TECHNICAL & INDUSTRIAL DIVISION

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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 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 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 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 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 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 Credits
Applying engineering graphic principles using CAD for sectional views, auxiliary views, dimensioning, tolerancing, geometric tolerances, threads and fastners, 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 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 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 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 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 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 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 1-12 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 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 3-4 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 3-4 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 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 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 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 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 1-10 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 1-10 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 1-12 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 1-12 Credits

AMFTI-394 IN: AUTOMATED MANUFACTURING TECHNOLOGY 1-12 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 1-12 Credits

AMFTI-492 DIRECTED SPECIAL PROJECTS 1-10 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 1-12 Credits

AUTMC-100 (G1) SAFETY AND GENERAL AUTOMOTIVE MAINTENANCE AND REPAIR 6 Credits
(G1) Safety and General Automotive Maintenance and Repair is an introductory course required of all Automotive Technology majors. This course is the prerequisite to all other Automotive Technology courses and places emphasis on shop safety and accepted safety practices, OSHA regulations and instructions on the handling of hazardous materials related to the automotive industry. Students will also learn the safe operation and use of tools, shop equipment and vehicle hoists. Students are required to pass the Safety examination before participating in the automotive lab. Coursework then focuses on preparing students for the 8 areas of emphasis in our ASE/NATEF Master accredited program courses. Basic theory and service of these 8 automotive systems, (ASE designation A1 - A8), are covered. Basic skills and accepted practice of mechanical applications, use of information systems, survey of industry related careers, laws governing the automotive service industry, and environmental impacts related to the automotive industry will be introduced. This course aligns with ASE/NATEF (G1) standards. Students will have the opportunity to certify in an Entry-Level ASE certification exam in Maintenance and Light Repair (G1). Successful completion of AUTMC-100 course, with a grade of C or higher is a prerequisite for all other Automotive Technology courses offered at LCSC. For Automotive Technology Majors only, must have a clean driving record, (must be insurable on State Insurance policy), and ability to bring or fund required tools for course. Students are required to either bring an approved starter tool kit of professional grade automotive hand tools or plan on purchasing these tools by the end of week 2. Instructors, Division Chair, Division Dean and Advising Center all have current copies of the recommended tool list and can advise on cost of initial tool investment.

AUTMC-102 (A6) ELECTRICAL/ELECTRONIC SYSTEMS 6 Credits
(A6) Electrical/Electronic Systems is an ASE Master Automotive Service Technology accredited course which is a prerequisite and foundational course for all other ASE courses offered at Lewis Clark State College. It consists of theory in automotive electrical with emphasis in AC and DC currents, Ohm's law related to series and parallel circuit theory, magnetism, induction, starting and charging systems, circuit testing practices, wiring diagrams and symbols, and basic automotive electronic theory. Students will participate in labs structured to test circuits, identify circuit and component faults, and learn to perform services and repairs of typical automotive electrical problems. Students will learn the use of electrical diagnostic equipment and how to read and use electrical diagrams with service instructions and materials. Theory learned in the classroom will be applied in live lab opportunities. Students must be enrolled as an Automotive Technology Major, have a clean driving record, (insurable on State Insurance policy). Students are required to successfully pass the (A6) Electrical/Electronic Systems ASE Entry-Level exam and earn a C or higher in this course to receive credit for program graduation. Pre-requisite: AUTMC-100 with a grade of 'C' or higher.

AUTMC-103 (A3) MANUAL DRIVE TRAIN AND AXLES 6 Credits
This is an ASE Master Automotive Service Technology accredited course offering an in-depth study of the operation of manual transmissions, transfer cases, differentials, and four-wheel-drive systems with an emphasis on the diagnostic process that a technician would use to isolate faults. This course includes theory, diagnosis, service, and repair of clutch assemblies, hydraulic actuators, gears, evaluating bearing wear and setting bearing preload. Each student will complete a manual transmission clutch and flywheel replacement. Additionally, each student will remove, rebuild, and reinstall a differential. Students will be required to write estimates for repair work performed in the lab and are expected to participate verbally in class discussions. Some lab projects will require students to work in small groups. Students are expected to write short answer essays to complete homework assignments and will be quizzed with ASE certification exam style questions in preparation for the ASE A3 test. Students must earn a C or higher and are required to successfully pass the (A3) Manual Drive Train and Axles ASE Entry-Level examination to receive credit for program graduation. Pre-requisite: AUTMC-100 with a grade of 'C' or higher.

AUTMC-105 (A1) ENGINE REPAIR 6 Credits
AUTMC-105 (A1) Engine Repair is an ASE Master Automotive Service Technology accredited course which offers an in-depth study of automotive gasoline and light diesel engines. The course includes theory, diagnosis, service, and repair in the following areas: general engine diagnosis, service and repair procedures for cylinder head and valve train, engine block and reciprocating assembly, lubrication function and requirements, and cooling systems. This course includes AERA (Automotive Engine Rebuilders Association) materials and certification examinations as well as ASE Entry-Level certification. Lab experience will focus on implementation of industry standards and practices in the repair/rebuilding of engines. Our students will have the opportunity to remove and reinstall engines in a service environment. They will participate in the machining and building of engines, repair and diagnosis of failed engines, and learn building concepts related to not only factory standards but also concepts in entry-level high-performance engine building applications. This course is designed to prepare students for the ASE A1 Engine Repair certification exam. Students are required to successfully pass the (A1) Engine Repair ASE Entry-Level examination, two AERA examinations, and earn a C or higher grade to receive credit for program graduation. The course requires students to be enrolled as an Automotive Technology Major, have a clean driving record, (insurable on State Insurance policy). Pre-requisites: MTHPT-103 or MTHPT-137, AUTMC-100, AUTMC-102 and AUTMC-212 with a grade of C or higher.

AUTMC-115 (A4) STEERING AND SUSPENSION 6 Credits
AUTMC-115 (A4) Steering and Suspension is an ASE Master Automotive Service Technology accredited course which offers an in-depth study of service of steering and suspension components and includes accepted practices in service and adjustment of alignment angles, service and replacement of steering links and related components, diagnosis and repair of suspension components. Upon completion of this course students will be competent in performing alignments and performing wheel and tire-related service work. Live lab assignments include in depth participation in performing vehicle alignments, service and repair of steering and suspensions components, diagnosis of handling and steering issues, basic concepts of ADAS (Advanced Drivers Assistance Systems) and prepare students for working with and diagnosing entry level ADAS issues. This course is designed to prepare students for the ASE (A4) Steering and Suspension entry level certification exam. Students are required to successfully pass the (A4) Steering and Suspension ASE Entry-Level examination and earn a C or higher to receive credit for program graduation. The course requires students to be enrolled as an Automotive Technology Major, have a clean driving record, (insurable on State Insurance policy). Pre-requisites: MTHPT-103 or MTHPT-137, AUTMC-100, AUTMC-102, AUTMC-212 completed with a grade of C or higher.

AUTMC-190 DIRECTED STUDY IN AUTO MECHANICS TECHNOLOGY 1-6 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 (A5) BRAKES (A7) HEATING, VENTILATION, AND AIR CONDITIONING 6 Credits
This is a two-part course that covers the ASE Master Automotive Service Technology accredited course requirements for both A5 and A7. Brake systems will be studied in-depth, including hydraulic brake circuits, parking brake systems, anti-lock brakes, service of brake rotors and drums, and traction control system service and repair. Students will participate in labs structured to experience accepted machining practices for brake rotors and drums, how to diagnose and service brake wearing components, how to service brake hydraulic, cable, and electric braking systems. Students will learn approved practices for diagnosing and servicing electronic brake and traction control system faults. The A7 HVAC section of this course covers service and repair of air conditioning and heating systems, including preparation for the Mobile Air Conditioning Service (MACS) examination. Industry and EPA standards for handling and servicing automotive refrigerants, HVAC system components, and basic concepts of computerized HVAC controls will be covered. HVAC lab experience focuses on diagnosis and service of automotive air conditioning systems and practices that are compliant with EPA standards. Students will learn how to diagnose and service heating and ventilation systems and the electronic devices that control automotive HVAC operation. This course is designed to prepare students for the ASE (A5) Brakes and the (A7) Heating, Ventilation and Air Conditioning certification exam. Students are required to successfully pass the (A5) Brakes and (A7) Heating, Ventilation and Air Conditioning ASE Entry-Level examinations and earn a C or higher to receive credit for program graduation. Pre-requisite: AUTMC-100 and AUTMC-102 with a grade of C or higher.

AUTMC-209 (A2) AUTOMATIC TRANSMISSION AND TRANSAXLE 6 Credits
This is an ASE Master Automotive Service Technology accredited course which offers an in-depth study of automatic transmissions and transaxles, with emphasis on the diagnostic process that a technician working on today's most common vehicles would use to isolate transmission faults. This course includes theory, diagnosis, service, and repair of transmission/transaxle hydraulic and electrical/electronic circuits, service of hard mechanical and wearing components, gaskets, seals, bearings, gears, and torque converters. Each student will remove, disassemble, inspect, reassemble, and reinstall an automatic transmission. Students will be required to write estimates for repair work performed in the lab and are expected to participate verbally in class discussions. Most lab projects will require students to work in groups of two. Students are expected to write short answer essays to complete homework assignments and will be quizzed with ASE certification exam style questions in preparation for the ASE (A2) Automatic Transmission and Transaxles certification exam. Students are required to pass the ASE Entrance Level examination for (A2) Automatic Transmission and Transaxle and pass the course with a C or higher for graduation requirements. This course is for Automotive Technology Majors only, who have completed AUTMC-100 and AUTMC-102 with a C or higher grades.

AUTMC-212 (A8) ENGINE PERFORMANCE 6 Credits
(A8) Engine Performance is an ASE Master Automotive Service Technology accredited course which is a foundational course for many advanced ASE accredited courses. The materials cover concepts in engine combustion, emissions, engine performance, fuel and ignition systems, diagnostic strategies and the use of related tools including DSO's (digital storage oscilloscopes) and scan tools. Students will be introduced to onboard computer networks and basic testing practices/standards for these electronic systems. This class is preparatory for the (L1) Advanced Engine Performance course. Lab experiences will include the operation of our chassis and engine dynamometers in conjunction with experiments in emissions, economy, and engine performance. Students will learn how to competently operate diagnostic scan tools and DSOs to help guide them to proper diagnostic outcomes in vehicles with engine performance issues. Students must be enrolled as an Automotive Technology Major, have a clean driving record, (insurable on State Insurance policy), successfully completed AUTMC-100 and AUTMC-102 with a grade of C or higher. Students are required to successfully pass the ASE Entry-Level (A8) Engine Performance examination and earn a C or higher to receive credit for program graduation.

AUTMC-225 (L1) ADVANCED ENGINE PERFORMANCE 6 Credits
(L1) Advanced Engine Performance is a continuation of (A8) AUTMC-212 Engine Performance with emphasis in the areas of advanced diagnostic strategies utilizing both engine and chassis dynamometers. Students will study components that impact emissions, economy, standard performance and hi-performance engines. The course will help prepare students for their (L1) Advanced Engine Performance ASE examination. This is accomplished through the study of final emissions, economy, and the power produced by modern gasoline engines, with focus on gasoline engines only. This course is designed to acquaint the student with environmental laws and the impact of vehicle emissions on our environment. Students will study, in depth, the relationship of emissions, economy and power output of today's modern gasoline engines and will learn to utilize test equipment for the evaluation of exhaust gas content in relation to emissions, economy and power. The importance of fuel quality and grades will be discussed and studied through experimentation of varied grades of gasoline fuels. Course study will include methods of performing modifications to fuel, ignition, and computer-controlled systems, and include tuning for hi-performance applications with emphasis on how these modifications impact emissions, economy, and power. Students will be required to participate in several experiments which will require engine building combinations to achieve varied outcomes which will impact final emissions, economy and power. Students will perform experiments utilizing our chassis and engine dynamometers to prove concepts and perform research experiments. Pre-requisites: Students must have successfully completed the following courses with a "C" or higher, AUTMC-100, AUTMC-102, AUTMC-105, AUTMC-212. Completion of this course with a grade of "C" or higher is required for the course to be applied toward graduation from the Auto Mechanics program.

AUTMC-227 (P2) PARTS SPECIALIST 3 Credits
(P2) Parts Specialist is designed to prepare students for the ASE (P2) Parts Specialist certification exam. This course is for students wanting to learn/experience the role of an automotive counter person. Students will learn how to order parts from many sources including aftermarket suppliers, original equipment manufacturers, wholesale supply chains, internet retailers, and used component sources. Students will learn inventory management skills and common practices for shipping and receiving goods. Particular attention will be paid to billing, cost of goods and margin calculations, labor rates, and customer communication skills. AUTMC-227 may be substituted for math requirements for students seeking a certificate in Auto Mechanics. AUTMC-227 cannot be substituted for the AAS mathematics requirement. Completion of course with a grade of "C" or higher is required for course credit to be applied for graduation with a certificate in Automotive Technology. AUTMC-227 is for Automotive Technology Majors only. Pre-requisite: AUTMC-100 with a C or higher is required.

AUTMC-250 (A9) LIGHT VEHICLE DIESEL ENGINES 6 Credits
(A9) Light Vehicle Diesel Engines is an ASE Master Automotive Service Technology accredited course. This course is an advanced course building on the theory and concepts of several other prerequisite courses. Study will be focused on today's light duty diesel engines in cars and light trucks. Particular attention will be given to diesel fuel systems, emissions, and diagnostic strategies for diesel engine performance. This course is an extension of theAUTMC-212 course in (A8) Engine Performance with dedicated emphasis on strategies for diagnosing, servicing, and repairing light diesel engine issues. Students will learn of EPA standards and laws governing over the road light diesels. In our live lab students will use diagnostic tools to analyze and diagnose diesel operation, perform services and repairs on light diesel vehicles. Students will use diagnostic equipment previously learned but applied to diesel systems. Students will prepare for the ASE (A9) Light Vehicle Diesel Engines certification exam. Students are required to pass the ASE Entrance Level examination (A9) Light Vehicle Diesel Engines with a C or higher and earn a C or higher for graduation requirements. This course is for Automotive Technology Majors only. Pre-requisites: MTHPT-103 or MTHPT-137, AUTMC-100, AUTMC-102, AUTMC-105 and AUTMC-212 with grades C or higher.

AUTMC-260 (L3) LIGHT DUTY HYBRID / ELECTRIC VEHICLES 6 Credits
This course expands on the concepts covered in (A6) Automotive Electrical / Electronics and (A2) Automatic Transmission / Transaxle courses. This offering prepares students for hybrid and electric vehicle high voltage system service. An in-depth study of safety requirements, procedures, and equipment required when working with high voltage is provided. Students will be introduced to the common designs and structures that hybrid/EV systems employ to operate safely and efficiently. Students will learn how to diagnose, service, and repair high voltage battery packs, on-board charging systems, charge cables, AC and DC circuits, inverters, converters, cooling systems/thermal management, and electric drive motors. An overview of charging and discharging principles for proper maintenance and upkeep of hybrid/EV batteries will be covered. Students will prepare for the ASE (L3) Light Duty Hybrid/Electric Vehicle certification exam. This course is for Automotive Technology Majors only, who have completed AUTMC-100, AUTMC-102, and AUTMC-209 with grades of C or higher. Students must earn a C or higher grade for course to be applied toward graduation.

AUTMC-270 (C1) AUTOMOBILE SERVICE CONSULTANT 6 Credits
AUMTC-270 (C1) course is for students that would like to manage or own an automotive repair facility. Automotive service is a very complex, ever-changing business. The products, technology and needs of customers change regularly. At the same time there are new competitors constantly entering the market with new approaches to cornering the market. This class will start with basic principles and skills necessary to be a service consultant and continue on with foundational principles to owning an automotive repair facility. Students must be Auto Mechanics Major, are required to have earned a C or higher grade in MTHPT 103 or MTHPT 137 and AUTMC-100, have a clean driving record for State insurance requirements. Students must earn a C or higher in this course to meet graduation requirements in the Auto Mechanics program.

AUTMC-290 DIRECTED STUDY IN AUTO MECHANICS TECHNOLOGY 1-6 Credits
Directed Study in Auto Mechanics Technology.

AUTMC-294 INTERNSHIP IN AUTO MECHANICS TECHNOLOGY 6 Credits
AUTMC-294 Internship in Auto Mechanics Technology is a critical component in preparing students for industry. The experience will include on the job experiences under the supervision of your advisor and industry mentor. Students are required to keep a weekly journal/log of their experience, and submit a weekly report. Only open to students enrolled in the Auto Mechanics program, sophomore standing or higher, and have a 2.0 grade point or higher in required Auto Mechanics core course work, and must have instructor's permission. The student will receive a Pass/Fail grade. Course is 1 - 6 credits depending on length of internship, (45 hours per credit).

AUTMC-394 IN: AUTO REPAIR 12 Credits
Individually prescribed instruction and self-study to meet specific training objectives. May be repeated.

CRPTI-110 INTRODUCTION TO COLLISION REPAIR 6 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 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 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 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 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 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 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 1-6 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 1-6 Credits
Individually prescribed instruction and self-study to meet specific training objectives. May be repeated.

CRPTI-210 STRUCTURAL REPAIRS II 6 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 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 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 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 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 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 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 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 1-6 Credits

CRPTI-292 SPECIAL TOPICS IN COLLISION REPAIR 1-6 Credits

CRPTI-294 INTERNSHIP IN COLLISION REPAIR 1-6 Credits
Individually prescribed instruction and self-study to meet specific training objectives. May be repeated.

CRPTI-394 IN: COLLISION REPAIR 1-6 Credits
Individually prescribed instruction and self-study to meet specific training objectives. May be repeated.

DSLTC-101 INTRODUCTION TO DIESEL TECHNOLOGY 2 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 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 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 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 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 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 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 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 1-12 Credits

DSLTC-200 SHOP SKILLS AND CLIMATE CONTROL 6 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 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 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 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 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 1-6 Credits

DSLTC-292 DIRECTED SPECIAL PROJECTS 1-6 Credits

DSLTC-294 INTERNSHIP IN DIESEL TECHNOLOGY 1-6 Credits
Advanced on-the-job training in diesel technology.

DSLTC-390 DIRECTED STUDY IN DIESEL TECHNOLOGY 1-12 Credits
Advanced on-the-job training in diesel technology.

DSLTC-394 INTERNSHIP IN DIESEL TECHNOLOGY 1-6 Credits
Advanced on-the-job training in diesel technology.

DSLTC-490 DIRECTED STUDY IN DIESEL TECHNOLOGY 1-12 Credits
Advanced on-the-job training in diesel technology.

DSLTC-494 Internship in Diesel Technology 12 Credits
Advanced on-the-job training in diesel technology.

ENGTE-105 DRAFTING PRINCIPLES 9 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 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 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 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 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 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 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 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 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 1-10 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 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 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 or ENGTE-106, ENGTE-154, and MTHPT-137.

ENGTE-202 INTRODUCTION TO SURVEY 3 Credits
This course provides students with a basic understanding of survey fundamentals. Students develop skills in the use and maintenance of survey equipment, surveying techniques, historical mapping practices, determinations for precision and accuracy as well as methods for error adjustments. Students use surveying equipment for measuring horizontal and vertical distances, angles, and develop mathematics skills specific to surveying. Pre-requisite: MTHPT-137 or MATH-147 or MATH-170 with a grade of 'C' or higher; ENGTE-154 with a grade of 'C' or better. Co-requisite: ENGTE-201.

ENGTE-203 UNMANNED AERIAL SYSTEMS AND IMAGERY FUNDAMENTALS 3 Credits
Introduction to unmanned aerial systems including unmanned aerial vehicle operation, limitations, best practices, maintenance and care, applicable regulations, aerial imagery fundamentals including settings, best practices, and photography basics.

ENGTE-204 CIVIL TECHNOLOGY 9 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 4 Credits
The student will be prepared to perform basic civil design functions, such as surface and contour creation, grading and drainage plans, alignment layout, plan and profiles, 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-201, MTHPT-137 or equivalent.

ENGTE-206 RESIDENTIAL ARCHITECTURAL DRAFTING 4 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-106 and ENGTE-154.

ENGTE-207 STRUCTURAL DRAFTING 4 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 or ENGTE-106 and ENGTE-154.

ENGTE-208 ARCHITECTURAL AND STRUCTURAL DRAFTING 9 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 ADVANCED SURVEYING 4 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 modern surveying instruments are covered in lecture and practiced in lab. Course covers fundamental surveying concepts and application practice using GPS and total stations, closure, error and accuracy computations, property, construction, and topographic surveys, highway curves and volume computations. Pre-requisite: ENGTE-202 or ENGTE-204 with grade of 'C' or better.

ENGTE-211 UNMANNED AERIAL SYSTEM SURVEYING 2 Credits
Survey applications with unmanned aerial systems specific to surveying including unmanned aerial vehicle operations, care and maintenance, licensing requirements, fundamental operations, flight requirements, photogrammetry, image processing using GIS, and CAD mapping. Pre-requisite MATH-137 or equivalent, ENGTE-154, ENGTE-171 all with a 'C' or higher.

ENGTE-221 GLOBAL POSITIONING CONCEPTS AND APPLICATIONS 3 Credits
Course covers GPS concepts including GPS signals, biases and solutions, framework, receivers, geodetic datums, coordinate systems and heights, and real-time GPS for land surveys. Pre-requisite: MATH-137 or MATH-170 with a grade of 'C' or better.

ENGTE-225 3-D CAD MODELING II 4 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 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 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 Credits
Covers basic engineering principles necessary for a draftsperson 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 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 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 Credits
This course is designed to develop a basic understanding of manufacturing and construction aspects including history, types, materials and materials production, management, quality, and safety.

ENGTE-261 3-D ASSEMBLIES & AUTOMATION 3 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-272 ADVANCED GIS AND APPLICATIONS 3 Credits
This course is designed to develop advanced GIS skills (spatial, suitability, surface, and point pattern analysis), web mapping, data collection, app development, and advanced cartography. Pre-requisite: GIS-271 with a grade of 'C' or better.

ENGTE-273 REMOTE SENSING AND APPLICATIONS 3 Credits
Course covers remote sensing physics, geodesy, photogrammetry, logistics for accessing imagery, preparing and rendering imagery, understanding variation and change through image analysis. Types of remotely sensed data include multispectral, digital elevation models, thermal, and Lidar. Pre-requisite GIS-271 with a 'C' or better.

ENGTE-290 DIRECTED STUDY IN ENGINEERING TECHNOLOGY 1-10 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 1-10 Credits
Offers opportunity to learn advanced skills for students who are progressing at faster than normal pace.

ENGTE-294 INTERNSHIP IN ENGINEERING TECHNOLOGY 1-10 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 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 Credits

ENGTE-310 SURVEYING LAW AND BOUNDARY DESCRIPTIONS 3 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 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 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 Credits
This course was designed to give the student a basic understanding of survey reseach and evidence. Student will become familiar with places to research, whre 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 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 Credits
This coursedeals 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 1-5 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 1-12 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 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 Credits
Lecture and field trips to construction projects. Estimating, contracts, contract administration, construction materials, and equipment management and productions covered.

ENGTE-411 GEODESY 3 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 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 1-12 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 1-5 Credits

ENGTE-494 IN:ENGINEERING TECHNOLOGY 1-12 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 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 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-103 POWER TRAINS LECTURE AND LAB 6 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 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-115 CHASSIS, SUSPENSION, AND BRAKES LEC/LAB 6 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 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 1-12 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.

HVAC-100 HVAC THEORY IA 3 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 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 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 Credits
This class is a continuation from HVAC-102 Theory IIA. Pre-requisite: HVAC-102.

HVAC-104 HVAC YEAR I 10 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 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 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 Credits
This class is a continuation from HVAC-200 Theory IIIA. Pre-requisite: HVAC-200.

HVAC-202 HVAC THEORY IVA 3 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 Credits
This class is a continuation from HVAC 202 Theory IVA. pre-requisite: HVAC-202.

HVAC-204 HVAC YEAR III 10 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 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 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 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 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 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 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 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 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 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 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 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 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 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 1-8 Credits
Directed Study in Heating, Venting, Air Conditioning and Refrigeration.

HVACR-294 INTERNSHIP 2-8 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 Credits
Directed Study in Heating, Venting, Air Conditioning and Refrigeration.

HVACR-394 IN:HEAT/VENT/AC/REF TECH 1-12 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 DC CIRCUIT THEORY 4 Credits
This course teaches the theory of DC and basic digital logic circuits with an emphasis on physical conservation laws as unifying principles, including series-parallel network analysis, network theorems, electromagnetism, discrete semiconductor devices and switching circuits, basic digital electronics through combinational logic, and basic programmable logic controllers (PLCs). Students will also learn how to write SPICE netlists to simulate simple circuits. Mastery-style written exams guarantee attainment of conceptual learning outcomes, while oral presentations and Socratic dialogue demonstrate communicative learning outcomes. Pre-requisite/Co-requisite: MTHPT-137 or higher.

IETTI-102 DC CIRCUIT PROJECTS 4 Credits
This course reinforces the content of IETTI-101 (DC Circuit Theory) through multiple student-designed projects, each project's scope and functional criteria defined by the instructor with input from the student. This course also prepares the student for entry into the profession through r\'esum\'e and cover letter writing as well as job research. All students must present their job research findings at the Technical Advisory Committee (TAC) meeting held with industry advisors. Pre-requisite/Co-requisite: MTHPT-137 or higher.

IETTI-103 DC CIRCUIT EXPERIMENTS 4 Credits
This course reinforces the content of IETTI-101 (DC Circuit Theory) through student-designed experiments. All experiments employ scientific method: proposing falsifiable hypotheses, devising procedures, gathering data, analyzing results, and developing documentation. Students also apply foundational circuit principles to the diagnosis of simulated and real faults in these same types of circuits. Mastery standards applied to all experimental and diagnostic activities guarantee attainment of learning outcomes. Pre-requisite/Co-requisite: MTHPT-137 or higher.

IETTI-104 AC CIRCUIT THEORY 4 Credits
This course teaches the theory of AC and state-based digital logic circuits with an emphasis on physical conservation laws and other foundational concepts as unifying principles, including AC measurements, series-parallel reactive networks, transformers, harmonics, polyphase AC power systems, power conversion circuits, latch-based digital logic circuits, and programmable logic controller (PLC) counting and timing functions. Mastery-style written exams guarantee attainment of conceptual learning outcomes, while oral presentations and Socratic dialogue demonstrate communicative learning outcomes. Pre-requisite: MTHPT-137 or higher.

IETTI-105 AC CIRCUIT PROJECTS 4 Credits
This course reinforces the content of IETTI-104 (AC Circuit Theory) through multiple student-designed projects, each project's scope and functional criteria defined by the instructor with input from the student. This course also prepares the student for entry into the profession through resume and cover letter writing as well as job research. All students must present their job research findings at the Technical Advisory Committee (TAC) meeting held with industry advisors. Additionally, students take a comprehensive exam covering all theory course topics to date. Pre-requisite: MTHPT-137 or higher.

IETTI-108 INTRODUCTION TO PLC'S 4 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 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 EXPERIMENTS 4 Credits
This course reinforces the content of IETTI-104 (AC Circuit Theory) through student-designed experiments. All experiments employ scientific method: proposing falsifiable hypotheses, devising procedures, gathering data, analyzing results, and developing documentation. Students also apply foundational circuit principles to the diagnosis of simulated and real faults in these same types of circuits. Mastery standards applied to all experimental and diagnostic activities guarantee attainment of learning outcomes. Pre-requisite: MTHPT-137 or higher.

IETTI-190 DIRECTED STUDY IN INDUSTRIAL ELECTRONICS TECHNOLOGY 1-12 Credits
Required study in area agreed upon by the student and the instructor. Might include specialized devices, new products, or advanced troubleshooting.

IETTI-194 INTERNSHIP IN INDUSTRIAL ELECTRONICS 12 Credits
The course consists solely of on-the-job work experience obtained by the student through employment at a company doing work relevant to the field of Industrial Electronics.

IETTI-201 INTRO TO INSTRUMENTATION 4 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 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 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 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 stared 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 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 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 Intermediate Electronics Projects 4 Credits
This course reinforces the content of IETTI-222 (Intermediate Electronics Theory) through multiple student-designed projects, each project's scope and functional criteria 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. This course also prepares the student for entry into the profession through resume and cover letter writing as well as job research. All students must present their job research findings at the Technical Advisory Committee (TAC) meeting held with industry advisors. Additionally, students take a comprehensive exam covering all theory course topics to date. Pre-requisite: MTHPT-137 or higher.

IETTI-221 Intermediate Electronics Experiments 4 Credits
This course reinforces the content of IETTI-222 (Intermediate Electronics Theory) by way of experimental system design and construction, starting with only a block diagram and a general description of the system's intended function. Students then engineer all details of the system, building and testing it in stages. Students also apply foundational circuit principles to the diagnosis of simulated and real faults in these same types of circuits. Mastery standards applied to all experimental and diagnostic activities guarantee attainment of learning outcomes. Pre-requisite: MTHPT-137 or higher.

IETTI-222 Intermediate Electronics Theory 4 Credits
This course reviews DC and AC circuit theory while introducing principles of C-language computer programming, then builds on that foundation to explore analog amplifier circuits (both discrete-transistor and operational amplifier), principles of RF and radio systems, operational amplifier circuits, AC motor controls, and protective relaying. Mastery-style written exams guarantee attainment of conceptual learning outcomes, while oral presentations and Socratic dialogue demonstrate communicative learning outcomes. Pre-requisite: MTHPT-137 or higher.

IETTI-223 ADVANCED ELECTRONICS THEORY 4 Credits
This course introduces microprocessor systems -- including computer programming in both assembly language and C -- and also explores serial data communication, advanced RF topics (e.g. modulation, mixers, Smith charts, VNAs), industrial signal conditioning, and industrial control systems. Mastery-style written exams guarantee attainment of conceptual learning outcomes, while oral presentations and Socratic dialogue demonstrate communicative learning outcomes. Pre-requisite: MTHPT-137 or higher.

IETTI-224 ADVANCED ELECTRONICS III 4 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 ADVANCED ELECTRONICS EXPERIMENTS 4 Credits
This course reinforces the content of IETTI-223 (Advanced Electronics Theory) by way of experimental system design and construction, starting with only a block diagram and a general description of the system's intended function. Students then engineer all details of the system, building and testing it in stages. Students also apply foundational circuit principles to the diagnosis of simulated and real faults in these same types of circuits. Mastery standards applied to all experimental and diagnostic activities guarantee attainment of learning outcomes. Pre-requisite: MTHPT-137 or higher.

IETTI-226 ELECTRONICS CIRCUIT TROUBLESHOOTING 3 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-236 ADVANCED ELECTRONICS PROJECTS 4 Credits
This course reinforces the content of IETTI-223 (Advanced Electronics Theory) through multiple student-designed projects, each project's scope and functional criteria 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. This course also prepares the student for entry into the profession through resume and cover letter writing as well as job research. All students must present their job research findings at the Technical Advisory Committee (TAC) meeting held with industry advisors. Additionally, students take a comprehensive exam covering all theory course topics to date. Pre-requisite: MTHPT-137 or higher.

IETTI-270 INDUSTRIAL MEASUREMENT THEORY 4 Credits
This course teaches the theory of physical process measurement used in modern industries including fluid pressure, liquid level, temperature, fluid flow, and chemical (analytical) sensing technologies. Mastery-style written exams guarantee all learning outcomes. Pre-requisite: MTHPT-137 or higher.

IETTI-271 INDUSTRIAL MEASUREMENT EXPERIMENTS 4 Credits
This course reinforces the content of IETTI-270 (Measurement Theory) through student-constructed process measurement systems. Students also apply foundational principles to the diagnosis of real faults in these same systems. Mastery standards applied to all experimental and diagnostic activities guarantee attainment of learning outcomes. Pre-requisite: MTHPT-137 or higher.

IETTI-272 INDUSTRIAL MEASUREMENT PROJECTS 4 Credits
This course reinforces the content of IETTI-270 (Measurement Theory) through the maintenance of operational measurement systems. Mastery standards applied to all activities guarantee attainment of learning outcomes. Pre-requisite: MTHPT-137 or higher.

IETTI-280 INDUSTRIAL CONTROL THEORY 4 Credits
This course teaches the theory of physical process control used in modern industries including PID closed loop control, variable-speed motor control, and discrete (on/off) control strategies. Mastery-style written exams guarantee all learning outcomes. Pre-requisite: MTHPT-137 or higher.

IETTI-281 INDUSTRIAL CONTROL EXPERIMENTS 4 Credits
This course reinforces the content of IETTI-280 (Control Theory) through student-constructed process control systems. Students also apply foundational principles to the diagnosis of real faults in these same systems. Mastery standards applied to all experimental and diagnostic activities guarantee attainment of learning outcomes. Pre-requisite: MTHPT-137 or higher.

IETTI-282 INDUSTRIAL CONTROL PROJECTS 4 Credits
This course reinforces the content of IETTI-280 (Control Theory) through the maintenance of operational control systems. Mastery standards applied to all activities guarantee attainment of learning outcomes. Pre-requisite: MTHPT-137 or higher.

IETTI-290 DIRECTED STUDY IN INDUSTRIAL ELECTRONICS TECHNOLOGY 1-10 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 4 Credits

IETTI-294 INTERNSHIP IN INDUSTRIAL ELECTRONICS 1-12 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 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 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 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 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 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 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 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 WLDTC-150.

IMMTI-155 BASIC WELDING PROCESSES LAB 7 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 WLDTC-155.

IMMTI-165 ADVANCED WELDING PROCESSES 7 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 WLDTC-165.

IMMTI-194 IN:INDUSTRIAL MAINTENANCE/MILLWRIGHT 2-8 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 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 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 WLDTC-251.

IMMTI-261 BENCHWORK FOR WELDERS 2 Credits
Familiarizes student with basic hand and machine tools, measuring devices, and shop and tool safety. Cross-listed with WLDTC-261.

IMMTI-262 DISTORTION CONTROL 2 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 WLDTC-262.

IMMTI-270 DIRECTED WELDING PROJECTS 1-8 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 WLDTC-270.

IMMTI-294 INTERNSHIP 2-8 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 1-12 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.

WLDTC-115 BASIC WELDING PROCEDURES 7 Credits
This class designed to introduce the beginning student to the welding industry with emphasis on safe working procedures and basic skills development. Students will receive instruction in SMAW (Shielded Metal Arc Welding, commonly called "stick welding"), as well as MIG (Metal Inert Gas, commonly called "wire-feed" welding). Students will also receive instruction in Oxygen/ Acetylene cutting of ferrous metals.

WLDTC-116 ADVANCED WELDING PROCEDURES 7 Credits
This class provides instruction and exercises to build students' skills in MIG welding. Students will receive instruction in MIG welding (Metal Inert Gas, commonly called "wire-feed welding") in all positions.

WLDTC-120 INTRODUCTION TO WELDING 1-3 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.

WLDTC-150 WELDING POWER SOURCES 2 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.

WLDTC-151 WELDING CODES FOR CERTIFICATIONS 1-2 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.

WLDTC-152 QUALITY CONTROL FOR WELDING INSPECTION 1-2 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.

WLDTC-153 BASIC ACETYLENE WELDING LAB 4 Credits
Shop practice in basic oxygen acetylene welding.

WLDTC-155 BASIC WELDING PROCESSES LAB 7 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.

WLDTC-155A SMAW PRACTICAL 4 Credits
SMA welding to include fillet and groove welds in all positions to the AWS standards. Successfully completing this course may lead to certification.

WLDTC-155B BASIC OXYACETYLENE AND GMAW 3 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 WLDTC-155A SMAW Practical. Pre-requisite: WLDTC-155A.

WLDTC-156 BASIC SMAW LAB 4-8 Credits
Weld with the SMAW process in all positions on mild steel using AC and DC equipment.

WLDTC-157 BASIC GMAW LAB 4-8 Credits
Weld with the GMAW and FCAW processes in all positions, single and multi pass.

WLDTC-158 ADVANCED SMAW LAB 4-8 Credits
Weld with the SMAW process in all positions using DC welding equipment. Obtain certifiable skills on a plate of unlimited thickness.

WLDTC-159 BASIC GTAW LAB 4-8 Credits
Weld with the GTAW process on thin gauge mild steel, stainless steel, and aluminum using both DC and AC equipment.

WLDTC-160 MATHEMATICS I 1-2 Credits
Working knowledge of basic mathematics as applied in the welding industry.

WLDTC-161 WELDING PROCESSES AND APPLICATIONS 1-2 Credits
Explores various welding and cutting processes commonly used in industry and provides students with a basic understanding of the principles involved.

WLDTC-162 METALLURGY 1-2 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.

WLDTC-165 ADVANCED WELDING PROCESSES 7 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 IMMTI-165.

WLDTC-190 DS:WELDING TECHNOLOGY 1-8 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.

WLDTC-192 SPECIAL TOPICS IN WELDING TECHNOLOGY 1-12 Credits

WLDTC-250 DRAFTING AND PIPEFITTING 1-2 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.

WLDTC-251 BLUEPRINT READING 2 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.

WLDTC-252 HEAT TREATMENT 1-2 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 1-7 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 4-8 Credits
Weld pipe in all positions using SMAW process and uphill technique to conform to ASME Section IX.

WLDTC-257 SMAW DOWNHILL PIPE LAB 4-8 Credits
Weld pipe in all positions using SMAW process and downhill technique to conform to API standard 1104.

WLDTC-258 BASIC ALUMINUM WELDING LAB 4-8 Credits
Weld aluminum using GTAW and GMAW processes in all positions.

WLDTC-260 MATHEMATICS II 1-2 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 BENCHWORK FOR WELDERS 2 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 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 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 1-7 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 Credits
Shop practice in project welding from drawings using all methods and materials.

WLDTC-270 DIRECTED WELDING PROJECTS 1-8 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 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 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 1-8 Credits

WLDTC-292 DIRECTED SPECIAL PROJECTS 1-8 Credits

WLDTC-294 INTERNSHIP IN WELDING TECHNOLOGY 1-8 Credits
Advanced on-the-job training in welding.

WLDTC-366 PROJECT WELDING FORM DRAWING LAB 4 Credits
Shop practice in project welding from drawings using all methods and materials.

WLDTC-370 DIRECTED WELDING PROJECTS 1-8 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 1-8 Credits

WLDTC-394 INTERNSHIP IN WELDING TECHNOLOGY 1-8 Credits
Advanced on-the-job training is welding.

WLDTC-494 INTERNSHIP IN WELDING TECHNOLOGY 12 Credits
Advanced on-the-job training is welding.