SKILLED TRADES

Associate Degrees

Associate in Applied Science Degrees

Skilled Trades, Associate in Applied Science (https://catalog.dccc.edu/academic-programs/programs-study/skilled-trades-aas/)

The Skilled Trades Program is designed to serve individuals who have a background or interest in pursuing a skilled trade such as automotive, electrical, plumbing, heating, ventilation and air conditioning, carpentry and welding and who desire to advance their career, through continued education, into a supervisory or management role. The program provides for up to 30 credits to be awarded toward the Associate in Applied Science Degree for a trade or technical certificate completed at the college and may include equivalent work or training experiences assessed as Credit for Prior Learning. The curriculum includes general education courses that will strengthen communication, problem solving and critical thinking skills essential to career advancement.

Certificates

Certificates are short-term educational programs focused on specific work force skills and/or preparation for continued academic study. Delaware County Community College offers a Certificate of Competency (https://catalog.dccc.edu/academic-information/degree-certificate-requirements/#CertComp) and a Certificate of Proficiency (https://catalog.dccc.edu/academic-information/degree-certificate-requirements/#CertProf).

Automotive Technology I, Certificate (AUT) (https://catalog.dccc.edu/academic-programs/programs-study/automotive-technology-i-certificate/)

This certificate is designed to prepare the student for entry level positions in the occupational specialty of automotive technician. The Certificate of Competency in Automotive Technology I will be awarded upon successful completion of the minimum competencies as out-lined below. Program completers will be prepared to seek positions as entry-level automotive service technicians and automotive mechanics.

Automotive Technology II, Certificate (AUTC) (https://catalog.dccc.edu/academic-programs/programs-study/automotive-technology-ii-certificate/)

This certificate is designed to prepare the student for above entry-level positions in the automotive service industry. The Certificate of Competency in Automotive Technology II will be awarded upon successful completion of the competencies outlined.

Building and Facilities Management, Certificate of Proficiency (BFMC) (https://catalog.dccc.edu/academic-programs/programs-study/building-facilities-maintenance-certificate/)

The Building and Facilities Maintenance certificate program is designed to prepare the student for entry-level positions in the field of Building Maintenance Managers and Maintenance Technicians. Building and Facilities Maintenance professionals ensure that continuous care in both preventative and general maintenance is scheduled and executed properly and in accordance with the local or state guidelines. Technicians are required to have a diverse skill set including knowledge in areas of carpentry, electrical, plumbing, and general facilities.

Carpentry (Residential), Certificate of Proficiency (CPTP) (https://catalog.dccc.edu/academic-programs/programs-study/carpentry-residential-certificate-proficiency/)

This certificate is designed to prepare the student for entry-level positions in the occupational specialty of residential carpentry. Students are offered learning experiences in the basics of blueprint reading, design concepts as well as the building, installing and repairing residential structures.

Electro-Mechanical Technologies, Certificate of Competency (ELTC) (https://catalog.dccc.edu/academic-programs/programs-study/electro-mechanical-technologies-certificate-competency/)

This hands-on training program is designed to prepare individuals to become residential electricians who can work in new home construction as well as do maintenance and repairs in existing homes. Students learn safe, proper and efficient installation, troubleshooting and servicing of electricity and its associated equipment and wiring. The curriculum has been approved by the U.S. Department of Labor, Bureau of Apprenticeship and Training, for the 144 hours of classroom training required in an electrical apprenticeship program.

Heating, Ventilation, Air Conditioning, Refrigeration, Certificate (HVCR) (https://catalog.dccc.edu/academic-programs/programs-study/heating-ventilation-air-conditioning-refrigeration-certificate/)

Offered as a Certificate of Proficiency beginning Spring 2025

The Heating, Ventilation, Air Conditioning and Refrigeration (HVAC&R) occupations program prepares graduates for employment with HVAC&R installation and service contractors and/or facilities maintenance positions. Students completing the program also receive EPA Refrigerant Certification. Having achieved the competencies of this program, students are prepared for full-time employment at an entry-level position or, if already in the fields, to advance in their organization.

Plumbing Apprenticeship, Certificate (PLB) (https://catalog.dccc.edu/academic-programs/programs-study/plumbing-apprenticeship-certificate/)

The Plumbing Apprenticeship program is a four-year curriculum that provides essential skills needed in today's plumbing occupations. The coursework covers a diverse range of skills and knowledge and helps develop maturity and independence of judgment. This apprenticeship training provides practical and theoretical aspects of the work required in this highly skilled occupation. This program is designed to be completed on a part-time basis only.

Plumbing Technology, Certificate of Competency (PLBC) (https://catalog.dccc.edu/academic-programs/programs-study/plumbing-technology-certificate-competency/)

The Plumbing Technology Certificate Program prepares graduates to enter the plumbing field and construction industry. Students develop skills in all types of plumbing installation and repair work used in residential, institutional and commercial applications. Graduates also

gain required industry knowledge and experience prior to entering a professional apprenticeship program.

Residential Electrical, Certificate of Competency (ELT) (https://catalog.dccc.edu/academic-programs/programs-study/residential-electrical-certificate-competency/)

This hands-on training program is designed to prepare individuals to become residential electricians who can work in new home construction as well as do maintenance and repairs in existing homes. Students learn safe, proper and efficient installation, troubleshooting and servicing of electricity and its associated equipment and wiring. The curriculum has been approved by the U.S. Department of Labor, Bureau of Apprenticeship and Training, for the 144 hours of classroom training required in an electrical apprenticeship program.

Welding Technology (WLD) (https://catalog.dccc.edu/academic-programs/programs-study/welding-technology-certificate-competency/)

The Welding Technology Certificate provides training in the field of industrial welding. This Certificate offers practical training and relevant theory in Shielded Metal Arc Welding, Gas Tungsten Arc Welding, Gas Metal Arc Welding, Flux cored Arc Welding, Oxy-fuel Welding and Cutting, Plasma Cutting, as well Welding Inspection.

Courses

View full A-Z Course List

AUT - Automotive

AUT 100 Introduction to Automotive Service Operation and Shop Practices

This introductory course is designed to provide the student with knowledge and skill in automotive service operations and shop practices. The student will interact with various automotive service organizations, dealerships, and independent service and repair contractors. Proper handling, parts departments, job classifications, training for a career in the automotive service and repair industry, and other automotive business related topics will be addressed. This course presents instruction in automotive terminology, use of service manuals, diagnostic equipment, use of shop tools, hand tools, and power tools in relation to shop practices and safety. Accident prevention practices, first aid tools and equipment, and personal environmental safety practices and procedures will be stressed throughout the course. In addition, an overview of the automotive engines system, its major components, delivery units, preventive maintenance, and basic mathematics will be covered.

Upon successful completion of this course, students should be able to:
Demonstrate personal and environmental safety practices.
Apply basic first aid procedures.
Identify tool and equipment nomenclature.
Apply and utilize tool safety regulations.
Explain Occupational Safety and Health Act (OSHA).
Utilize service manuals/electronic media.
Identify all data informational systems.
Perform basic mathematical calculations.
Identify the major components of the automobile.
Perform calculations using the metric system.

2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

AUT 101 Automotive Electricity and Electronics

This course is designed to prepare the student to work in the field of electricity and electronics as it relates to the modern day automobile. The course covers concepts in basic electricity, electrical terms, electrical circuits, and electronic systems protection. The student will be introduced to various types of batteries such as deep cycle batteries and hybrid batteries, their design, maintenance, size, selection, factors affecting the battery's life, safety procedures, testing, charging, and jump-starting. Emphasis will be placed on the ignition system, its design, components, control circuits, testing, disassembly and assembly. The course is also designed to provide the student with a basic understanding of present and future developments in sophisticated automotive electronics. In addition, indicator systems, pollution control systems and other modern automotive accessory systems will be addressed.

Upon successful completion of this course, students should be able to:
Perform electronic pollution controls testing, service and repair requirements.
Identify basic electronic circuits used in the modern automobile.
Identify system defects and troubleshooting procedures.
Utilize various techniques to adjust electronic ignition systems.
Recognize electronic braking systems.
Test, service, and repair various systems according to requirements.
Identify indicators and gauges.
Repair power operated cruise control.
Install warning, security, and sound systems.
Identify electronic controlled trip computers, and digital indicator systems.
Troubleshoot warning and warning indicators.

4 Credits 2 Weekly Lecture Hours
4 Weekly Lab Hours

AUT 102 Automotive Engines
This course is designed to provide the student with the fundamental theory, construction, inspection, measurement, performance, and identification of the automobile's engine. Integrating theory and practical application in the lab is stressed throughout the course. The course covers topics such as preparing the engine for removal, lifting, disassembly, assembly, and inspection, as well as identifying, diagnosing, and evaluating engine parts. The student will gain skill in analyzing defects and the proper process to administer specific maintenance requirements. In addition, the student will be exposed to concepts in cylinder block reconditioning, crankshaft inspection and measurements, piston rings inspection, renewal, and installation.
Upon successful completion of this course, students should be able to:
Prepare engines for removal.
Disassemble, inspect, and clean engine parts.
Install bearing, pistons, piston rings, and crankshaft.
Assemble the cylinder head.
Remove the camshaft.
Install timing components, gears chain, and belts.
Inspect and service oil pumps.
Inspect aluminum cylinder heads; combustion chamber, and intake exhaust valves.
Follow valves reconditioning guide for valve seats, and valve stem seals.
Adjust hydraulic and manual valve clearance.
Lubricate and test cooling system.
Inspect air induction system and exhaust system components.
Service turbochargers and superchargers.
Utilize torque wrench and its components.
Thread and repair gaskets and their sealing properties.
Use adhesives, sealant and other sealing materials.
Reassemble engine and install engine in the vehicle.
Perform crankshaft inspection measurements.
4 Credits 2 Weekly Lecture Hours
4 Weekly Lab Hours

AUT 103 Brake Systems
This course is designed to introduce students to the principles of hydraulic brake systems and their components. The course will emphasize how to analyze and repair domestic and foreign brake systems to include shoe, disc, hydraulic, vacuum and air brake systems. Instruction will include principles of hydraulic brake systems, its components, hydraulic system safety switches and valves, master cylinder operation, as well as inspection, machining, fitting, and adjustments of brake systems. Measurements required for brakes, rotors, brake lining, and brake-bleeding procedures will be addressed. Mathematical calculation requirements and the use of digital readout units will be covered. In addition, diagnostic testing of disc brake components and functions, two and four wheel equipped disc brakes, general caliper inspection and service, rotor inspection and service, various antilock brake systems, ABS components and systems, automatic traction control and stability will be thoroughly presented.
Upon successful completion of this course, students should be able to:
Identify hydraulic brake systems.
Repair brake components and systems.
Perform inspection, measurement and machining procedures.
Diagnose, service and repair antilock brake systems and automated traction control.
Service and repair four-wheel disc brake systems.
Identify principles of hydraulic brake systems and components.
Identify drum and disc brake assemblies.
Diagnose and service brake drum and rotor components.
Perform rotor inspection service and measurements.
Diagnose and repair antilock brake systems for two wheel and four-wheel units.
4 Credits 2 Weekly Lecture Hours
4 Weekly Lab Hours

AUT 114 Steering and Suspension
This course is designed as an introduction to tire descriptions, wheels, tire repairs, measurements, wheel run out, tires and wheels service, and wheel bearings. The course provides the student with methods of analyzing defects and the necessary preventive or corrective maintenance requirements. Tire wear patterns and remedies will be thoroughly covered. Emphasis will be placed on McPherson Strut Systems, independent suspension systems, general front suspension inspection, and repairs. Topics such as electronically controlled suspension, manual steering systems, power steering systems, electrically controlled power steering systems, and steering system diagnosis will be covered. Visual inspection, four-wheel steering systems, alignment geometry, pre-alignment inspection, wheel alignment equipment, and alignment machines will also be presented.
Upon successful completion of this course, students should be able to:
Identify tire descriptions and usage.
Perform service on tires and wheels, wheel bearings, front and rear from tapered to roller.
Identify tire wear patterns and remedies.
Repair frames, suspension system components, and McPherson Strut Systems.
Inspect and service front suspension components.
Repair rear, independent, semi-independent, and live-axle rear suspension systems.
Perform two- and four-wheel alignment procedures.
Utilize alignment machines.
4 Credits 2 Weekly Lecture Hours
4 Weekly Lab Hours

AUT 115 Fuel I and II
This course introduces the student to gasoline and diesel fuels with emphasis on fuel performance, delivery systems, pumps, and fuel lines in major domestic and foreign automotive fuel systems. The course includes carburetor design, basic carburetor circuits, and various types of carburetors. It also covers fuel injection systems, fuel lines, and fuel pumps, detailed inspection processes, and fuel tanks. The course also includes a complete diagnostic troubleshooting process, and an overall factory adjustment procedure of all major carburetor and fuel injection systems.
Upon successful completion of this course, students should be able to:
Demonstrate safety in handling fuels.
Evaluate uses of alternative fuels.
Identify fuel delivery systems for gasoline and diesel engines.
Determine alcohol and/or water levels in fuel tests.
Identify fuel systems pressure, relief, and fuel filters.
Identify the sources of technical data for automotive fuel systems.
Discuss diesel fuel injection systems for passenger cars.
Operate and service hydraulic and mechanically controlled fuel injection systems.
Explain the operation/service of electronically controlled fuel injection systems.
Determine methods to analyze defects.
Identify the fuel injection systems defects.
Diagnose carburetor circuits and electronic control.
Service carburetors and their related components.
Evaluate basic carburetor designs, basic carburetor circuits, types of carburetors, updraft, side draft, and downdraft.
Identify manifold vacuum, ported vacuum, venturi vacuum and their relationship to fuel injection systems.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

AUT 121 Engine Performance
This course is designed to provide the student with theory, design, construction, inspection, and service of the automotive engine. The purpose of the course is to review engine operation and performance, the creation of vacuum during engine operation, comparison of engine vacuum to low voltages use with vehicle engine management computer. Concepts such as computer programming, diagnosing, and troubleshooting internal circuit boards will be presented. The purpose and operation of critical sensors in fuel economy, emission control and electronic spark timing will also be presented. Catalytic converters, their purpose in controlling exhaust gas emission and the use of two or more O2 sensors will also be covered. Case studies of the vehicle engine, spark and fuel malfunctions, the use of scan tools, AC and DC test instruments, and dynamometer operation to simulate on-road conditions will be explored. Moreover, the use of OBD (On-Board Diagnostics) to determine malfunctions within the overall engine fuel and electronic management parameters will also be reviewed. Hands on skills to determine malfunctions in the operation of the modern vehicle in real life scenarios will be practiced.
Upon successful completion of this course, students should be able to:
Identify engine operation and performance, vacuums, and electronic devices.
Perform computer programming.
Process malfunction retrieval of diagnostic trouble codes.
Test sensors and activators performance.
Define the relationship of fuel management to electronic engine control.
Utilize scan tools.
Repair emission control and electronic spark timing.
Utilize exhaust dynamometer operation to simulate on-road conditions.
Recognize internal circuits malfunctions.
Identify results using two or more O2 sensors.
Define operation of exhaust analyzers and dynamometers.
Solve case studies describing malfunctions of engine parts.
Apply AC and DC test instruments.
Define OBD.
Determine malfunctions within the overall engine fuel and electronic management parameters.
3 Credits 1 Weekly Lecture Hour
4 Weekly Lab Hours

AUT 123 Power Train Controls
This course is designed to expose the student to the design, service, and diagnosis of automotive computer power train controls in automotive transmissions. Shifting, transfer case shifting, four- wheel drive and all-wheel drive shifting as well as shift feel diagnostics, and linkage adjustments will be covered. Emphasis will be placed on diagnostic and troubleshooting malfunctions and diagnostic and troubleshooting electronically controlled transmission/transaxles. Hands-on experience will be gained by utilizing electronic meters to retrieve malfunction trouble codes from the vehicle's computer. Factory/aftermarket scanner tools will be utilized to determine or retrieve malfunctions trouble codes within the transmission/transaxle units.
Upon successful completion of this course, students should be able to:
Prepare a list of electronically controlled unit cases.
Diagnose and troubleshoot electronically controlled units.
Demonstrate electronically controlled 4-wheel drive and all-wheel drive units.
Service electronically controlled transfer case units.
Troubleshoot the unit's malfunctions.
Utilize factory/aftermarket scanner tools to retrieve malfunction trouble codes.
Disassemble, repair and replace electronic sensors.
Locate oil pressure controlled switches.
Reassemble electronic sensors and test for proper operation.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

AUT 150 Air Conditioning
This course is designed to provide the student with theory and skill in the design, operation, diagnostic, repair, and service procedures of the automotive heating and air conditioning combinations, individual controls, and refrigerants used in air conditioning systems. Manual and automatic operations of systems, basic and advanced control systems, and computer controlled air conditioning systems will be discussed. In addition, temperature controls systems, refrigerant control systems, proper maintenance procedures, and recommendations will also be addressed. Topics such as electrical, electronic diagnosis, troubleshooting, retrofitting R-12 systems to R-134A, and utilizing proper antifreeze protection will also be covered.
Upon successful completion of this course, students should be able to:
Demonstrate safety and caution with refrigerants.
Obtain EPA (Environmental Protection Agency) certification.
Handle approved refrigerants.
Diagnose heating and air conditioning system failures.
Diagnose and repair electric and electronic systems.
Discharge, evacuate, and repair various systems.
Repair and change various systems.
Drain, flush and refill cooling systems.
Operate combustion and individual controls.
Identify refrigerants to be used in A/C systems.
Apply basic and advanced control systems.
Recommend maintenance procedures.
Operate manual and automatic systems.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

AUT 151 Ignition Systems
This course is designed to provide the student with a foundation in theory and skill in the field of ignition systems. Basic, primary and secondary circuits, ignition timing, spark timing systems, and the components and operation of the ignition system will be discussed. Visual inspection of components, wiring, and no-start diagnosis and general ignition system testing as well as the scope and effects of incorrect ignition timing will be included. Theory and practical application in the laboratory will be stressed.
Upon successful completion of this course, students should be able to:
Define the purpose of the ignition system.
Demonstrate safety, caution and proper use of tools.
Install high voltage secondary wiring.
Diagnose and troubleshoot primary and secondary ignition systems.
Troubleshoot distributor equipped and direct sparks ignition systems.
Diagnose primary and secondary distributor service ignition control systems.

Diagnose and repair no start problems.
Adjust ignition timing on engines.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

AUT 152 Computer and Emissions Systems
This course is designed to provide the student with theory and skill in the design, repair, service, and testing procedures of emission systems, and as well as drivability problems. Electronic service precautions, computer outputs, primary sensors, monitoring capabilities, OBD (On-Board Diagnostics) systems and terms will be covered thoroughly. The use of various types of computers in diagnostic systems, such as retrieving trouble codes, diagnosing computer voltage supply, and ground wires will be presented. The student will also be prepared to test input sensors, actuator sensors, and variable resistor type sensors, generate sensors, and test various computer circuits in the modern day automobile. The legislative history of emission controls, pollutants, evaporative emission control systems, PVC emission control system, exhaust emission control system, EGR (Exhaust, Gas, and Recirculation) systems, catalytic converter systems, troubleshooting and diagnosing emission systems, and engine management by computer systems will be thoroughly covered.
Upon successful completion of this course, students should be able to:
Explain computer operation, circuits, and design.
Define OBD (On-Board Diagnostics) terms.
Utilize testing tools to retrieve malfunction codes from the computer.
Identify the importance of emission controls and emission control procedures.
Interpret electronic service precautions.
Perform basic diagnosis.
Explain computer outputs and actuators.
Retrieve trouble codes from various types of computers.
Test input sensors and actuator sensors.
Explain exhaust emission control system.
Define EGR (Exhaust, Gas and Recirculation) systems Troubleshoot and diagnose emission systems.
Maintain control of emission and engine management by the computer.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

AUT 153 Automotive Manual Transmission/Transaxle and Chassis
This course is designed to provide the student with knowledge and skill in manual transmission/transaxle and clutch units, used to move vehicles from a stop to full speed. It includes internal unit designs; power flows, gearing theory, internal nomenclature overdrive, and gear ratio explanation. Disassembly, assembly, and removal of the transmission/transaxle, as well as inspection of the internal components will be covered. Service and replacement of CV joints and front wheel drive will also be included. Conventional and limited slip differentials provide the student with knowledge and skill in the operation and function of the clutch.
Upon successful completion of this course, students should be able to:
Demonstrate safety in disassembly, removal, and assembly of units in the vehicle.
Inspect components in a vehicle.
Install units in the vehicle.
Explain gear ratio.
Apply gearing theory.
Inspect and measure internal components.
Replace internal components.
Demonstrate how varied gear combinations move a vehicle to highway speeds.
Diagnose gearing and clutch problems during unit's operation.
Differentiate between manual transmissions and manual transaxles.
Identify clutch components and determine replacement.
3 Credits 1 Weekly Lecture Hour
4 Weekly Lab Hours

AUT 190 Automotive Internship (1 credit)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 60 hour internship will earn 1 college credit for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
1 Credit

AUT 194 Automotive Internship (2 credits)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 120 hour internship will earn 2 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
2 Credits

AUT 199 Automotive Internship (3 credits)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 180 hour internship will earn 3 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
3 Credits

AUT 200 Automotive Automatic Transmission/Transaxle
This course is designed to provide the student with theory and skill in the design, construction, inspection, repair, and diagnostic testing of the automatic transmission/transaxle. The student will be prepared to perform diagnostic procedures during the evaluation of the component's operation to determine if minor or major repairs are required to bring the automatic transmission/transaxle units back to manufacturer's specifications. In addition, processes to disassemble, measure, inspect, and re-assemble automatic transmission/transaxle units correctly will be stressed. Electronic controls, hydraulic systems, locking and unlocking hubs, and operational modes will be discussed. Emphasis will be placed on servicing four-wheel drive and all-wheel drive systems; transmission clutches, automatic transmission /transaxles maintenance, oil, and filter change procedures will also be covered. Hands-on procedures will be stressed throughout the course.
Upon successful completion of this course, students should be able to:
Demonstrate cautions and safety.
Evaluate torque converters, bearings, bushings, and thrust washers.
Disassemble, measure, and assemble units.
Measure and install new parts as required.
Differentiate between 4-wheel drive and all-wheel drive.
Evaluate transfer cases, their operation, service, and maintenance.
Service 4-wheel drive and all-wheel drive vehicles.
Identify hydraulic systems.
Lock and unlock hubs.
Change transmission fluids and determine their proper usage in various manufacturers' units.
Apply proper procedures for oil and filter change.
Remove, overhaul and re-install transmission/transaxle in vehicles.
Adjust units back to manufacturer's specifications.
4 Credits 2 Weekly Lecture Hours
4 Weekly Lab Hours

AUT 201 Automotive Chassis and Security Systems
This course is designed to expose the student to the chassis and many security systems used on today's modern vehicles. This course will prepare the student to diagnose, wire, troubleshoot, remove, and install components in a safe and efficient manner. In addition, topics such as air bag restraint systems; front, side, and roof units restraint systems; conventional seat belts and roofline slider belts will be addressed. Moreover, radio and speaker installations, automatic vehicle leveling systems, and proper wiring for anti-theft device installation systems will also be covered.
Upon successful completion of this course, students should be able to:
Test chassis and security systems.
Define air bag restraint systems.
Remove and service air bag systems.
Prevent deployment of air bag systems.
Demonstrate precaution during the disconnecting of air bags for servicing.
Repair restraint systems using conventional seat belts and roofline slider belts.
Inspect belt webbing and anchor locations.
Install belt webbing and anchor locations.
Recognize delayed lighting and running lamps.
Install and repair automatic locks, security and anti-theft devices.
Perform appropriate wiring for anti-theft device installation.
Install radios, CD tape players, and speakers systems.
Replace and repair electronic heat grids on rear windows.
Utilize automatic vehicle leveling systems.
Utilize the wiring diagram and computer.
Install automatic built in security systems.
Adjust chassis.
Troubleshoot chassis operation.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

CPT - Carpentry

CPT 102 Carpentry Fundamentals
This course is designed for students preparing for a career in carpentry. Students are introduced to foundational concepts and principles of the carpentry trade. Students receive instruction in the use and care of hand and power carpentry tools; layout, measuring and cutting procedures; as well as selection and application of building materials.
Upon successful completion of this course, students should be able to:
Demonstrate knowledge of hand and power tools and their practical applications.
Demonstrate understanding of workplace safety requirements.
Utilize measurement tools correctly and accurately.
Demonstrate basic layout and cutting procedures.
Read and apply basic blueprints for carpentry jobs.
Identify the structural components in construction.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

CPT 105 Framing and Roofing
This course provides students with the basic principles of framing and roofing. It includes terminology, print information, design, codes and systems. Students also receive hands on training in rough framing skills as well as the construction of common types of roofs.
Upon successful completion of this course, students should be able to:
Demonstrate knowledge of the components of framing and roof structures.
Estimate materials for framing and roofing.
Frame structures using blueprint information.
Install insulation.
Demonstrate knowledge of the different types of roofing and materials.
Construct simple roof rafters.
Complete different types of roofing jobs.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

CPT 110 Exterior Finishing
This course is designed to teach students the necessary skills needed to complete exterior finishing in residential construction. Instruction includes insulation, siding, window and door installations.
Upon successful completion of this course, students should be able to:
Estimate materials for exterior finishing.
Demonstrate knowledge of different types of sidings and exterior finishing.
Apply different types of sidings.
Select and install appropriate windows and doors based on rough openings and manufacturers specifications.
Select and install various types of window casings and window glazing.
Construct and set door frames.
Identify and install door and window hardware.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

CPT 115 Interior Finishing
This course is designed to teach students the necessary skills needed to complete interior finishing in residential construction. Topics covered include dry wall, doors, trim and paneling, as well as the layout, fabrication and installation of staircases.
Upon successful completion of this course, students should be able to:
Safe and proper use of power and hand tools.
Demonstrate knowledge of wall and ceiling covering materials.
Demonstrate proper applications of different types of moldings.
Prepare and install various interior door frames and doors.
Install various types of floors.
Identify the various types of stairs.
Construct basic stairways.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

CPT 120 Energy Efficiency
This course introduces students to the techniques and materials used in remodeling and new construction of homes. Topics covered in the class include green building and green building standard; energy conservation; weatherization and efficiency techniques.
Upon successful completion of this course, students should be able to:
Demonstrate understanding of industry standards related to green building and energy efficiences.
Demonstrate knowledge of areas of inefficiency in homes.
Demonstrate understanding of different types of insulation and their uses.
Identify more efficient construction and landscaping designs.
Conduct a general home energy audit.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

CPT 150 Introduction to Cabinetmaking
This course introduces basic cabinetmaking skills. Topics covered include material selection, layout, design, proper use and application of hand and power tools, and finishing techniques. Course includes the design and construction of various projects. NOTE: Must have department head approval
Upon successful completion of this course, students should be able to:
Describe cabinet design considerations.
Make basic sketches and layouts.
Generate a Bill of Material for a project.
Identify woods by sight.
Discuss applications for woods.
List applications for each wood species.
Apply veneers.
Affix plastic laminates.
Select and apply different fasteners.
Use hand and power tools safely.
Make up various wood joints.
Fabricate fixtures.
Prepare a project for finishing.
Apply finishes to wood.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

CPT 151 Furniture Building
This course presents the basic skills necessary to build furniture. Proper use of hand and power tools is covered. Wood joinery is covered along with different finishing techniques. NOTE: Must have department head approval
Upon successful completion of this course, students should be able to:
Select wood for various applications.
Make basic joints including mortise, tenon and dovetails.
Demonstrate proper router applications.
Perform proper clamping techniques.
Apply finishes to achieve desired appearance.
Utilize shop tools safely.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

CPT 152 Home Remodeling/Additions
Introduces basic principles of framing structures, insulation, paneling, ceramic tile for floors and walls, and basic carpentry skills. Topics covered include: stairs, roofing, basic plumbing and wiring, finishing work, skylights and windows and kitchens and bathrooms.
Upon successful completion of this course, students should be able to:
Demonstrate proper applications of framing members including headers, beams, roof joist.
Lay out a stairway.
Apply ceramic tile with use of mastic or substrate.
Explain the basic concepts involved of home wiring.
Install a window into a new or existing opening.
Solder 1/2" and 3/4" copper tubing.
Construct a simple drainage branch using plastic pipe.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

CPT 153 Advanced Furniture Building
This course is designed for students who are ready to progress beyond The Basics of Furniture Building (CPT 151) course. It presents advanced techniques in wood bending using steam, laminate, freeform and coopering. The process of working with wood veneers and veneer inlays will be covered. Various methods in finishing and finishing materials will be emphasized.
Upon successful completion of this course, students should be able to: Select various types of wood for numerous application procedures Build, setup and operate a steaming device for bending wood Construct the appropriate form for bending procedures Use wood laminates for the purpose of bending Layout construction for coopering Apply various techniques for staining and finishing
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

CPT 190 Carpentry Internship (1 credit)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 60 hour internship will earn 1 college credit for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to: Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
1 Credit

CPT 194 Carpentry Internship (2 credits)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 120 hour internship will earn 2 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to: Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
2 Credits

CPT 199 Carpentry Internship (3 credits)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 180 hour internship will earn 3 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
3 Credits

ELT - Electrical

ELT 102 Commercial Wire I
Commercial Wiring I presents the requirements of a commercial electrical installation. Specific commercial installation methods, techniques, materials and National Electrical Code requirements will be presented.
Upon successful completion of this course, students should be able to:
Define job requirements from the contract documents.
Identify and properly apply different wiring devices.
Size and apply various types of conduits.
Install electrical boxes.
Size and install branch circuits per National Electrical code requirements.
Demonstrate a working knowledge of special raceways, outlets and communication systems.
Read engineering drawings.
Properly apply National Electrical Code requirements to the intended use presented by engineering drawings.
Describe the different types of lighting systems and associated fixtures.
4 Credits 3 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 110 Introduction to Electricity
This introductory course introduces students to the fundamental theories and principles of electricity. These theories and principles include voltage, current, magnetism, Ohm's Law, inductance, capacitance, and resistance, as well as the basics of DC circuits, their applications, and associated symbols. The course emphasizes safe working procedures in a construction environment.
Upon successful completion of this course, students should be able to:
Describe the competitive origins of the infant electric and gas industries in the late 1800s and early 1900s.
Describe the political, social and economic issues that led to industry regulation.
Describe the development of large public power electric systems.
Discuss the impact of siting and environmental issues within the United States and in the Delaware Valley.
Evaluate the impact of moving to a partially deregulated environment.
4 Credits 3 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 112 Electrical Code
This course is designed to help students read and understand the National Electrical Code. The National Electrical Code is the basic code that governs all electrical installations. The course teaches students how to locate code information in Code Manual, as well as how to interpret and apply the appropriate code to all facets of the electrical installation.
Upon successful completion of this course, students should be able to:
Demonstrate an understanding of the National Electrical Code.
Apply the NEC index in referencing an electrical problem or concern.
Identify codes and/or tables applicable to various electrical situations.
Apply minimum Code requirements to a floor plan of a residence.
2 Credits 2 Weekly Lecture Hours

ELT 114 Residential Wire
This course introduces students to the theory and practice of residential wiring. Students learn how to complete new house wiring, including the wiring of lighting receptacles, major appliances, alarm systems, telephone, television, and an electrical service. The course stresses National Electric Code compliance.
Upon successful completion of this course, students should be able to:
Demonstrate knowledge of the general requirements for residential rough-in wiring.
Apply NEC requirements in completing wiring tasks.
Demonstrate understanding of the difference between grounded and ungrounded conductors.
Demonstrate knowledge of electrical services, overhead services, service drop, and service lateral.
Layout and install cable and make connections.
Demonstrate competence in installing basic electrical services.
Demonstrate safe electrical practices.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 116 Advanced Electrical Wire
This course teaches students more complex residential electrical installations. Students learn additional wiring methods for single family and multi-family dwellings that include load calculations, service entrance sizing, proper grounding techniques, and associated safety procedures.
Upon successful completion of this course, students should be able to:
Install conduits, wiring, and electrical distribution equipment associated with residential electrical installations.
Identify and apply the criteria for selecting service panel boards and feeder sizes.
Apply the NEC requirements to the intended use presented by engineering drawings.
Calculate feeder loading and determine the minimum feeder conductor size and rating of over-current protective devices.
Tabulate materials required to install an electrical rough-in.
Lay-out an electrical system for a new house.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 118 Troubleshooting and Old Work Wiring
This course introduces students to the issues related to completing electrical work on old houses, as well as doing troubleshooting and preventive maintenance on residential buildings. Students learn how to rewire different areas of old houses properly, with minimal damage to the building, as well as wire major house additions. Additionally, students learn how to troubleshoot electrical problems.
Upon successful completion of this course, students should be able to:
Identify issues involved in completing work on old house wiring.
Evaluate electrical circuits in older homes.
Perform basic circuit checks for shorts, opens, and ground faults.
Perform continuity and resistance checks on relay coils and contacts, overloads, fuses, circuit breakers, switches, and other control circuit components.
Wire and troubleshoot basic electrical control circuits to develop a logical, systematic approach to troubleshooting.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

ELT 153 Smart Home Systems
Smart Home Systems is an introductory course on the principles, installation, and operation of wired and wireless residential electrical and electronic systems. The student will apply those lessons on a mock-up house. The student will then program various switches, outlets, thermostats, cameras, door locks, and other smart house devices.
Upon successful completion of this course, students should be able to:
Install a smart home system in a mock residential setting.
Lay out, install, and program various smart switches, outlets, and other smart house devices.
Determine how smart home devices reduce energy consumption.
Integrate smart home devices with voice-control assistance.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 190 Electrical Internship (1 credit)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 60 hour internship will earn 1 college credit for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
1 Credit

ELT 194 Electrical Internship (2 credits)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 120 hour internship will earn 2 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
2 Credits 2 Weekly Lecture Hours

ELT 199 Electrical Internship (3 credits)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 180 hour internship will earn 3 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
3 Credits

ELT 200 Commercial Wiring
This course provides an in-depth comprehension of commercial wiring. It includes the understanding of electrical power needs and distribution requirements for a typical commercial facility. The course stresses the application of main power components to support calculations necessary to have a safe and efficient commercial installation. Students will become knowledgeable of wiring for special circuits, appliances and loads such as, but not limited to, refrigeration, HVAC, food preparation apparatus and associated loads relative to various types of commercial wiring. The course will include requirements for a thorough study of commercial service entrance equipment from the utility company's service drop to the building's main switchboard.
Upon successful completion of this course, students should be able to:
Demonstrate the application of commercial building plans and specifications and interpret electrical symbols.
Compute the correct service entrance feeder size, number of circuits and identify the criteria for selecting the appropriate service equipment.
Comprehend installation requirements for commercial wiring.
Demonstrate an understanding of the common techniques to determine whether a circuit has a short circuit, a ground fault or an open circuit and trouble shoot common residential electrical system problems.
Draw basic Wye and Delta transformer diagrams and make connections.
Identify and comprehend entrance grounding requirements.
Determine the preferred and required minimum size conductors for lighting, appliances and general purpose branch circuits.
Compute the lighting watts per square foot for a commercial building.
Identify types of lighting fixtures used.
Demonstrate the correct connections for wiring a low-voltage remote control system.
Identify the different types of emergency power systems and all the sub-components and site requirements.
Demonstrate knowledge of transformers, disconnecting devices, service entrances and metering configuration in a commercial building.
Determine the proper raceway type and size dependent on conductors to be installed and box size for approved box fill.
Describe both Wye and Delta connected three-phase services.
Calculate loads for single-phase and three-phase branch circuits.
Calculate loads for a retail store, office building, both single and multi-family dwellings, restaurant and other institutional projects.
4 Credits 3 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 202 Industrial Electric II
This course will include heavy coverage in the areas of transformer selection and installation, AC circuits, AC motor control, industrial lighting and electric heat.
Upon successful completion of this course, students should be able to:
Describe the effect of high- and low-power factors on alternating current circuits.
Cite the methods for producing single and multi phase voltages.
State the construction and operating characteristics of transformers, illustrating the various types of transformer connections and discussing the results of these connections.
Detail the construction of various AC motors.
Demonstrate a knowledge of the construction and operation of various types of motorcontrollers and protective devices.
Determine the amount of light required for various areas and types of work.
Lay out and select the correct lighting fixtures for various areas.
Explain the operation of electronic motor controls.
4 Credits 3 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 203 Industrial Electrical Systems
This course provides the student with an introduction to various electrical systems and devices used in a manufacturing/commercial facilities environment. Students will learn how to identify the function of electrical components, to include relays, sensors, switching/other devices and circuits. Instruction will include the theory and use of electrical instruments, to install and make repairs as well as identify, troubleshoot isolate and remedy problems. Emphasis will be placed on electric motors and motor controls. Topics of instruction will cover installation of electrical conduit, wiring, motors and other devices.
Upon successful completion of this course, students should be able to:
Define the terminology associated with common/basic electrical systems and devices.
Describe the operational characteristics and applications of various sensing devices.
Identify and describe the function of basic control circuits/components.
Contrast electrical starting and braking methods.
Compare wound rotor, synchronous and consequent pole motors.
Conduct job planning routines for various electrical component and system installations/repairs/replacements.
Determine sizes and install electrical conduit, boxes, wiring, etc. with regard for engineered work plans and appropriate standards.
Install motor controls and motors.
Discuss and troubleshoot sensing devices and circuits, to include ground faults.
Determine a methodology for troubleshooting various distribution and control circuits.
Troubleshoot variable frequency AC motor drives.
4 Credits 3 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 204 Introduction to Programmable Logic Controllers
This introductory course is intended to acquaint students in a hands-on mode with the basic skills and knowledge of programmable logic controllers, with respect to Industrial Systems. Students will learn to interpret electrical and Programmable Logic Controller (PLC) input/output diagrams and ladder logic. In addition, they will become acquainted with PLC functions, components, circuitry, testing of PLC programs and troubleshooting a PLC system. This course is recommended for students with little or no programmable logic controller experience.
Upon successful completion of this course, students should be able to:
Discuss terminology associated with PLCs.
Describe the function, uses, and operation of a PLC.
Define the function and operation of input/output diagrams and system networks.
Interpret ladder logic to determine the functions of mechanical equipment.
Discuss event driven sequencing as it relates to the input and output terminals of the PLC.
Compare the operations of a PLC to manual and automatic control devices.
Decipher which inputs and outputs are controlling internal counters and math functions.
Interface wiring ladder logic diagrams with controller equipment.
List the functions and types of timer instructions and give applications.
Diagnose a PLC program, as it relates to a mechanical environment.
Use PLC diagnostic equipment.
Diagnose a motor control program in both manual and automatic modes.
Analyze the consequences of changing a PLC program on the system being controlled.
Identify the function and operation of a program interlock and give an application.
Troubleshoot various levels of PLC systems to include up and down counter, timer and branching instructions.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 206 Commercial Wire
This course provides an overview of commercial wiring. It includes the understanding of electrical power needs and distribution requirements for a typical commercial facility. The course stresses the application of main power components to support calculations necessary to have a safe and efficient commercial installation.
Upon successful completion of this course, students should be able to:
Demonstrate the application of commercial building plans and specifications and interpret electrical symbols.
Demonstrate an understanding of installation requirements for commercial wiring.
Compute the lighting watts per square foot for a commercial building.
Identify types of lighting fixtures used in commercial work.
Demonstrate knowledge of transformers, disconnecting devices, service entrances and metering configuration in a commercial building.
Calculate loads for a retail store, office building, and both single and multi-family residences.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

ELT 208 Solar Photovoltaic System Design and Installation
This International Renewable Energy Council (IREC) focused course is designed to introduce students to grid tied photovoltaic (PV) systems. In this course, students will learn the benefits of a grid tied system and the positive impact on the environment these systems can have. At the conclusion of this course, students will have the basic knowledge and understanding in design and installation of residential and commercial buildings. This course is patterned after the Job Task Analysis set by the North American Board of Certified Energy Practitioners (NABCEP) Entry-Level Solar PV exam and also fulfills the prerequisite of related experience and education required to sit for the industry certification. The certification is not included in the course. NOTE: Alternative Pre-requsite Certified Electrical License
Upon successful completion of this course, students should be able to:
Demonstrate a thorough knowledge of the safety requirements applicable to solar PV system installation and maintenance, including electrical, work-site, and personal safety.
Accurately interpret and apply the National Electrical Code to solar PV system design and installation, with emphasis on a thorough working knowledge of NEC Article 690 "Solar Photovoltaic Systems", and PV system grounding & bonding, overcurrent protection, wire and conduit type and sizing, and PV system labeling.
Identify PV system monitoring and maintenance needs, and specify service procedures and schedule to keep a system operating safely and efficiently throughout service life.
Identify the appropriate layout, orientation, and mounting method for the modules/array, inverters, and other system components, with attention to electrical efficiency, mechanical integrity, site requirements, maintenance access, and safety.
Conduct an accurate site survey to determine location suitability for a solar PV system, including adequate solar access, sufficient area and structure, proper orientation, and options for placement of PV modules, inverters, and other equipment.
Install inverters, charge controllers, disconnects and overcurrent protection devices, meters, surge protection and grounding equipment, junction boxes, batteries and enclosures, system monitoring equipment, conduit, and other system hardware in conformance with equipment manufacturers' guidelines, the system design, the NEC, the utility company, and the local authority having jurisdiction.
Draw a basic site plan, showing site details and equipment layout.
Obtain and accurately interpret solar radiation and temperature data for the site and solar PV module and inverter performance specifications, determine customer energy use and needs, and then calculate the required PV system output and configure a solar PV system from available components to produce the required output.
Determine the local requirements for utility interconnection, and select an appropriate utility interconnection point and method in conformance with the local utility company, the local authority having jurisdiction, and the NEC.
Identify opportunities to reduce energy demand through building performance and/or electric equipment upgrades in order to optimize PV system size and create an efficient, integrated electrical system.
Calculate design voltages and currents for all circuits within the PV system, and select the appropriate conductor type and rating for each circuit, taking into account all de-rating factors and voltage drop.
Verify that the array operating voltages and currents are within the operating limits for the inverters or charge controllers that the capacity and insulation ratings of all conductors conform to NEC requirements, and that voltage drop losses are within acceptable limits.
Determine the proper size, rating, and location for PV system overcurrent protection and disconnect devices, and for all grounding, bonding, surge suppression, and lightning arrest equipment.
Draw complete one-line and three-line wiring diagrams for grid-tied and off-grid solar PV systems.
Properly identify and connect all system equipment, conduit and conductors, specify conduit and conductor type and size, and specify location and text of all NEC required labels.

HVA - Heating, Ventilation and Air Conditioning

HVA 100 Introduction to Heating, Ventilating, Air Conditioning and Refrigeration Electrical Fabrication
This course will provide a background and understanding of electron flow, Ohm's law, wire sizing, system controls, types of motors, AC/DC theory and understanding of the use of meters and equipment components associated with this field. The math necessary to perform the calculations in this course will be covered as an integral part of instruction. The course includes theory as well as practical shop applications.
Upon successful completion of this course, students should be able to:
Define electrical circuit fundamentals.
Identify circuit symbols on a schematic diagram or plan.
Describe the difference between parallel and series circuits.
Define the relationship among voltage, amperage and resistance.
Perform calculations using Ohm's law.
Demonstrate the use of electric meters, their operation and application.
Identify current carrying capacity of conductors, use wire sizing charts and properly size conductors for system connections.
Cite the hazard potential and safety procedures when working on equipment.
Describe the types of motors used within the HVAC&R field, including both theory and operation.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

HVA 101 Introduction to Refrigeration and Air Conditioning
This course will cover the design and functions of the major components of residential and commercial refrigeration and air conditioning. The refrigeration cycle is reviewed and heat transfer discussed. Particular attention is placed on use of hand tools, techniques of installation and service of equipment.
Upon successful completion of this course, students should be able to:
Demonstrate appropriate procedures for attaching refrigeration manifold to a refrigerator system.
Position compressor service valves for variety of operations in refrigeration and air conditioning systems.
Demonstrate knowledge of the functions of the various parts of refrigeration systems and refrigerant cycles.
Interpret pressure temperature charts and pressure-enthalpy relationships.
Demonstrate understanding of piping layout and the relevant application considerations.
Troubleshoot refrigerant problems.
Apply computations for heat loss and heat again.
Conduct operational procedures such as pump down for refrigeration and air conditioning systems.
Demonstrate awareness of workplace safety principles and practices.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

HVA 103 Advanced Refrigeration and Air Conditioning
This course provides students with a background and understanding of residential, light and commercial refrigeration design, installation as well as service. The course materials will also address troubleshooting techniques of components with special emphasis on refrigerant control devices, compressors, reducing valves and dryers. Air conditioning fundamentals to be covered shall include psychrometer, air flow and duct sizing. Superheat and subcooling adjustments for both refrigeration and air conditioning will be covered.
Upon successful completion of this course, students should be able to:
Explain heat flow, change of state condensing point, evaporation point and laws of refrigeration.
Describe knowledge of the types of commercial refrigeration systems and the integral components.
Identify the common problems with valves, pressure switches, filters and dryers.
Demonstrate the adjustment of the superheat and subcooling of refrigeration and air conditioning machines for maximum efficiency.
Demonstrate understanding of psychrometric charts and its uses in air conditioning.
Measure air flow.
Diagnose common problems associated with air side residential and commercial air conditioning.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

HVA 104 Practical Problems in Mathematics for HVAC&R Technicians
This course introduces basic mathematics for the HVAC&R student. The course includes whole and mixed numbers, fractions, decimals, ratios and proportions, basic trigonometry and Ohm's law of electrical relationships. It covers direct and computed measure and presents the use of standard formulas, graphs and graphing. Emphasis will be placed on real practical applications.
Upon successful completion of this course, students should be able to:
Solve problems using ratios and proportion.
Calculate answers using standard HVAC&R formulas.
Solve triangles using trigonometric ratios and the law of sines and cosines.
Construct airflow charts from raw data and also interpret HVAC&R related graphs.
3 Credits 3 Weekly Lecture Hours

HVA 106 Basic Piping for Contractors
This course is an introduction to piping principles and practices as they apply to Heating, Ventilating, Air Conditioning, and Refrigeration. The course utilizes a variety of pipes, pipe materials, and fittings in the instruction of proper method of joining pipe and material lists, measuring, and assembly of manifolds. The students will develop the skills needed to work with drawings and testing procedures.
Upon successful completion of this course, students should be able to:
Identify various types of pipes and fittings.
Interpret and apply information contained in drawings and blue prints.
Perform accurate measurements.
Demonstrate procedures required for the HVAC&R pipe installation.
Demonstrate the proper procedure for valve installation.
Demonstrate appropriate procedures to test hydraulic and pneumatic pipe deficiencies.
Demonstrate required safety knowledge.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

HVA 107 Gas Heating
This course is designed to provide the relevant theory and skill to remove and install gas or oil heating systems. The topics of instruction will include but will not be limited to the basic system sizing selection of equipment recognizing the venting requirements for a new installation. Steps to follow for the safe removal of existing equipment will be discussed. Restate an understanding of NFPA 54 the NEC codes and the manufacturers installation instructions. Provides knowledge to perform basic electric wiring for the installation of heating equipment and how ductwork is assembled for hot air systems, the piping schematics, and components for hot water systems will also be presented.
Upon successful completion of this course, students should be able to:
Perform a startup and check operation of the equipment.
Understand basic heat loss calculation.
Restate the two types of warm air systems.
Recognize an up flow, and counter flow heater.
Recognize operating and safety controls.
Identify the function of each operating and safety control.
Calculate air combustion.
Calculate gas pipes.
Identify NFPA guidelines for venting gas.
3 Credits 3 Weekly Lecture Hours

HVA 108 Duct and Sheet Metal Fabrication and Installation - Residential
This course is designed for students who plan a career in the heating, ventilation, and air conditioning industry. Topics covered in this course includes, but is not limited to, safety, duct takeoff, sheet metal calculations, costing, installation, heat loss/gain and blueprint reading.
Upon successful completion of this course, students should be able to:
Read and use a duct factor chart.
Utilize a duct take-off form.
Determine total weight of metal needed for duct.
Utilize an installation take-off form.
Identify costing sheet metal duct, duct liner, and installation.
Fabricate air and splitter dampers and drivers.
Cut openings in duct for take-off collars.
Join duct sections.
Apply the proper method of duct sealing.
Apply external duct insulation.
Utilize tools of the trade.
Perform an oblique drawing of a duct system.
Read a blueprint.
Install grilles, registers, and diffusers.
Install flexible connectors.
Identify NFPA-54 guidelines for venting gas-fired appliances.
Identify NFPA-31 guidelines for venting oil-fired appliances.
Identify NFPA-58 guidelines for venting propane/LP-fired appliances.
3 Credits 3 Weekly Lecture Hours

HVA 109 HVAC Troubleshooting
This course presents the sequence of operation in the troubleshooting of residential air conditioning and gas-fired warm air systems. The materials and lab demonstrations promote the safe use of electrical, temperature, and pressure gages to facilitate a system diagnosis and recommended solution.
Upon successful completion of this course, students should be able to:
Collect and analyze data with the owner.
Use proper tools safely to find problems.
Operate the HVAC System to verify safe, efficient services.
Record operating pressures, temperatures, airflow, and identification numbers.
Develop a cost-effective plan of action.
Demonstrate safe working habits.
Troubleshoot flow charts.
Identify low voltage systems.
Identify diagram circuits.
Utilize pressure gauges.
Utilize electrical meters.
Use combustion analyzer.
Recognize system hazards.
Review plan of action with owner.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

HVA 110 Hydronic Heating Systems
This course is an introduction to hydronic hot water heating. The course is designed to cover residential and light commercial systems, which involves many different piping disciplines. Also covered are design and building techniques of hot water heating systems.
Upon successful completion of this course, students should be able to:
Review safety rules.
Explain the principles of heat transfer.
Detail boiler design and construction.
Calculate heat loss/gain.
Identify various heat distribution systems.
Cite the different piping designs of hydronic heating systems.
Cite the sequence of operation of a gas or oil fired hot water boiler.
Cite the sequence of operation of a hydronic heating system.
Service and replace hot water boilers.
Service mechanical controls of a hydronic heating system.
Identify and install appropriate venting.
Analyze combustion procedures.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

HVA 111 Advanced Duct and Sheet Metal Fabrication/Installation - Commercial
This course is designed for students who plan a career in the HVAC industry. This course covers safety, duct take-off, duct support systems, installation techniques, duct design, sizing and layout, blueprint reading, and venting of heating appliances.
Upon successful completion of this course, students should be able to:
Read a blueprint.
Perform oblique drawings of a duct system.
Know the difference between supply air and return air duct systems.
Identify the different types of duct hangers, clamps, and connectors.
Identify the need for duct reducers.
Identify various duct sealing techniques.
Cut a perfect 10-inch diameter hole in a duct.
Connect various duct fittings.
Make branch connections.
Properly install flexible duct.
Install flexible connectors.
Perform an air test and balance.
Apply external duct insulation.
Apply and repair duct liner.
Install grilles, registers and diffusers.
Identify NFPA-54 guidelines for venting gas fired heating appliances.
Identify NFPA-31 guidelines for venting oil fired heating appliances.
Identify NFPA-58 guidelines for venting propane/LP gas fired appliances.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

HVA 112 Oil Burners and Hydronic Steam Heating
This course is an introduction to oil burners and hydronic steam heating. The course covers the history of oil burners and their technological growth to present day in residential and light commercial appliances. Also discussed are petroleum crude, refinement, and distillation into light grade fuel oil. This course also covers techniques in designing and building of steam heating systems.
Upon successful completion of this course, students should be able to:
Explain the differences in fuel oil grades.
Explain the principles of oil burner combustion.
Describe fuel pump operation.
Explain the functions of safety and operating controls; their purpose and operation.
Identify the sequences of operation of an oil burner as related to hydronic steam boilers.
Identify the venting process of oil-fired appliances.
Service oil burners.
Identify methods of heat transfer.
Cite the principles of steam generation.
Describe one and two pipe steam distribution systems.
Explain the importance and operation of the Hartford Loop.
Service steam boilers.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

HVA 113 Hydronic Troubleshooting
This course demonstrates the control functions of residential hydronic heating systems. The course materials address troubleshooting techniques, electrical and mechanical operations, and a review of basic steam and hot water design schemes. Service, safety, combustion analysis and cost-effective repair are included.
Upon successful completion of this course, students should be able to:
Operate a residential boiler.
Recognize and list safety hazards and concerns.
Use tools to determine draft and combustion.
Identify mechanical devices including pumps.
Explain fluid dynamics including pumps.
Install and wire a zone control module.
Explain principles of steam.
Identify types of electrical circuits for zoning.
Detail basic control schemes.
Explain hydronic circuits.
Replace electric mechanical components.
Identify circuits on diagram.
Use electric meter.
Recognize system hazards.
Review plan of action with owner.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

HVA 190 Heating, Ventilation and Air Conditioning Internship (1 credit)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 60 hour internship will earn 1 college credit for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
1 Credit

HVA 194 Heating, Ventilation and Air Conditioning Internship (2 credits)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 120 hour internship will earn 2 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
2 Credits

HVA 199 Heating, Ventilation and Air Conditioning Internship (3 credits)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 180 hour internship will earn 3 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
3 Credits

HVA 200 Advanced HVAC&R Electrical Fabrication
This course will introduce students to the electronic operation and safety controls in refrigeration and air conditioning equipment. Also addressed will be the use and application of schematic and ladder wiring diagrams and introduce the proper troubleshooting procedures of residential and light commercial systems.
Upon successful completion of this course, students should be able to:
Demonstrate understanding of the system operation and sequence of operation for HVAC&R equipment.
Explain control circuits, their use and potential problems.
Troubleshoot refrigeration and air conditioning control systems and isolate the faulty components with the system.
Determine proper replacement procedures when defective or faulty components are found.
Follow safety requirements and regulations.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

HVA 201 Refrigerant Certification
This course will instruct the students about the harmful effects of chlorofluorocarbons on the ozone, production limitations and phase-out of CFCs and HCFCs, and recycle, reclaim and recover. The course also prepares students to take EPA national certification exam.
Upon successful completion of this course, students should be able to:
Detail the chemical properties of CFCs and HCFCs.
Demonstrate understanding of the Montreal protocol and the regulations established by the international community concerning refrigerants.
Demonstrate understanding of the US Clean Air Act and the limits and prohibition of CFCs and HCFCs.
Set up record keeping and documentation for refrigerant management program.
Demonstrate understanding of how to recover, recycle and reclaim equipment.
Demonstrate understanding of how to service refrigeration and air conditioning without venting refrigerant into the atmosphere.
3 Credits 3 Weekly Lecture Hours

HVA 203 Heat Pump Systems
This course is designed to present practical fundamentals, recommended service procedures and start-up of heat-pump systems. The course is structured to introduce the basics of each topic and then move into the more technical aspects of the topic. Topics covered include troubleshooting, standard service procedures and earth-coupled, water source heat-pump systems.
Upon successful completion of this course, students should be able to:
Demonstrate understanding of the operation of a heat pump.
Demonstrate understanding of heat-pump components and control.
Detail the operation of air-source and ground-source heat-pump systems.
Perform calculations necessary for proper heat-pump system design.
Demonstrate installation and start-up of a heat-pump system.
Troubleshoot a heat-pump system.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

HVA 204 Blueprint Reading for HVAC
This course presents fundamentals in the understanding and use of basic HVAC drawings and schematics to determine construction drawings to determine methods and materials of light construction. Emphasis is placed on architectural symbols, use of scales and orthographic projection.
Upon successful completion of this course, students should be able to:
Demonstrate an understanding of residential and light commercial construction practices.
Demonstrate competencies in reading and intepreting technical drawings.
Identify appropriate types of reference sources and use them effectively.
3 Credits

HVA 205 Oil and Gas Burner Service
(Formerly HVA 202) This course includes review of heat transfer products and their use in institutional and commercial equipment. High efficiency heating equipment, principles and operation, sequence of operation and oil and gas burner technology will be addressed.
Upon successful completion of this course, students should be able to:
Explain principles of combustion.
Identify three methods of heat transfer.
Demonstrate the knowledge of the principles of convection of high-efficiency heating equipment.
Demonstrate knowledge of the furnace design and construction.
Identify potential venting problems with high-efficiency equipment.
Demonstrate knowledge of hydronic heating-system components and design.

Service oil and gas burners.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

HVA 206 Industrial Piping
This course provides a logical succession for the topics covered in HVA 106. In essence, this course introduces the student to additional varieties of pipe materials, pipe connectors and systems used as conductors for various materials within varied industrial facilities. Instruction will be given in the selection, installation and proper use of the different types of materials available as industrial piping. General shop safety and health, accident protection practices and procedures and OSHA/EPA requirements for the proper use of tools, ladders and hi-bay lifts for the installation, repair and replacement of piping system components will also be addressed.
Upon successful completion of this course, students should be able to:
Utilize appropriate terminology for the description of piping systems, components, devices and tools and for installation and repair.
Calculate costs and savings associated with varied types of piping systems.
Identify, select and install proper pipe for various applications, including cast-iron, copper, PVC and other plastics/composites, stainless and other alloy steels.
Investigate the correct use of water pipes (1/2" 3" in diameter) and effect field or shop installations or repairs.
Determine the correct application size and pressure rating for Wirsboro (PRO-PEX), Victaulic and LOKRING piping materials and devices.
Install, repair and list types of pipe and fittings with the appropriate tools.
Prepare job plans for the installation and repair of various piping systems.
Apply safety/health/accident protection practices and procedures for inspection/installation/repair of various piping systems.
Employ proper methods for cutting steel, cast-iron, various plastics and stainless steel pipes and tubing.
Prepare and install stainless steel pipe and fittings for food processing and pharmaceutical applications.
Select a type of piping material with regard for application and system pressure.
Utilize a T-Drill System for pipe installation and/or repair.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

PLB - Plumbing

PLB 100 Plumbing Theory I

This course is designed to provide the student with instruction in plumbing practices applicable to all areas of plumbing. Emphasis will be placed on presenting the history of plumbing, materials, tools and ideas in the plumbing industry. Traditional approaches are covered to ensure that the student receives a broad exposure to all materials and practices potentially encountered in the workplace. NOTE: Prerequisites: Must take College Placement Exam and must be employed by a Master Plumber.

Upon successful completion of this course, students should be able to:
Explain the history of plumbingExplain the development of plumbing codesDefine terminology associated with the trade, for example; fitting allowances Specify fittings correctlyIdentify various patterns of fittingsDefine different types of sketchesDemonstrate the proper use of measuring toolsCalculate dimensions and interpret piping symbolsPerform basic measurements (expressed in feet, inches, and fractions)Accurately measure pipes, threads, runs and angles related to plumbing installationsCalculate pipe sizes for drainage and service linesIdentify tools used to install plumbing systemsExplain the various methods of assembling pipe

5 Credits 3 Weekly Lecture Hours

PLB 101 Plumbing Theory II

This continuation course is designed to stress good solid plumbing practices applicable to all areas of plumbing. Emphasis will be placed on presenting advanced concepts and materials in the plumbing industry. Traditional approaches are covered to ensure that the student receives a broad exposure to all materials and practices that may be encountered in the work place. NOTE: Prerequisites: Must be employed by a Master Plumber.

Upon successful completion of this course, students should be able to:
Test and repair gas piping.
Describe the relationship of threads per inch to pipe size.
Identify the various tools for threaded pipe.
Describe the use of the tools for threaded pipe.
Explain how pipe is cut, reamed, and threaded.
Define the terms associated with pipe threading.
Demonstrate the procedures necessary to properly tighten fittings on pipes.
Tighten fittings on pipes and valves.
Define fitting allowance.
Interpret center-to-center measurements.
Perform fittings to obtain end-to-end measurements.

5 Credits

PLB 102 Math for Plumbers

This course is designed to provide the student with relevant theory and skills in solving practical, industrially based, trade-related mathematical problems. Topics of instruction will include, but will not be limited to, calculating arithmetic expressions involving whole numbers, fractions, decimals, ratio, proportion, and percentages. The appropriate use of English/metric conversions, exponents, square roots, basic graph interpretation, and basic algebraic expression (formulas) manipulation will be presented. Emphasis is placed on providing the student with a problem-solving methodology applicable to new and future mathematical concepts. An introduction to the use of trigonometry for the solution of right and oblique triangles will also be included.

Upon successful completion of this course, students should be able to:
Perform the addition, subtraction, multiplication and division of fractions.
Utilize ratio and proportion.
Define the Pythagorean theorem and show its use in plumbing for finding angles and offsets.
Solve square roots and perimeter, area, and volume problems.
Use mathematical concepts as they relate to plumbing projects.
Define the types of measurements used in plumbing projects.
Identify the mathematical symbols.
Define the use of symbols in mathematics Define math procedure and math precedence.
Relate geometry to piping mathematics.
Define formulas/equations.
Utilize square root to solve triangles.
Describe the relationship of angles formed by intersecting lines.
Utilize the proper unit of measure for each task.
Interpret various pipe weights and use a pipe data sheet.
Calculate pipe clearances.
"Take off" for fittings.
State generic rules for fitting allowance.

5 Credits 3 Weekly Lecture Hours

PLB 103 Installation & Repair

This course is designed to stress good solid plumbing practices applicable to all areas of plumbing materials, installations, and repair. Emphasis will be placed on advanced concepts and material selections in the plumbing industry. Traditional approaches are covered to ensure that the student receives a broad exposure to all materials and practices that may be encountered in the work place. Proper selection, installation of materials, application, and use of tools according to plumbing codes will be covered. In addition, practical application in the lab of the theoretical material covered in class will be stressed throughout the course. NOTE: Prerequisites: Must have completed one year apprenticeship and must be employed by a Master Plumber.

Upon successful completion of this course, students should be able to:
Explain how to install gas piping correctly.
Explain how to install domestic gas equipment safely.
Describe pipe threads.
Describe loop and circuit vents and how they are installed.
Identify and perform the various methods of supporting pipes.
Sketch the various devices used to support pipes.
Describe the purpose of cleanouts.
Identify the various locations and sizes of cleanouts.
Identify the size and types of drainage traps.
Describe siphonage and its effect on various types of traps.
Describe backpressure and how to prevent it.
Discuss capillary attraction and evaporation.
Describe the types of fixture traps and where they are used.
Explain why and where grease traps are used

5 Credits 3 Weekly Lecture Hours

PLB 104 Bathroom Installation
This course explains the manifold rules and regulations regarding shop safety. It demonstrates the right ways to lay out a job by the department of Labor and Industry, as well as, discuss job site hazards. In addition, it places emphasis on the power threader, soldering, brazing and safety. Students are taught how to create a detailed tool and material list as well as how to complete the manifold drawing to scale. NOTE: Prerequisites: Must have completed two years apprenticeship and must be employed by a Master Plumber.
Upon successful completion of this course, students should be able to:
Understand job site hazards and apply safety regulations.
Design and create a manifold drawing.
Identify appropriate symbols.
Demonstrate the power threader, soldering and brazing.
Create a detailed tool and material list.
Complete a manifold project.
Interpret the fitting allowance chart.
Rough in the waste for the bathrooms Design a bathroom according to a given plumbing code.
Create a tool and material lists for said bathroom.
Describe siphonage and its effect on various types of traps.
Describe backpressure and how to prevent it.
Discuss capillary attraction and evaporation.
Describe the types of fixture traps and where they are used.
1 Credit 3 Weekly Lecture Hours

PLB 110 Introduction to Plumbing
This introductory course in the Plumbing Technology Certificate program exposes students to the foundational knowledge needed to develop skills in the plumbing trade. This course presents basic plumbing concepts, plumbing lexicon and terminology, as well as the use of critical plumbing tools and equipment. Students also learn the basics of applications and installation for a residential plumbing system.
Upon successful completion of this course, students should be able to:
Describe the history of plumbing systems.
Use appropriate terminology in discussing plumbing projects and assignments.
Demonstrate knowledge of health and safety practices in the plumbing trade.

Distinguish plumbing tools and their uses.
Examine and identify plumbing configurations commonly used in a domestic water system.
Identify plumbing materials used in supply and drainage of a domestic water system.
Define major components of domestic plumbing.
Demonstrate knowledge of the sources and solvency of domestic water.
3 Credits 3 Weekly Lecture Hours

PLB 111 Faucets & Fixture Systems
This course focuses on fixtures and faucets used in domestic plumbing applications. It includes, but not limited to complete bathroom, kitchen, and laundry room fixtures, This course also emphasizes common design theories. Upon successful completion of this course, students should be able to: Identify various fixtures and their applications in industry. Demonstrate an understanding of the mechanical operations of fixtures and faucets. Explain troubleshooting techniques used in addressing plumbing problems. Demonstrate an understanding of ADA requirements in relation to domestic plumbing systems. Model layouts and designs for new bathrooms and kitchens. Illustrate rough installations of plumbing fixtures.
Upon successful completion of this course, students should be able to:
Identify various fixtures and their applications in industry.
Demonstrate an understanding of the mechanical operations of fixtures and faucets.
Explain troubleshooting techniques used in addressing plumbing problems.
Demonstrate an understanding of ADA requirements in relation to domestic plumbing systems.
Model layouts and designs for new bathrooms and kitchens.
Illustrate rough installations of plumbing fixtures.
3 Credits 3 Weekly Lecture Hours

PLB 112 Plumbing Residential Service
This course presents an in-depth study of residential plumbing services. The course prepares students to diagnose and solve problems with potable water and waste water systems. In addition, students will learn how to work with fixtures, faucets, and equipment associated with residential plumbing systems.
Upon successful completion of this course, students should be able to:
Identify potable water and waste water delivery systems.
Demonstrate an understanding of problems related to potable water and waste delivery systems.
Troubleshoot and repair plumbing fixtures and faucets.
Identify pumps and their applications in domestic plumbing systems.
Prepare domestic plumbing systems for seasonal temperatures changes.
Detect in fixtures, the sources of leaks, odors and sounds reported by consumers.
Demonstrate competencies in customer services and professionalism.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

PLB 190 Plumbing Internship (1 credit)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 60 hour internship will earn 1 college credit for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
1 Credit

PLB 194 Plumbing Internship (2 credits)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 120 hour internship will earn 2 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
2 Credits

PLB 199 Plumbing Internship (3 credits)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 180 hour internship will earn 3 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Demonstrate specifically how job-related competence has improved.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes
3 Credits

PLB 200 Heating Systems
This course is designed to help the heating professional become comfortable with the electrical portion of an installation or service call. The program covers basic electric circuits, flow of electricity, switches, grounding, electrical terms and principles, electric power in the home, electric wire and supplies, tooled and test equipment, transformers, electric heating components, wiring diagrams, practical wiring of a heating appliance, and troubleshooting. NOTE: Prerequisites: Must have completed two years apprenticeship and must be employed by a Master Plumber.
Upon successful completion of this course, students should be able to:
Identify basic electrical circuits.
Define two Laws of Electricity and understand fundamental electrical terms.
Describe how electric power gets to a home and some safety considerations.
Explain types and common uses of electrical wire (conductors).
Splice and connect wires.
Extend a circuit and some common electrical parts.
Use the proper tools and test equipment to perform basic electrical work.
Demonstrate how electrical power from the Power Company transformer can reduce to run low voltage components in a home.
Identify the essential electrical components of a heating system.
Perform the basics of wiring, schematics, ladder, and pictorial diagrams Read a schematic and ladder-wiring diagram, and wire a boiler.
Troubleshoot an electrical circuit.
Install gas utilization equipment in accordance with their listing and the manufacturer's instructions.
Perform methods of vent installations of venting systems based on the operating characteristics of the gas utilization equipment.
Adjust the burner input to the proper rate in accordance with the equipment manufacturers' instruction by changing the size of a fixed orifice, by changing the adjustment of an adjustable orifice, or by readjustment of the gas pressure regulator outlet pressure without overfiring.
Perform modifications to an existing appliance installation for the purpose of fuel conservation.
2 Credits 3 Weekly Lecture Hours

PLB 202 Blueprint Reading
This course was designed for plumbing and pipe fitting students who need to develop the ability to interpret trade blueprints and plan the installation of the required plumbing. The appropriate method to interpret all types of trade drawings and make orthographic or isometric sketches of plumbing installations will be discussed. The student will have the opportunities for extensive practice which provide reinforcement and additional performance skills will be presented. NOTE: Prerequisites: Must have completed three years apprenticeship and must be employed by a Master Plumber.
Upon successful completion of this course, students should be able to:
Read blueprints and sketch plumbing features.
Discuss the purpose of specifications and plumbing codes.
Measure scales lengths and uses of the architect's scale.
Discuss materials, construction, and pipe connections for a floor drain.
Identify floor plan symbols for sinks and other kitchen equipment and describe the details of kitchen planning.
Identify the floor plan symbols for bathtub, water closet, lavatory, and shower.
Interpret the rough-in sheet.
Discuss the installation of a wall-hung lavatory.
Show why isometric drawings are used in the plumbing trade.
Show pipe sizes on an isometric pipe drawing.
3 Credits 3 Weekly Lecture Hours

PLB 207 Cross Connection Control
This course presents the essential ingredients of blending theoretical and practical aspects of cross-connection controls along with specific guidelines concerning the theory of backflow prevention and administration. It provides extensive information on troubleshooting from a hands-on point of view and is designed to be used as an on-the-job troubleshooting tool. Standardized training in the backflow/cross-connection control field will be addressed. NOTE: Prerequisites: Must be employed by a Master Plumber.
Upon successful completion of this course, students should be able to:
Pass ASSE (American Society of Sanitation Engineers) Backflow Certification Exam for Testers.
Communicate historical data regarding cross-connections.
Perform the five methods of properly controlling backflow.
Articulate and define various cross-connections definitions.
Identify the various responsibilities of public and private agencies for cross-connection controls.
Apply, define and identify the appropriate plumbing codes and standards.
Discuss basic hydraulics and the fundamentals of cross-connection controls.

Utilize and apply the safety program material and implementation into the workplace.
Implement installation guidelines for backflow prevention assemblies.
Observe the condition of the test gage equipment during all steps of the field test procedure.
Troubleshoot and repair the problem with a backflow prevention assembly.
Document the validity of the inspection and certification of a backflow prevention assembly.
Report the results of the field-testing operations.
Maintain and generate all records and certifications of all backflow prevention assembly tests performed.
3 Credits 3 Weekly Lecture Hours

PLB 208 Philadelphia Plumbing Codes
This course reviews the major aspects of Philadelphia Plumbing Code (1996 Edition). Emphasis will be placed on general regulations, plumbing definitions, materials, sanitary and storm water systems. Students will be exposed to sketching, laying out, and sizing of various systems. NOTE: Prerequisites: NOTE: Prerequisites: Must be employed by a Master Plumber.
Upon successful completion of this course, students should be able to:
Determine if a back-flow prevention assembly is necessary.
Check with your inspector on the appropriate assembly required for the job.
Determine the minimum water pressure required at the most remote outlet on any potable water system.
Identify the requirements on a potable water system flush-out valve.
Identify and operate the vacuum breaker on the discharge side.
Demonstrate how a direct connection to a sewer or waste line can be properly utilized.
Connect and identify appropriate pipelines.
Size drainage and vent lines.
3 Credits 3 Weekly Lecture Hours

PLB 209 International Plumbing Codes
This course is designed to assist students in understanding codes and adjacent code provisions. It addresses various codes founded upon certain basic principles of environmental sanitation and safety through properly designed, acceptably installed, and adequately maintained plumbing systems will be addressed. NOTE: Prerequisites: Must be employed by a Master Plumber.
Upon successful completion of this course, students should be able to:
Correct all plumbing violations.
Size and design plumbing systems for residential and commercial buildings.
Define various plumbing systems code.
Change the direction of flow without restrictions regarding drainage fitting patterns.
Apply the standards to control all materials, systems, and equipment used in the construction, installation, alteration, repair, or replacement of plumbing or drainage systems or parts.
Test joints and connections in the plumbing system requiring gas tight and watertight for the pressure required.
Apply the plumbing code regarding how fixtures shall be separately trapped by a water seal trap and placed as close as possible to the fixture outlet.
Demonstrate the proper handling of liquid waste containing grease, flammable wastes and other ingredients harmful to the building drainage system.
Confirm the requirements for plumbing fixtures for accessible use and their installation.
5 Credits

PLB 210 Drains and Sewers
This course focuses on residential drainage and venting systems. It provides explanations of the elements and processes involved in the drainage systems, as well as instructions on appropriate applications. Student will also learn how to diagnosis blockage and slow drain problems associated with improper installation, inferior materials and improper venting.
Upon successful completion of this course, students should be able to:
Design residential drainage, waste and venting systems.
Determine proper fall and sizing for common bathroom groups.
Differientiate between public and private sewage disposals systems.
Identify obstructions in branch drains, waste and soil lines.
Diagnose problems in drainage and venting systems.
Install testing equipment according to local code requirements as pertains to drain lines and venting.
3 Credits 3 Weekly Lecture Hours

PLB 211 Advanced Plumbing
This course introduces advance piping principles as they apply to the plumbing industry. Students learn to identify and use a variety of piping, fittings, and materials in domestic water and drainage installations. These installations could be in new or retro-fit applications.
Upon successful completion of this course, students should be able to:
Identify various material, components, and accessories for water and drainage installation and venting applications.
Explain the differences in piping and fittings used in domestic water systems and drainage systems.
Demonstrate various installation techniques for copper, plastic and domestic water lines.
Idenify drainage fitting patterns, bend, degrees and their common application.
Calculate pitch and grade.
Connect different drainage fittings of dissimilar materials.
Design a bathroom draw a sketch of pipe.
Evaluate gas piping distribution and associated accessories.
Design gas line based on BTU requirements.
Demonstrate knowledge of drilling, boring, and notching techniques as well as installations.
Apply the appropriate techniques to install, repair, and maintain pipes in accordance with local and international plumbing codes.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

PLB 212 Installation of Plumbing Related Fixtures
The purpose of this course is to help students develop the fundamentals skills required to install plumbing related fixtures, faucets and appliances in residential homes. The course builds on the skills students acquire in the introductory Faucets and Fixtures course.
Upon successful completion of this course, students should be able to:
Install selected fixtures.
Adjust applications for proper appearance and function.
Analyze conditions that impact the installation of fixtures.
Demonstrate knowledge of code requirements for residential fixtures.
Demonstrate knowledge of water and drainage testing systems in preparation for testing.
2 Credits 1 Weekly Lecture Hour
1 Weekly Lab Hour

PLB 213 Principles of Prod Hot Water
This course presents the principles of heating water for consumption in a variety of applications. Students also learn the theories and practice of using different fuels to produce hot water systems. In addition, they gain knowledge of several types of hot water systems configurations as well as how to install residential hot water heating systems.
Upon successful completion of this course, students should be able to:
Demonstrate an understanding of the theory of British Thermal Unit.
Explain the principles of domestic hot water heating and circulation.
Analyze the different energy-fuel sources for hot water.
Explain the advantages and disadvantages of various fuel options.
Explain the process for selecting the proper water heater to meet the consumer requirements.
Describe the different hot water heating distribution systems.
Identify the valves, safety devices and control components of domestic hot water heating systems.
Demonstrate an understanding o fthe combustion and venting processess of gas and oil fired hot water units.
Troubleshoot gas, electric, and oil water heater systems.
Discuss layout of solar hot water heaters.
Describe the operation of residential boilers.
Demonstrate an understanding of radiant heating systems.
3 Credits 3 Weekly Lecture Hours

WLD - Welding

WLD 100 Introduction to Welding
This course introduces students to the fundamentals of welding technology. Classroom instruction includes the proper selection of A.C and D.C. power sources and their applications. Oxy-fuel welding and cutting equipment and safety procedures are covered. Also discussed is proper set-up, use of GMAW and GTAW power sources and how to correctly set up and use them. All requirements and safety procedures are covered.
Upon successful completion of this course, students should be able to:
State the power sources associated with welding and their application.
Select the correct welding equipment for the job.
Set up and use oxy-fuel welding and cutting equipment.
Follow safety requirements and regulations.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 101 Introduction to Oxy-Fuel Welding and Cutting
This course introduces students to the basic techniques used in oxy-fuel welding and cutting operations. Course emphasis is on fuel gases, welding and cutting equipment.
Upon successful completion of this course, students should be able to:
List the major advantages and disadvantages of different fuel gases.
Maintain an oxy-fuel welding set.
Demonstrate lighting, adjusting, and extinguishing an Oxy-Fuel flare.
Use an Oxy-Fuel cutting torch.
Demonstrate the safety practices within the work environment.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 102 Oxy-Fuel Welding
This course provides instruction in welding of mill steel. Emphasis is placed on showing correct torch size and angle welding rod size, flame effects on metal, characteristics of the weld, welding in different positions.
Upon successful completion of this course, students should be able to:
Utilize correct method of welding mill steel.
Cite the effects of flame on metal.
Demonstrate ability to weld a variety of joints in any position.
Demonstrate an understanding of safety issues as they pertain to shop safety, occupational safety and personal safety.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 103 Shielded Metal Arc Welding I
This course is designed to enable student learn the fundamentals of Shield Metal Arc Welding. The course covers the principles of electric arc welding, using electrodes 6010, 6011, 6012, 6013 in the flat position, correct angles and methods.
Upon successful completion of this course, students should be able to:
Set correct amperage for welding.
Explain and calculate effects of changing arc length, angle and travel speed on a weld.
Weld in the flat position.
Demonstrate ability to control undercut, overlap, porosity, and slag inclusion when welding.
Demonstrate job safety in the set-up and operation of arc welding equipment.

2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 104 Shielded Metal Arc Welding II
This course covers effects of current settings, arc lengths, electrode angles and electrode manipulation on the quality of weld joint. Students also learn to weld in horizontal, vertical and overhead positions.
Upon successful completion of this course, students should be able to:
State the effects of current settings on the weld.
Control electrodes in the correct manner.
Weld in vertical, overhead, and horizontal positions using 6010 and 6011, 6012 and 6013 electrodes.
Demonstrate the proper handling and storage of electrodes.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 105 Intermediate Shielded Metal Arc Welding I
This course reviews the theories related to Shielded Metal Arc Welding. Students continue to learn and use the proper welding processes and procedures. Various joint designs are emphasized for the various positions using such electrodes as 7018 and 8018.
Upon successful completion of this course, students should be able to:
Detail various joint designs.
Identify joint designs.
Weld joints from designs.
Weld in various positions using E7018 and E8018 electrodes.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 106 Intermediate Shielded Metal Arc Welding II
This course continues the theories covered in Intermediate SMAW 1. Students are taught how to weld typical joints in both flat and horizontal positions using various electrodes. Students are introduced to A.W.S., A.S.M.E. and A.P.I. Welding codes.
Upon successful completion of this course, students should be able to:
Prepare, set up and design tee joints for welding.
Demonstrate procedures for fillet welds in the flat and horizontal positions.
Create E6010 and E6011 fillet welds in flat and horizontal positions.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 111 Printing Reading and Shop Math for Fabricators
This course provides the student with an introduction and review of basic mathematical concepts and applications required to accomplish standard fabrication functions. Students also learn to use common ruled measuring tools and scales in order to perform linear measurements. Students are taught how to locate, interpret and utilize information found in working drawings, blueprints and technical documents.
Upon successful completion of this course, students should be able to:
Perform mathematical calculations required to complete fabrication tasks.
Identify common measurement units in both English (US Convention) and Metric standards.
Demonstrate how to locate and utilize data on blueprints.
Interpret technical drawings, sketches, blueprints.
Demonstrate an understanding of the techniques and design-drafting practices used to create working drawings.
3 Credits 3 Weekly Lecture Hours

WLD 150 Welding Design
This course emphasizes the use of basic drafting skills for lay out of plate steel, sheet metal, and patterns and the selection of welding processes and joint design. Students will calculate and estimate weldment and weld metal, and will learn how to allow for distortion and the use of jigs, fixtures and positioners.
Upon successful completion of this course, students should be able to:
Calculate material costs.
Demonstrate the layout of plate and sheet metals.
Demonstrate the use of fixtures and jigs for design purposes.
Identify and apply approved methods to control distortion.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 151 Testing and Inspection of Welds
This course introduces the principles and applications of non destructive testing using liquid penetrant, magnetic particles, and ultrasonic and radiographic testing methods. Emphasis is placed on non-destructive procedures and interpretation of code specifications and standards.
Upon successful completion of this course, students should be able to:
Cite the principles of non-destructive testing.
Explain the use of liquid penetrant, mag positive and ultrasonic and radiographic testing.
Work with welding and safety codes and standards.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 152 Welding Codes and Specifications
This course is designed to assist students in understanding welding industry codes and specifications. Students also learn to properly apply the codes and specifications.
Upon successful completion of this course, students should be able to:
Demonstrate an understanding of welding codes and their use.
Use welding specifications.
Apply proper use of API, AWS, and ASME codes.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 153 Brazing and Brace Welding
This course discusses the advantages of Soldering and Brazing. Soldering and Brazing methods including building up surfaces, filling holes, filler metals and fluxes are covered.
Upon successful completion of this course, students should be able to:
Explain the use of soldering and brazing.
Use methods involved in soldering and brazing.
Demonstrate basic soldering and brazing of varied joint designs.
Explain the weldability of commercial alloys.
Describe the function of fluxes in making proper liquid-solid paased bonded joints.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 154 Welding Metallurgy
As an introduction to metallurgy, this course helps students develop an understanding of basic metallurgical principles as they apply to fusion welding to improve quality of workmanship in the field of welding. The course material will cover the chemical, physical and mechanical properties of metals as applied to welding applications. Welding metallurgy for welders will cover heat treating processes for metals, physical and mechanical properties of metals, metal identification, carbon equivalency, filler metal selection, heat input and its effects on the weld zone (HAZ) and the effects of heat treating and stress relieving applications within the welding field.
Upon successful completion of this course, students should be able to:
Define the practical aspects of metallurgy.
Identify the fundamental principles and practices of welding metallurgy.
Identify the composition and classification of base metals.
Explain the physical characteristics and mechanical properties of metals.
Identify grain structures and hardfacing of a weldment.
Demonstrate field identification methods of base metals.
Demonstrate preheat, postheat and postweld heat treatment of metals.
Identify hydrogen cracking and its effect on welds.
Identify metallurgical considerations for welding ferrous and non-ferrous metals.
Identify various heat treating processes and their effects on metals.
3 Credits 3 Weekly Lecture Hours

WLD 190 Welding Internship (1 credit)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 60 hour internship will earn 1 college credit for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
1 Credit

WLD 194 Welding Internship (2 credits)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 120 hour internship will earn 2 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
2 Credits

WLD 199 Welding Internship (3 credits)
College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 180 hour internship will earn 3 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.
Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.
Describe the ways that technology is utilized in the work experience.
Analyze the culture of the host organization.
Analyze an operational process within the work experience.
Demonstrate how assigned tasks depend on successful communication.
Describe how time and activity are managed to meet work-imposed deadlines.
Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.
Formulate a self-assessment for career growth and personal satisfaction.
Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).
Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.
3 Credits

WLD 200 Gas Metal Arc I
This course covers GMAW equipment set-up and operation. The theory of gas metal arc welding is applied to mild steel and plate steel in all positions. Students are introduced to single and multi phase welds using a variety of electrode (wire) diameters.
Upon successful completion of this course, students should be able to:
Explain GMAW as applied to nonferrous metals.
Demonstrate different modes of metal transfer.
Practice welding sheet and plate steel in all positions.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 201 Gas Metal Arc II
This course covers the application of gas metal arc welding theory to non-ferrous materials and their alloys. Different modes of metal transfer are addressed.
Upon successful completion of this course, students should be able to:
Show proper GMAW equipment set-up.
Demonstrate threading GMAW wire.
State how to set appropriate gas flow rate and current.
Describe the various methods of metal transfer.
Explain the effect of slope and inductance in gas metal arc welding.
Perform welds in all positions using the short-circuiting metal transfer method.
Weld in the IF, 2F and IG positions using the globular metal transfer method.
Perform welds in the IF and IG positions using the axial spray metal transfer method.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 202 Advanced Shielded Arc Welding I
The Advanced Shielded Metal Arc course continues the theory covered in Shielded Metal Arc Welding II. A variety of electrodes are discussed. The American Welding Society (A.W.S.) numbering system is emphasized. Specifications of A.S.M.E., A.W.S. and A.P.I codes are covered. Students learn mild steel with E6010 in all positions. Students will learn A.W.S. welding symbols and how they are used.
Upon successful completion of this course, students should be able to:
Depict the variety of electrodes in SMAW and their uses.
Explain the AWS numbering system.
Work with ASME, ASTM and API codes.
Weld with E6010 on heavy plate in all positions.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 203 Advanced Shielded Arc Welding II
Students practice all positions, applications and weldments to the specifications of A.W.S., A.S.M.E., A S.T.M. and A.P.I. codes. Also covered is blueprint reading for welding and its uses. Students test welds using non-destructive tests.
Upon successful completion of this course, students should be able to:
Weld in all positions using a variety of electrodes.
Weld in accordance with AWS, ASME, ASTM and API specifications.
Interpret welding blueprints.
Interpret technical information used on industrial working and assembly drawings.
Perform non-destructive testing procedures.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 204 Gas Tungsten Arc Welding I
This course emphasizes the set up and operation of the GTAW process. Various types of tungsten electrodes are covered, along with tolerances and color codes. Welding machines and polar lines that are commonly used are discussed.
Upon successful completion of this course, students should be able to:
Differentiate GTAW welding equipment.
Set up and operate GTAW equipment for welding.
List the types of tungsten and their uses.
Depict the different torches used in GTAW.
Explain the polarities used in GTAW processes.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours

WLD 205 Gas Tungsten Arc Welding II
Gas Tungsten Arc Welding is covered in various positions, using ferrous and non-ferrous sheet and plate. Different welding gases are also used with GTAW processes.
Upon successful completion of this course, students should be able to:
Perform gas tungsten arc weld in various positions.
Use different welding gases in the GTAW process.
Demonstrate gas tungsten arc weld on ferrous and non-ferrous metals.
2 Credits 1 Weekly Lecture Hour
2 Weekly Lab Hours