positions on mild steel using AC and DC equipment.

**WLDT-157 BASIC GMAW LAB 4.00-8.00 Credits**

Weld with the GMAW and FCAW processes in all positions, single and multi pass.

**WLDT-158 ADVANCED SMAW LAB 4.00-8.00 Credits**

Weld with the SMAW process in all positions using DC welding equipment. Obtain certifiable skills on a plate of unlimited thickness.

**WLDT-159 BASIC GTAW LAB 4.00-8.00 Credits**

Weld with the GTAW process on thin gauge mild steel, stainless steel, and aluminum using both DC and AC equipment.

**WLDT-160 MATHEMATICS I 1.00-2.00 Credits**

Working knowledge of basic mathematics as applied in the welding industry.

**WLDT-161 WELDING PROCESSES AND APPLICATIONS 1.00-2.00 Credits**

Explores various welding and cutting processes commonly used in industry and provides students with a basic understanding of the principles involved.

**WLDT-162 METALLURGY 1.00-2.00 Credits**

Introduces basic metallurgy and gives working knowledge of problems that occur as a result of heating and cooling metal when using the various welding processes.

**WLDT-165 ADVANCED WELDING PROCESSES 7.00 Credits**

To further develop employable skills for arc welder (DOT 810.884) and combination line welder (DOT 812.844). This involves welding with the SMAW process in all positions, single and multi-pass, using DC equipment and covered electrodes. Covers welding with the GTAW process on thin gauge mild steel, stainless steel, and aluminum in all positions using both direct and alternating current. Pre-requisite: IMMTI-155. Cross-listed with IMMTI-165.

**WLDT-190 DS:WELDING TECHNOLOGY 1.00-8.00 Credits**

Individual instruction and self-study established to meet specific training objectives. May be repeated. Credits earned may not be directly applicable to degree or certificate.

**WLDT-192 SPECIAL TOPICS IN WELDING TECHNOLOGY 1.00-12.00 Credits****WLDT-250 DRAFTING AND PIPEFITTING 1.00-2.00 Credits**

Basic fundamentals of drafting as used in welding trade. Pipefitting section enables students to do basic layout of pipe, figure offsets, runs, and travel distances, and give practical experience in fitting and welding branches or laterals, and blanking off pipe.

**WLDT-251 BLUEPRINT READING 2.00 Credits**

To give the student a basic working knowledge of blue print reading as it applies in today's welding/millwright industries. This includes welding symbols, nondestructive testing symbols, and methods of dimensioning drawings. Pre-requisite: MTHPT-137. Cross-listed with IMMTI-251.

**WLDT-252 HEAT TREATMENT 1.00-2.00 Credits**

Acquaints students with various industrial heat treatment processes and their applications in industry. Teaches in-depth, the properties and strengths of metals in fabrication and technology.

**WLDTC-254 PIPE WELDING: SMAW LAB 1.00-7.00 Credits**

Develops skills for the welder portion of Pipe Fitter. Involves welding with the SMAW process on mild steel, multi-pass, using E6010 and E7018 electrodes. Welds are performed in the 2G, 5G, and 6G positions. Covers both uphill and downhill techniques.

**WLDTC-256 SMAW UPHILL PIPE LAB 4.00-8.00 Credits**

Weld pipe in all positions using SMAW process and uphill technique to conform to ASME Section IX.

**WLDTC-257 SMAW DOWNHILL PIPE LAB 4.00-8.00 Credits**

Weld pipe in all positions using SMAW process and downhill technique to conform to API standard 1104.

**WLDTC-258 BASIC ALUMINUM WELDING LAB 4.00-8.00 Credits**

Weld aluminum using GTAW and GMAW processes in all positions.

**WLDTC-260 MATHEMATICS II 1.00-2.00 Credits**

Gives students thorough working knowledge of basic algebra and geometry as applied in industry. Reviews and re-applies basic trigonometry as learned in previous semester course Drafting/Pipefitting.

**WLDTC-261 BENCHMARK FOR WELDERS 2.00 Credits**

Familiarizes student with basic hand and machine tools, measuring devices, and shop and tool safety. Cross-listed with IMMTI-261.

**WLDTC-262 DISTORTION CONTROL 2.00 Credits**

Trains students in the correct method of distortion control in welded fabrications. Gives basic guidance to assist student in overcoming and understanding some difficulties inherent when working metals where heat input is involved. Cross-listed with IMMTI-262.

**WLDTC-263 PIPE WELDING GMAW LAB 4.00 Credits**

Develops skills for the welder portion of Pipe Fitter I. Involves welding with the GMAW process on mild steel, multi-pass, using small diameter wire and short circuit transfer in the 2G, 5G, and 6G positions. Covers both uphill and downhill techniques.

**WLDTC-264 PIPE WELDING GTAW LAB 1.00-7.00 Credits**

Develops employable skills in the gas tungsten arc welding portion of Pipe Fitter I. Involves welding with GTAW process on small diameter thin wall pipe and tubing in all positions. High pressure pipe welding using GTAW on root pass with E7018 fill and cover passes is covered.

**WLDTC-266 PROJECT WELDING FROM DRAWING LAB 4.00 Credits**

Shop practice in project welding from drawings using all methods and materials.

**WLDTC-270 DIRECTED WELDING PROJECTS 1.00-8.00 Credits**

This course is designed for students who desire to specialize in one field of the welding industry. The student will learn how to safely operate and optimize the performance of various welding machines and how to operate welding shop equipment. They will also acquire additional knowledge of welding theory concerning specific processes or applications, and welding skills appropriate to the area of interest. Cross-listed with IMMTI-270.

**WLDTC-270A WELDING SAFETY 2.00 Credits**

The student will identify lab organization and safety procedures, demonstrate applied leadership skills and abilities, demonstrate and identify hand tools and their proper usage. The student will also demonstrate and identify power tools and equipment including their proper usage and maintenance.

**WLDTC-271 WELDING SAFETY 2.00 Credits**

The student will identify lab organization and safety procedures, demonstrate applied leadership skills and abilities, demonstrate and identify hand tools and their proper usage. The student will also demonstrate and identify power tools and equipment including their proper usage and maintenance.

**WLDTC-290 DIRECTED STUDY IN WELDING TECHNOLOGY 1.00-8.00 Credits**

**WLDTC-292 DIRECTED SPECIAL PROJECTS 1.00-8.00 Credits**

**WLDTC-294 INTERNSHIP IN WELDING TECHNOLOGY 1.00-8.00 Credits**

Advanced on-the-job training in welding.

**WLDTC-366 PROJECT WELDING FORM DRAWING LAB 4.00 Credits**

Shop practice in project welding from drawings using all methods and materials.

**WLDTC-370 DIRECTED WELDING PROJECTS 1.00-8.00 Credits**

This course is designed for students who desire to specialize in one field of the welding industry. The student will learn how to safely operate and optimize the performance of various welding machines and how to operate welding shop equipment. They will also acquire additional knowledge of welding theory concerning specific processes or applications, and welding skills appropriate to the area of interest.

**WLDTC-390 DIRECTED STUDY IN WELDING TECHNOLOGY 1.00-8.00 Credits**

**WLDTC-394 INTERNSHIP IN WELDING TECHNOLOGY 1.00-8.00 Credits**

Advanced on-the-job training is welding.

**WLDTC-494 INTERNSHIP IN WELDING TECHNOLOGY 12.00 Credits**

Advanced on-the-job training is welding.

