WD&CE classes are offered year round at dozens of sites throughout Montgomery County, Maryland. This is a compilation of noncredit classes that are offered at the Gudelsky Institute for Technical Education. Classes are offered in the fields of Automotive Technology, Building and Construction Technology, Computer Publishing and Printing, Montgomery College FAB Lab, and Workforce Technologies. Visit the program web page for more information.

Not all of these classes are offered each term. Please check the Course Schedule for information about current class schedules: http://www.montgomerycollege.edu/wdce/courseschedule. Or you may visit the web page listed for each Program. New classes may be added to the schedule throughout the year.
GITE is a facility offering instructional programs in four primary areas: Automotive Technology, Building and Construction Technology, Computer Publishing/Printing and Workforce Technologies. Visit the link below for more information on this program.

http://cms.montgomerycollege.edu/EDU/Department2.aspx?id=21388

### A+ 220-801 Exam Preparation: Module One

**TTG 517**

This is part one of a two part course designed to prepare students to take the CompTIA A+ Certification computer repair technician exams. A+ 220-801 Exam Preparation: Module One will focus on the A+ 220-801 exam topics. But, because the two tests cover overlapping material, many of the same topics will be covered in both Module One and Module Two. Topics to include: assemble and disassemble desktop and notebook PCs; install, configure and maintain devices, PCs and software for end users; networking and security/forensics; properly and safely diagnose, resolve and document common issues while applying troubleshooting skills; provide appropriate customer support and understand the basics of virtualization, desktop imaging, and deployment.

**Course Outcomes:**

1. Assemble and disassemble desktop and notebook PCs.
2. Provide appropriate customer support.
3. Demonstrate an understanding of the basics of virtualization, desktop imaging, and deployment.

### A+ 220-802 Exam Preparation: Module Two

**TTG 518**

This is part two of a two part course designed to prepare students to take the CompTIA A+ Certification computer repair technician exams. A+ 220-802 Exam Preparation: Module Two will focus on the 220-802 exam topics. But, because the two tests cover overlapping material, many of the same topics will be covered in both Module One and Module Two. Topics to include: assemble and disassemble desktop and notebook PCs; install, configure and maintain devices, PCs and software for end users; networking and security/forensics; properly and safely diagnose, resolve and document common issues while applying troubleshooting skills; provide appropriate customer support and understand the basics of virtualization, desktop imaging, and deployment.

**Course Outcomes:**

1. Install, configure and maintain devices, PCs and software for end users.
2. Describe the basics of networking and security/forensics.
3. Diagnose, resolve and document common issues while applying troubleshooting skills.
A+ Certification Repair Technician Cram Course

TTG 284

This three-day course for computer repair technicians is the final preparation you might need to be sure of success when you take your A+ Certification exams. The course is an in-depth look at the two exams required to earn the A+ Certified IT Technician credential: CompTIA exams 220–701 & 220–702. We present up-to-date information on exam changes, a comprehensive explanation of the objectives, exam format and types of questions to expect, and guidance to register and prepare for a successful exam experience. Actual A+ exams are not administered in this course. This course is aimed strictly at exam preparation and review for qualified technicians. Prerequisites: To get the greatest benefit from this course, you should already understand common versions of the Windows operating system and be able to identify, compare, and contrast typical PC hardware.

Course Outcomes:

Upon completion of this course students should be able to:
2. Recognize the different A+ question formats.
3. Develop a strategy for preparing and studying for the A+ exams.

AC / Heat Pump Systems

TTG 384

This course is designed as a study of the operation, installation, servicing, and troubleshooting of cooling-only and heat pump systems. Topics include installation and service procedures, tools, equipment, systems and subsystems, and cooling principles.

This class is co-listed with a credit course by the same name.

Course Outcomes:

1. Describe residential air conditioning system operation.
2. Identify various heat pump systems
3. Describe heat pump cooling process.

Advanced Framing and Exterior Finishing

TTG 480

This course is designed as an advanced carpentry course, emphasizing framing and exterior finishing of residential buildings. Topics include rafter layout and roof framing, stair calculations and installation, steel framing, exterior door and window installation, and roofing and siding materials and installation.

This course is co-listed with a credit course by the same name.

Course Outcomes:

1. Identify roof framing components.
2. Describe stairway layout.
3. Demonstrate an ability to install exterior windows.
### Advanced Photoshop

**TTG 444**

This course continues where Introduction to Photoshop leaves off. Learn advanced techniques - cloning, clipping paths, advanced layer techniques, layer masks, spot colors, color correction, and color separation - and how to prepare images for output to prepress, Internet Web delivery, or for use with other imaging applications.

**Course Outcomes:**

1. Input, edit, and prepare images in a professional, color managed image-editing workflow to prepare print-ready digital images for digital publishing.
2. Proficiently use color samplers, histograms, highlight/shadow, gray balance, levels, curves, sel

### Advanced Solar PV Design

**TTG 537**

This continuing education course designed for general public provides advanced topics in solar PV technology including calculations, energy storage, commercial systems, and more. Topics include: components of battery storage system; residential and commercial POC systems; wire sizing calculations.

**Course Outcomes:**

1. Identify components of a battery storage system.
2. Describe primary differences between a residential and commercial POC system.
3. Perform various wire sizing calculations.

### Apartment Maintenance Technician Certificate

**TTG 500**

This course is designed to teach students how to become certified Apartment Maintenance Technicians. Topics include performing diagnostic tests with an electrical multimeter; repairing damaged wall sections; performing plumbing repairs such as faucet, garbage disposal, and toilet float/value replacement; replacing a defective thermocouple on a gas water heater; and performing electrical repairs on switches, receptacles, luminaires, heating elements, and electrical appliances.

**Course Outcomes:**

1. Perform diagnostic tests with an electrical multimeter.
2. Repair damaged wall sections.
3. Perform plumbing repairs such as faucet, garbage disposal, and toilet float/value replacement.
4. Replace a defective thermocouple on a gas water heater.
5. Perform electrical repairs on switches, receptacles, luminaires, heating elements, and electrical appliances.
ASE A-1 Engine Repair Prep

TTG 434

Course prepares you for the ASE A-1 Engine Repair technician certification exam. Course covers testing, repair, removal, rebuilding, installation, and break-in of an internal combustion engine. Prerequisite: Intro to Auto Tech or current employment as a repair technician or technician's helper.

Course Outcomes:
1. Inspect engine assembly for leaks; determine necessary action.
2. Diagnose engine noises and vibrations; determine necessary action.
3. Perform engine mechanical tests; interpret results.
4. Perform OHV and OHC valve train repairs.
5. Perform

ASE A-3 Manual Drive Train and Axles Prep

TTG 443

Course prepares you for the ASE A-3 Manual Drive Train and Axles technician certification exam. Course covers inspection, testing, service, and repair of manual transmissions, transaxles, transfer cases, and differentials. Prerequisite: Intro to Auto Tech or current employment as a technician or technician's helper.

Course Outcomes:
1. Remove/Replace transmission and transaxle assembly (unit).
2. Remove/Service/Replace driveshafts and axle shafts.
3. Overhaul a RWD manual transmission.
4. Overhaul a FWD manual transaxle.
5. Overhaul an AWD/4WD transfer case.
6. Overhaul a

ASE A-4 Suspension and Steering Prep

TTG 435

Course prepares you for the ASE A-4 Suspension and Steering technician certification exam. Topics include purpose, parts, operation, failure diagnosis, and repair of suspension and steering systems. Two- and four-wheel alignment is included. Prerequisite: Intro to Auto Tech or current employment as a repair technician or technician's helper.

Course Outcomes:
1. Identify steering system components.
2. Identify suspension system components.
3. Perform diagnostic routines associated with steering and suspension system concerns.
4. Use special tools to effect steering and suspension system repairs.
5. Perform basic measurements of and adjustments to steering and suspension systems.
### ASE A-5 Brakes Prep

**TTG 436**

Course prepares you for the ASE A-5 Brakes technician certification exam. Course discusses purpose, parts, operation, failure diagnosis, and repair of disc and drum brake systems. ABS operation, diagnosis, and repair is included. Prerequisite: Intro to Auto Tech or current employment as a repair technician or technician's helper.

**Course Outcomes:**

1. Identify and interpret brake system concerns.
2. Diagnose and repair hydraulic system failures.
3. Diagnose and repair incorrect operation of a drum brake assembly.
4. Diagnose and repair incorrect operation of a disc brake assembly.
5. Repair

### Automotive Electricity I

**TTG 437**

This course is part one of a three-part series. The SERIES prepares you for the ASE A-6 Electrical/Electronic Systems technician certification exam. Topics include basic electrical concepts applicable to automotive components, circuits, and systems. Common failures, diagnostic techniques, and repair procedures are covered. Selection, use, and maintenance of specialized tools is emphasized. Wiring diagram tracing is included.

**Course Outcomes:**

1. Use Ohm's Law to calculate Voltage, Current or Resistance.
2. Use the Power Formula to calculate Voltage, Current or Power.
3. Use a DMM to measure voltage, resistance, continuity and current.
4. Use a current clamp to measure current.
5. Use

### Basic Automotive Maintenance

**TTG 047**

Course introduces the student to modern automotive systems and sub-systems, their service and maintenance. Use and selection of hand, power and specialty tools is discussed. Repair industry practices and career options are covered.

**Course Outcomes:**

1. Locate service and repair information using an electronic retrieval system.
2. Demonstrate the proper way to jack, hoist and support a car or light truck.
3. Describe the purpose and operation of major vehicle systems and sub-systems.
4. Perfor
Basic Electrical Principles and Practices

TTG 338

This continuing education course designed for apprentice or journeyman level electricians, building maintenance technicians as well as anyone wishing to further their understanding and knowledge of electricity. Topics include: electrical theory; grounding and bonding; fusing, wiring, and switching techniques; electrical measuring equipment; schematic and construction drawings; transformers and motors; service, conductor, and raceway calculations.

Course Outcomes:
1. Explain OHM's Law.
2. Operate an Ohmmeter.
3. Identify electrical components on drawings.
4. Explain motor principles.

Basic Engine Performance

TTG 439

This course is part one of a three-part series. The SERIES prepares you for the ASE A-8 Engine Performance technician certification exam. Topics include engine mechanical evaluation and electronic engine control. Engine leaks, noises, vibration, and exhaust smoke will also be discussed. PCMs, scan tools, DTCs, and PCM modes and sensors are included. Students should have taken "Automotive Electricity I" or be currently employed as a technician or technician's helper familiar with basic electrical theory and DMM operation.

Course Outcomes:
1. Determine the cause of engine fluid leaks.
2. Perform/Interpret results of a power balance and/or compression tests.
4. Retrieve serial data, freeze-frame data and DTC's using a scanner.
5. Inspect/Test/Replace oxygen, temperature, position, pressure, airflow and motion sensors.

Basic Repair: Appliance Maintenance

TTG 507

Learn how to do basic home appliances maintenance. Topics include dryer vents, HVAC filters, water heater and boiler thermocouples, and more.

Course Outcomes:
1. Replace a bad water heater thermocouple.
2. Replace a forced-air filter.
3. Replace a water filter.
<table>
<thead>
<tr>
<th>Course Title</th>
<th>Course Code</th>
<th>Course Description</th>
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</thead>
<tbody>
<tr>
<td>Basic Repair: Carpentry</td>
<td>TTG 297</td>
<td>This 12-hour course will prepare students to perform carpentry skills such as basic framing, door and window installation, trim installation, and deck design and construction. The class will cover tools and materials as well as the safe performance of standard construction methods and techniques. The course is taught by a qualified technician with professional experience in the field. Course Outcomes: Upon completion of this course students should be able to: 1. Safely operate carpentry hand and power tools. 2. Install prehung doors and windows. 3. Frame a standard, wood-stud wall. 4. Layout and construct a simple wooden deck.</td>
</tr>
<tr>
<td>Basic Repair: Deck Design and Construction</td>
<td>TTG 055</td>
<td>This course is designed to teach students how to design and build a deck. Basic deck building procedures and techniques will be covered, from layout to finishing. Types of decks and various methods and materials used to build them will also be explored. Course Outcomes: 1. Identify various types of residential decks. 2. Design and construct a basic deck. 3. Identify and describe various deck-building materials.</td>
</tr>
<tr>
<td>Basic Repair: Drywall Patch, Painting, and Wallpapering</td>
<td>TTG 227</td>
<td>Learn how to repair damaged drywall using standard patching techniques, and the best methods and materials for painting and wallpapering. This course will cover the tools, materials, and techniques used by professionals. Course Outcomes: 1. Patch cracks, holes, and dents in drywall. 2. Select the appropriate quick drying material to make patches. 3. Apply interior paints and primers to walls and trim. 4. Select the appropriate paints and primers for the job. 5. Apply prepasted and...</td>
</tr>
</tbody>
</table>
Basic Repair: Electrical

TTG 229

This course prepares you to replace bad electrical components and install outlets and fixtures safely and according to National Electrical Code specifications. Learn the proper techniques for wiring and connecting, as well as the different types of circuits.

Course Outcomes:
1. Install a 15-amp receptacle.
2. Replace an existing lighting fixture.
3. Connect a wired circuit to an existing circuit breaker or fuse.

Basic Repair: Flooring and Tile Installation

TTG 026

Learn to install laminate and hardwood flooring, vinyl floor coverings, and ceramic tile on floors, walls, and countertops.

Course Outcomes:
1. Install hardwood flooring.
2. Install ceramic tile.
3. Describe various floor coverings.

Basic Repair: Plumbing

TTG 228

Learn how to properly replace faulty plumbing fixtures and perform typical maintenance. Topics include gluing plastic pipe, soldering copper pipe, making connections, and replacing faulty or leaking components.

Course Outcomes:
1. Replace a kitchen sink faucet.
2. Install and connect a residential toilet.
3. Install a bathroom lavatory drain.
### Battery/Starting/Charging

**TTG 438**

This course is part two of a three-part series. The SERIES prepares you for the ASE A-6 Electrical/Electronic Systems technician certification exam. Topics include purpose, parts, operation, failure diagnosis, and repair of automotive batteries, cranking systems, and charging systems. Cruise control, RKE, theft-deterrent, and remote-start systems are also covered. Prerequisite: Automotive Electricity I or current employment as a technician or technician's helper familiar with basic electrical theory and DMM operation.

**Course Outcomes:**

1. Explain common battery ratings and performance standards.
2. Perform common battery tests and interpret results.
3. Diagnose and Repair common starting circuit failures.
4. Diagnose and Repair common charging system failures.

### Building Codes and Standards

**TTG 379**

This course is designed as an examination of building codes and standards applied to residential buildings. The International Residential Code (IRC) will be emphasized, and local area amendments will be addressed. Topics include planning and permitting, foundations, floors, walls, roofs, energy efficiency, chimneys, and fireplaces.

This course is co-listed with a credit course by the same name.

**Course Outcomes:**

1. Identify appropriate IRC codes and their applications
2. Describe permitting process.
3. Identify common IRC violations.

### Building Technology and Documentation

**TTG 491**

This course is designed for prospective entry-level architectural designers and provides instruction on developing career skills in architecture. Topics include an introduction to the architectural profession and the related fields of design and construction, an exploration of the impact of architecture within the build environment including conservation and interior design issues, urban and regional planning, construction implications, and an examination of the entire building process and the legal, social, and cultural implications.

**Course Outcomes:**

1. Prepare hand-drafted drawings that follow professional standards in format.
2. Identify and illustrate basic components in light frame building construction.
3. Interpret architectural symbols and conventions of documentation.
4. Apply principles of geometric construction in the execution of their drawings.
Building Trades Blueprint Reading
TTG 008
Focus on reading and interpreting working construction drawings and making practical applications in the building trades, primarily in carpentry, electrical, plumbing, and HVAC/R. Topics include drawing types; symbols and terminology; interpreting scale and dimensioning; floor plans; and mechanical, elevation, and detail drawings. Textbook is available at the Rockville Campus Bookstore.

Course Outcomes:
1. Recognize residential blueprint symbols.
2. Describe a typical floor plan.
3. Apply plans to working situations.

BUILDING TRADES CFC CERT
TTG 056
This course is designed for building trades students to pass the Air Conditioning Contractors of America certification exam for Type I, II, III, and universal refrigeration systems.

Course Outcomes:
1. Identify various HVAC refrigerants
2. Describe environmental issues surrounding HVAC refrigerants

CAD: Building Modeling Information System I
TTG 492
This course is designed for prospective entry-level architectural designers and provides instruction on developing career skills in drawing buildings. Topics include: skills and understanding of a parametric computer drafting system based on construction components, elements, families, and types with specific usage of building modeling information software. Students will learn to create building models with BIMS software. Skills will include views, sheets, tagging and scheduling, annotating, dimensioning, and detailing. Final project will be a set of Building Modeling Information System (BIMS) documents based on residential and commercial structure.

Course Outcomes:
1. Distinguish the concepts of building information modeling rendering commands.
2. Demonstrate expertise in the most current version of AutoCAD BIMS software, REVIT.
3. Measure area and volume.
4. Describe the complexity of construction in terms of building code compliance.
5. Prepare a set of rendering set of views including site contours and solar orientation.
CFC Certification for Apartment Maintenance Technicians

TTG 501
This course is designed to teach apartment maintenance technicians how to recover CFCs. Topics include environmental issues associated with CFCs, different types of refrigerants, and safely handling refrigerants and associated equipment.

Course Outcomes:
1. Identify environmental issues associated with CFCs.
2. Identify different types of refrigerants.
3. Safely handle refrigerants and associated equipment.

Chassis Circuits

TTG 445
This course is designed to prepare students for the ASE A-6 Electrical/Electronic Systems technician certification exam. Course discusses operation and failure diagnosis of interior and exterior lighting systems; gauge, warning, and driver information systems; horn, wiper/washer, and heated glass circuits; motor-driven accessory circuits; and supplementary restraint systems.

Course Outcomes:
1. Explain the function of the various Automobile Chassis Circuits, Lighting, Gauges, Warning, Driver Information, Horn, Wiper/Washer, Heated Glass, Motor Driven Accessories, and SRS Systems.
2. Employ the use of service information to assist in diagnosing electrical concerns.
3. Identify the effects of component and system malfunction on chassis electrical circuits.
4. Practice using DVOM’s, Scan Tools and Scopes to diagnose a series of instructor simulated electrical concerns.
5. Demonstrate the ability to read and use wiring diagrams in the diagnosis and repair of chassis circuits.

CLV - Automotive Maintenance and Light Repair

TTG 540
This course is designed to provide technical training on Domestic and Import Vehicles. The content in this course is designed to provide the required Maintenance and Light Repair information and experience so that the student can pass ASE Certification G-a1. Strategies for diagnosis will be discussed and demonstrated. Topics include: Systems Theory and Operation, Maintenance and Diagnosis and Repair for Brakes, Suspension and Steering, Engines, Automotive fluids, Drive trains. This is a contract course for Carquest.

Course Outcomes:
1. Describe normal operation of EVAP Monitor during a run cycle.
2. Discuss Domestic and Import vehicle EVAP Monitoring while the vehicle is parked over night.
3. Describe the purpose of monitoring EVAP leaks over night.
4. Discuss EVAP Fault codes, challenges leak testing for leaks a small as 0.020”.
5. Explain why some systems may require over 16 hours of testing data to be captured before a PASS or FAIL.
CLV 100 - Automotive Maintenance and Light Repair

TTG 524

This continuing education course is designed for lab students of Centro Latino Vocational in Wheaton and provides necessary knowledge and working skills to perform vehicle maintenance and light repair. Topics include: identification and safe use of hand, pneumatic and electrical tools used in automotive repair; operating systems of the modern automobile; basic maintenance and light repair strategies for service and diagnosis.

Course Outcomes:

1. Perform an oil change.
2. Perform a coolant change.
3. Perform Disc brake and Drum brake service and repair.
4. Perform ignition system service, plugs and wires.
5. Perform transmission fluid and filter service.

CLV-2015 Automotive Maintenance and Light Repair

TTG 548

This continuing education course is designed for the auto repair technician and provides technical training on Domestic and Import Vehicles. Topics include: Systems Theory and Operation, Maintenance and Diagnosis and Repair for Brakes, Suspension and Steering, Engines, Automotive fluids and Drive trains. The content in this course is designed to provide the required Maintenance and Light Repair information and experience so that the student can pass ASE Certification G-1.

Course Outcomes:

1. Describe the various systems and subsystems of the modern automobile.
2. Discuss Domestic and Import vehicle maintenance and service required in time and in mileage.
3. Perform light repair and maintenance for Brakes, Suspension and Steering, Engines and Drivetrains.
4. Discuss automotive fluid and hazardous waste regulations and disposal.
5. Demonstrate handtool and pneumatic tool use and safety.

Commercial Electrical Wiring

TTG 381

This course is designed as an advanced electrical course, emphasizing wiring of commercial buildings. Topics include conduits and cables, branch circuits and feeders, fasteners, motors and transformers, services and panelboards, and commercial wiring codes and specifications.

This course is co-listed with a credit course by the same name.

Course Outcomes:

1. Identify commercial building wiring codes and their applications.
2. Demonstrate an ability to install a motor circuit.
3. Describe transformer principles.
### Computer Applications in Construction

**TTG 502**

This course reviews the fundamental software applications used in construction management, administration, estimating, scheduling and cost control. Topics include an introduction to several software packages used in subsequent courses, internet applications, and emerging technologies in construction. Software packages reviewed and applied include Microsoft Word, Excel and Powerpoint; Timberline for estimating and Primavera P^ for scheduling.

**Course Outcomes:**

1. Demonstrate competence using word processing software to develop documents typically used in construction
2. Use spreadsheet software to produce, maintain and sort various construction logs; to produce estimates; and to summarize information
3. Demonstrate familiarity with computer estimating using Timberline Estimating software
4. Demonstrate use of computer scheduling software using Primavera Project Planner (P6)
5. Discuss emerging uses of technology in the construction industry including web based project management software and building information modeling (BIM)

### Computer Hardware Repair and Upgrade

**TTG 176**

Course description is not available.

**Course Outcomes:**

Outcomes are not available.

### Computer Hardware Repair and Upgrade--Troubleshooting

**TTG 235**

Learn to diagnose and repair common PC and peripheral device software problems. Course content includes troubleshooting techniques and repairing problems with printers, monitors, hard drives, interface cards, and peripheral device configurations. Textbook is available at the Rockville Campus Bookstore.

**Course Outcomes:**

Outcomes are not available.
Construction Estimating

**TTG 418**

This course includes an overview of the estimating process, estimator's role, bidding process, contract documents, and other requirements affecting the preparation of a construction estimate. Emphasis is placed on preparing quantity takeoffs for general conditions, site work, concrete, masonry, structural steel, wood, thermal and moisture control, doors, windows, and finishes. Common pricing techniques and the use of computers in estimating are introduced. A basic knowledge of construction, plan reading, and basic math is required.

**Course Outcomes:**

1. Demonstrate an understanding of all general aspects and variables related to construction estimating.
2. Describe and understand the bidding process and all its steps.
3. Demonstrate a working knowledge of the quantity takeoff process as it applies.

Construction Estimating for Small Contractors

**TTG 531**

This continuing education course is designed for small construction contractors and provides instruction on developing career skills in the field of construction estimating. Topics include: construction plan reading; estimating math and the preparation of a basic construction estimate; Quantity Takeoff; calculation of direct costs (labor, materials and equipment) and calculation of indirect costs (overhead, profit).

**Course Outcomes:**

1. Demonstrate an understanding of the basic concepts of plan reading, as they apply to estimating, floor plans, sections, elevations and details.
2. Perform basic estimating math, decimal conversions, length, area and volume calculations.
3. Perform a methodical approach to Quantity Takeoff.
4. Calculate direct costs such as labor, material and equipment costs.
5. Demonstrate how to consolidate the estimate by adding indirect costs such as overhead, profit, taxes.

Construction Field Operations

**TTG 494**

The course introduces field management procedures from the project superintendent's perspective. Topics include jobsite analysis and planning, equipment utilization, labor and material coordination, field records and documentation, field scheduling, safety programs and methods, and production efficiency and improvement. The course includes site visits and observations to supplement class discussions.

**Course Outcomes:**

1. Understand the roles performed by the project superintendent assigned to a construction project
2. Describe and understand the jobsite layout
3. Demonstrate a good understanding of field records and jobsite administration through the use of field reports and general administrative procedures
4. Describe and understand the basic methods of construction scheduling used both at the construction firm’s office and at the jobsite
5. Demonstrate an understanding of basic safety procedures implemented at a construction site
Construction Management

TTG 495
This course includes a comprehensive overview of the elements of construction project management. Emphasis is placed on the business processes and management techniques the companies use to manage and control construction projects. Topics include an overview of the construction and design industries, different types of company organizations, construction documents and contracts, project delivery methods, responsibilities of the construction manager, project chronology, estimating / bidding and procurement procedures, cost and time control strategies, and site administration. A general understanding of construction and architecture is required to take this course.

Course Outcomes:
1. Demonstrate an understanding of the process of planning, organizing, staffing, directing, and controlling a construction project.
2. Recognize and have a basic understanding of the various contract documents used in the construction business.
3. Describe the construction manager’s role and responsibilities during the design phase as well as the construction phase.
4. Understand the terminology and language related to construction management.
5. Describe the numerous techniques and methods used to control the cost and time elements of building construction.

Construction Methods and Materials

TTG 493
This course includes an introduction to the terminology, characteristics, and properties of various building materials and construction methods. Particular emphasis is placed on how to select and install various materials and building components.

Course Outcomes:
1. Understand the manner in which buildings are constructed.
2. Recognize the various participants, and their respective responsibilities, in the process of construction
3. Demonstrate a comprehensive knowledge of the properties and technology associated with the most common materials used in construction such as concrete, masonry, steel, and wood.
4. Identify the methods and materials used in the basic building systems such as foundations, concrete and steel structures, wood framing, roofing systems, glass and cladding systems, and finish systems.
5. Demonstrate a basic understanding of the terminology related to sustainability issues in building construction.
Construction Planning and Scheduling
TTG 457
This course is designed to review and analyze the planning and scheduling requirements used to manage construction projects. It will cover the preparation and pre-construction planning performed by the Project Manager and Project Superintendent. You will learn how to manually develop a Critical Path Method (CPM) for planning of construction operations. You will use Primavera Scheduling software to develop the list of activities for the project, the duration of activities, project critical path, and duration. Management reports will be developed and analyzed.

Course Outcomes:
1. Identify pre-construction planning activities.
2. Determine crew/days and labor/hour duration.
3. Determine project duration and critical path through forward/backward pass.
4. Perform computer driven CPM.

Construction Surveying
TTG 496
This course introduces attendees to typical surveying and layout methods including the use of mathematics and formulas required to perform layout functions. Using surveying and layout instruments, attendees are able to establish and measure lines, elevations, angles, building layout and basic grading layout. Laboratory exercises focus on fieldwork and use of surveying equipment. A basic knowledge of construction is required. Basic knowledge of Trigonometry is recommended.

Course Outcomes:
1. Demonstrate an understanding of math formulas and calculations used in surveying
2. Demonstrate a working knowledge of a surveying level, theodolite, and Total Station.
3. Apply their knowledge of surveying instruments towards the process of determining surveying lines and elevations
4. Demonstrate a basic understanding of the process of building layout using surveying instruments
5. Demonstrate an understanding of techniques used for basic grading procedures

Design Principles
TTG 505
This course introduces design elements including color, space, form, texture, and lighting in two and three-dimensional spaces. Topics include design theory which will be used to complete various drawings and studies. Topics include the elements and principles of design in interior projects; mixing color and using color harmonies; formulating design concepts and using them in interior projects; building simple models; using the principles of design in simple custom furniture designs.

Course Outcomes:
1. Demonstrate the ability to use the elements and principles of design in interior projects.
2. Demonstrate the ability to mix color and use color harmonies
3. Demonstrate the ability to formulate design concepts and use them in interior projects.
4. Demonstrate the ability to build simple models.
5. Demonstrate the ability to use the principles of design in simple custom furniture designs.
Electrical Calculations

TTG 038

Learn how to perform calculations associated with electrical construction, including service load calculations, conduit fill, wire de-rating, conductor loads, motor calculations, and more. Course will apply NEC calculations to field applications. Bring a copy of the 2008 NEC book to the first class. This course fulfills the Prince George’s County continuing education requirement for electrical license renewal. Only students with 100% attendance will receive a certificate of completion.

Course Outcomes:
1. Perform a service load calculation.
2. De-rate various wire combinations.
3. Calculate conduit fill for various raceways.

Engine Performance II

TTG 440

This course is part two of a three-part series. The SERIES prepares you for the ASE A-8 Engine Performance technician certification exam. Topics include inspection, testing, service, and repair of automotive induction, fuel delivery, and ignition systems. Prerequisite: Basic Engine Performance or current employment as a technician or technician's helper familiar with basic electrical theory, DMM operation, and OBD systems including sensor types, operation, and testing.

Course Outcomes:
1. Inspect, service and repair failures in the air induction system.
2. Inspect, service and repair failures in the fuel supply system.
3. Inspect, service and repair failures in the exhaust system.
4. Inspect, service and repair failures in the ignition system.

Engine Performance III

TTG 441

This course is part three of a three-part series. The SERIES prepares you for the ASE A-8 Engine Performance technician certification exam. Topics include inspection, testing, service, and repair of automotive emission control systems. Driveability complaints are addressed. Prerequisite: Basic Engine Performance or current employment as a technician or technician's helper familiar with basic electrical theory, DMM operation, and OBD systems including sensor types, operation, and testing.

Course Outcomes:
1. Verify/Diagnose typical driveability complaints.
2. Retrieve/Interpret DTC's, readiness monitors and freeze-frame data.
3. Interpret exhaust gas analyzer and I/M 240 test results.
4. Diagnose incorrect tubro or super-charger operation.
EPA Certification for CFC Recovery

TTG 234

After five hours' instruction in principles and practices of refrigerant recovery, safety, and environmental issues (recommended in the EPA Guidelines), you may take the Air Conditioning Contractors of America certification test for Type I, II, III, and universal refrigeration systems. Course fee includes instruction, test, and required manuals. (Please pick up manuals two weeks before class begins. Call 240-567-7172 for information.)

Course Outcomes:
Outcomes are not available.

Fab Lab 3D Printer Applications Introduction

TTG 544

This continuing education course is designed to teach students applications using the 3D (three-dimensional) printer and CAD (computer-aided design) software. Instruction will support proficiency in use of existing STL files and Part123D. This course also includes a comprehensive final project. Topics include safety procedures, machine setup, and operation.

Course Outcomes:
1. Demonstrate proficiency in STL files and Part123D.
2. Describe the uses of the 3D Printer and CAD.

Fab Lab 3D Printer Open Lab

TTG 062

The Fab Lab 3D Printer Open Lab is for open enrollment students to work on their own, with limited assistance, in creating innovative products and designs. Students must submit for approval by the instructor, any design work they wish to create. These designs must be in a digital format. The student must demonstrate the ability to safely set up and operate the 3D printer.

Course Outcomes:
Create a digital 3D file to be used to produce an item using the 3D printer.
Demonstrate the ability to safely operate the 3D printer.
Set up correctly and operate the 3D printer to fabricate a product.

Fab Lab CNC Router Applications Introduction

TTG 543

This continuing education course is designed for general population and instruction for students to learn applications using the Forest Scientific CNC Router and Vetric- V-Carve software. This course also includes a comprehensive final project. Topics include: safety procedures, machine setup, and operation.

Course Outcomes:
1. Demonstrate proficiency in Scientific CNC Router and Vetric-V-Carve Software.
2. Demonstrate safety procedures.
Fab Lab Introduction

TTG 538

This continuing education course designed for general public provides an Introduction to Fabrication Laboratory Technology. Topics include: Identify the various types of machinery in the Fab Lab; Identify the software used for each machine; Recognize the process in which digital files are handled and transferred to the equipment. Discuss procedures to adhere to general Fab Lab safety protocol; Recognize the handling of each piece of equipment.

Course Outcomes:

1. Identify the various types of machinery in the Fab Lab.
2. Identify the software used for each machine.
3. Recognize the process in which digital files are handled and transferred to the equipment.
4. Discuss procedures to adhere to general Fab Lab safety protocol.
5. Recognize the handling of each piece of equipment.

Fab Lab Laser Cutter Applications Introduction

TTG 542

This continuing education course is designed for general population and provides instruction on applications using laser cutter/engraver. Instructions will support proficiency in CorelDraw and Inkscape software. This course also includes a final comprehensive project. Topics include: Safety procedures, machine setup, and operation.

Course Outcomes:

1. Demonstrate safety procedures.
2. Demonstrate the process involved in setting up and operating laser engraver.
3. Demonstrate proficiency in CorelDraw and Inkscape software.

Fab Lab Open Lab

TTG 061

The Fab Lab Open Lab is for open enrollment students to work on their own, with limited assistance, in creating innovative products and designs. Students must submit for approval by the instructor, any design work they wish to create. These designs must be in a digital format. Machines include laser cutters, a vinyl cutter, and a CNC router. The student must demonstrate the ability to safely set up and operate various Fab Lab equipment.

Course Outcomes:

Create a digital file to be used to produce an item using the Fab Lab equipment.
Demonstrate the ability to safely operate various Fab Lab equipment.
Set up correctly and operate various digital fabrication equipment to fabricate a product.
Fundamentals of Carpentry

TTG 477

This course is designed as an introduction to framing and the carpentry trade. Topics include material selection and estimating, basic calculations, tools, print reading, layout, and floor, wall, and ceiling framing.

This course is co-listed with a credit course by the same name.

Course Outcomes:

1. Identify typical framing tools and materials.
2. Describe the wall framing process.
3. Install wall studs and ceiling joists.

Fundamentals of Electrical Wiring

TTG 478

This course is designed as an introduction to electrical wiring and the electrical trade. Topics include material identification and selection, tools, electrical theory, switch and receptacle wiring, electrical plans reading, and electrical safety.

This course is co-listed with a credit course by the same name.

Course Outcomes:

1. Identify typical electrical wiring tools and materials.
2. Describe a basic electrical circuit.
3. Demonstrate an ability to install various residential electrical circuits.

Fundamentals of Plumbing

TTG 479

This course is designed as an introduction to plumbing and the plumbing trade. Topics include material identification and selection, tools, water supply and waste systems, pipes and fittings, fixtures, plumbing plans reading, and water heaters.

This course is co-listed with a credit course by the same name.

Course Outcomes:

1. Identify typical plumbing tools and materials.
2. Describe a typical fresh water system.
3. Demonstrate an ability to install various plumbing fixtures.
Fundamentals of Refrigeration

TTG 373

This course is designed as an introduction to the theory, principles, and applications of heat transfer as applied to refrigeration processes and the compression refrigeration cycle. Topics include refrigerants, system performance, tools, tubing and fittings, soldering and brazing, and system charging and evacuation.

Course Outcomes:

1. Describe the refrigeration cycle.
2. Identify refrigeration cycle components.
3. Demonstrate an ability to solder copper tubing.

Heating Systems

TTG 383

This course is designed as a study of the operation, installation, servicing, and troubleshooting of gas, oil, and electric forced-air heating systems. Topics include installation and service procedures, tools, equipment, systems, fuels, and principles of combustion.

This course is co-listed with a credit course by the same name.

Course Outcomes:

1. Describe combustion process.
2. Identify various heating fuels.
3. Describe various residential heating systems.

HVAC Electricity

TTG 374

This course is designed as an introduction to the theory and applications of electricity as applied to heating, ventilation, and air conditioning systems. Topics include Ohm’s Law, schematics, control and line voltage circuits, meters, motors, and troubleshooting.

Course Outcomes:

1. Describe an electrical circuit.
2. Identify electrical circuit components.
3. Demonstrate an ability to measure voltage in an alternating circuit.
HVAC Industry Competency Prep

TTG 058

This course will prepare students for entry-level industry competency evaluation in residential HVAC.

Course Outcomes:

Describe the operation of a natural gas furnace.

Describe the operation of a central AC system.

Describe operational differences between heat pump and AC systems.

HVAC Technician Development

TTG 375

This course is designed as an overview of the HVAC technician’s professional development responsibilities and opportunities. Refrigerant transition and recovery certification training will be provided. Topics include career opportunities, customer relations, safety, and environmental issues.

Course Outcomes:

1. Identify various refrigerant types.
2. Describe common duties of HVAC technicians.
3. Describe environmental issues associated with refrigerant usage.

Interior Design I

TTG 503

This course is designed to teach the basics of interior design - space planning, color, furniture, lighting, and textiles. Basic drafting and scale will be taught as well as 2D and 3D presentation methods. Projects will explore residential, kitchen and commercial design. Topics include the design process and the elements and principles of design to complete design projects; space planning and know the spatial requirements for furniture; correct use of lighting, color, textiles and furniture in their projects; using an architectural scale and draft at a basic level; and drawing elevations, isometrics and perspectives and construct presentation boards.

Course Outcomes:

1. Demonstrate the ability to use the design process and the elements and principles of design to complete design projects.
2. Demonstrate the ability to plan space and know the spatial requirements for furniture.
3. Demonstrate the ability to correctly use lighting, color, textiles and furniture in their projects.
4. Demonstrate the ability to use an architectural scale and draft at a basic level.
5. Demonstrate the ability to draw elevations, isometrics and perspectives and construct presentation boards.
**Introduction to Auto Tech**

**TTG 433**

Service and maintenance of modern automotive systems and sub-systems are introduced. Use and selection of hand, power, and specialty tools is discussed. Repair industry practices and career options are explored.

**Course Outcomes:**

1. Locate service and repair information using an electronic retrieval system.
2. Properly jack, hoist and support a car or light truck.
3. Describe the purpose and operation of major vehicle systems and sub-systems.
4. Perform routine maintenance

**Introduction to Desktop Publishing**

**TTG 430**

Learn how to create fliers, brochures, newsletters, and magazines with InDesign on the Macintosh. Desktop publishing techniques covered include typography; page design principles; document setup and manipulation; and application of digital and scanned images, text, and art work.

**Course Outcomes:**

1. Identify and proficiently use all tools in the applications tool box.
2. Create and apply paragraph, character, and object style sheets.
3. Manipulate and format text.
4. Import graphics, text, and illustrations.
5. Create a table.
6. Set up

**Introduction to Hybrid Electric Vehicles (HEVs)**

**TTG 508**

This course is a technical course designed to train the working automotive service repair technician or the automotive technology student on how to safely work on Hybrid Electric Vehicles (HEV's). Safety, testing, and replacement of Hybrid components is covered. Diagnosis, testing and repair of the vehicle as it relates to hybrid component malfunctions is also covered.

**Course Outcomes:**

1. Describe the various HEV systems.
2. Identify HEV components.
3. Demonstrate proper safety procedures when working on High voltage HEV's.
4. Demonstrate accurate use of scopes, scantools and DVOM's in HEV system testing and diagnosis.
5. Perform testing, diagnosis and removal and installation of hybrid components.
### Introduction to Machining

**TTG 201**

Introduction to basic machine shop practices, including a review of the history of machine tools, safety, measurements and precision measuring tools, lay-out, blueprint reading, bench and hand tools, power saws, drill presses, lathes and milling machines. Note: Students must furnish their own eye and ear protection devices. Textbook is available at the Rockville Campus Bookstore.

**Course Outcomes:**

Outcomes are not available.

### Introduction to Photoshop

**TTG 431**

Learn how to use the powerful Photoshop imaging software to scan, layer elements, create photographic montages, and make tonal corrections of halftone images for use in high-quality printing, Internet, and other electronic media. For more information regarding this course please contact Frederick Howell at frederick.howell@montgomerycollege.edu.

**Course Outcomes:**

1. Demonstrate an understanding of image resolution, color mode and file formatting.
2. Demonstrate competence in choosing and working with image editing tools.
3. Demonstrate competence in using desktop scanners to scan art and continuous tone photo

### Introduction to the Building Trades

**TTG 010**

This introductory course covers general aspects of residential construction, including major building systems and components and their relationship with the building trades. Career options, opportunities, professional preparation, and conduct in the building trades will be explored. Textbook is available at the Rockville Campus Bookstore.

**Course Outcomes:**

1. Demonstrate an understanding of various phases of building construction.
2. Recognize building systems and components.
3. Describe training requirements for various trades.
Journeyman Electrician Exam Prep

TTG 382

This course is designed as an examination of the National Electrical Code (NEC) and its application in electrical construction. Topics include terminology, wiring specifications and methods, grounding and bonding, tables and calculations, overcurrent protection, services, branch circuits and feeders, raceways, cables, motors, and equipment.

This course is co-listed with a credit course by the same name.

Course Outcomes:

1. Identify various NEC Articles and their applications.
2. Define overcurrent protection.
3. Calculate conductor size according to Table 310.16.

Kitchen/Bath Appliances and Equipment

TTG 426

Design professionals will learn the latest kitchen appliances and bath fixtures and fittings and their application. The categories of kitchen appliances and equipment will be discussed. Available finishes and correct application of products will be reviewed along with the mechanical, plumbing and electrical requirements associated with each product. Following the classroom segments, you will visit local area appliance and bath fixture showrooms where you will be introduced to the equipment and participate in hands-on demonstrations.

Course Outcomes:

1. Interpret kitchen and bath appliance and equipment product information for installation requirements.
2. Distinguish between the different finishes and features offered for kitchen and bath appliances and equipment and select the appropriate finish and features for your project.
3. Show knowledge of product operation.

Machining Intermediate

TTG 511

This course is designed to provide the student with an understanding of intermediate lathe operations including thread cutting procedures, as well as intermediate mill set-up and operation. Other topics will include shop mathematics, intermediate blueprint reading, and an introduction to heat-treatment.

Course Outcomes:

1. Describe and demonstrate various methods of cutting threads on a lathe.
2. Demonstrate the ability to set up angled cuts on a milling machine by changing the angle of the vise, and/or changing the head forward tilt and/or head side tilt angle. Verify the angle using trigonometry, indicators, sine bars, and gage blocks.
3. Demonstrate the ability to reset the head and vise to the "normal" square position using indicators and parallels.
4. Calculate proper feeds and speeds for various materials and cuts for thread cutting, milling, and boring operations.
5. Interpret machining blueprints and plan the proper choice of tools and sequence of cuts to produce the part.
Module 1: A+ Essentials Exam Preparation  
**TTG 454**

The latest version is the CompTIA A+ 2009 Edition. Two exams are necessary to be certified: CompTIA A+ Essentials, exam code 220-701; and CompTIA A+ Practical Application, exam code 220-702. This course prepares the student to take the CompTIA 01 A+ Essentials exam. The CompTIA A+ certification is the industry standard for computer support technicians. This international, vendor-neutral certification proves your skills in areas such as installation, preventative maintenance, networking, security and troubleshooting PC's. CompTIA A+ certified technicians also have excellent customer service and communication skills to work with clients. No prerequisites. Tuition waiver applies; seniors pay fee only.  

**Course Outcomes:**

1. Identify and name, the purpose & characteristics of typical PC hardware  
2. Identify the fundamentals of using, installing, and troubleshooting typical Operating Systems.  
3. Identify the principles of using, creating and managing W  

Module 2: A+ IT Technician Exam Preparation  
**TTG 455**

The latest version is the CompTIA A+ 2009 Edition. Two exams are necessary to be certified: CompTIA A+ Essentials, exam code 220-701; and CompTIA A+ Practical Application, exam code 220-702. This course prepares the student to take the CompTIA A+ Practical Application exam, which is an extension of the knowledge and skills identified in CompTIA A+ Essentials, with more of a “hands-on” orientation focused on scenarios in which troubleshooting and tools must be applied to resolve problems. Prerequisites: Module 1 or equivalent. Tuition waiver applies; seniors pay fee only.  

**Course Outcomes:**

1. Demonstrate an understanding of installation, configure, and optimize components like disk drives, motherboards, memory, display devices, and cooling systems.  
2. Identify tools, diagnostic procedures, and troubleshooting techniques.  

Module 3: Windows In Depth; MCP Exam Preparation  
**TTG 456**

In this course you will become the master of Windows. You'll learn about supporting users and troubleshooting MS Windows operating systems. The extra time and additional material adds to your knowledge from Modules 1 & 2, making you more prepared for the CompTIA A+, and positioning you for two professional credentials. This course will help prepare you to pass the corresponding Microsoft exam and earn the Microsoft Certified Professional credential. Topics include: installing Windows using various methods, configuring and restricting Windows, managing networking, sharing files & printers, understanding networking topics involving peer-to-peer and domain networks. Prerequisites: Module 1 & 2 or equivalent. Tuition waiver applies; seniors pay fee only.  

**Course Outcomes:**

1. Demonstrate an understanding of installing, Windows 2000 Professional using automated tools.  
2. Monitoring and optimizing system performance and reliability.  
3. Manage and troubleshoot hardware devices  
4. Implement, manage
### NABCEP Entry Level Exam

**TTG 520**

This continuing education course is designed for students to review for and take the North American Board of Certified Energy Practitioners (NABCEP) Entry Level PV exam. Topics covered include: PV system components and functions; module and inverter specs; solar analysis; mounting systems; safety and more.

**Course Outcomes:**
1. Identify electrical requirements for PV installations.
2. Describe the operation of a grid-tied PV system.
3. Identify and describe major components in a PV system

### NEC Calculations

**TTG 525**

This continuing education course is designed for electricians and provides the training necessary for the electrical license renewals. Topics include: calculations associated with the National Electrical Code, including service loads, conduit and box fill, conductor ampacity and sizing, voltage drop, motors, and more. This course fulfills the State of Maryland continuing education requirements for electrical license renewal.

**Course Outcomes:**
1. Perform voltage drop calculations.
2. Perform wire ampacity adjustment calculations.
3. Perform conduit fill calculations.

### NEC Changes

**TTG 528**

Find out what has changed in the latest edition of the National Electrical Code. Highlights and explanations of changes throughout the entire NEC will be discussed. Students must bring a copy of the NEC to the first class meeting. This course fulfills the State of Maryland continuing education requirements for electrical license renewal. Only students with 100% attendance will receive a certificate of completion.

**Course Outcomes:**
- Identify changes to NEC Article 250.
- Identify changes to NEC Article 300.
- Explain the NEC Article revision process.
NEC Field Applications

**TTG 416**

A general overview of the National Electrical Code (NEC) and its application in the field will be the focus of this course. Electrical installation practices and methods, and their corresponding NEC requirements, will be highlighted. Additional topics will be covered according to students' needs and interests. Please bring a copy of the 2008 NEC to the first class. This course fulfills the Prince George's County continuing education requirement for electrical license renewal. Only students with 100% attendance will receive a certificate of completion.

**Course Outcomes:**

1. Effectively apply NEC to jobsite practices.
2. Effectively navigate the NEC book in attempting to apply code issues.
3. Explain the technical basis and justification for particular codes.

PC Repair Introduction

**TTG 516**

This continuing education course is designed for anyone who wants to learn about computer repair. Topics to include: upgrade, diagnose and repair most types of PC hardware; RAM and disk drive installation; functions of motherboards; repair procedures; disassembly and assembly of modern PCs; and problems with printers, monitors and interface cards.

**Course Outcomes:**

1. Install RAM and disk drives.
2. Describe the functions of motherboards.
3. Use troubleshooting procedures to diagnose/repair printer, monitors, and interface cards.
4. Disassemble and assemble PCs.

Principles of Green Building Design and Construction

**TTG 040**

This course is an introduction to the principles of energy conservation and their application to building design. Students will examine the materials, methods of construction, site planning, and programming that are sustainable solutions to design problems. Assessment of available energy systems and concepts for conserving natural resources will also be discussed.

**Course Outcomes:**

1. Apply energy conservation principles to building systems.
2. Assess various energy systems.
Professional Interior Design: Bath Design
TTG 424
Learn the National Kitchen and Bath Association (NKBA) approach to bath design. Topics include NKBA Bath Guidelines and graphic standards, and their application. Mechanical, electrical and plumbing requirements for bathroom design will be discussed and a bath design project will allow you to put drafting skills and new knowledge to use. Drafting and design experience are required.

Course Outcomes:
1. Interpret NKBA Bath Guidelines and graphic standards.
2. Apply NKBA Bath Guidelines to bath design.
3. Apply NKBA graphic standards to drawings.

Professional Interior Design: Interior Systems
TTG 453
Learn the NKBA (National Kitchen and Bath Association) approach to interior systems design. Drafting and design experience required. Topics include how mechanical, plumbing, and electrical systems function. Requirements for kitchen and bath will be covered along with the roles of the different team members in the renovation process.

Course Outcomes:
1. Demonstrate an understanding of how mechanical, electrical and plumbing systems work.
2. List mechanical, electrical and plumbing requirements for kitchens and baths.
3. Apply NKBA graphic standards to drawings.

Professional Interior Design: Kitchen Design
TTG 451
Learn the NKBA (National Kitchen and Bath Association) approach to kitchen design. Drafting and design experience are required. Topics include NKBA kitchen guidelines, graphic standards and their application. Mechanical, electrical, and plumbing requirements for kitchen design will be discussed and a kitchen design project will allow you to put your drafting skills and new knowledge to use.

Course Outcomes:
1. Interpret NKBA Kitchen guidelines and graphic standards.
2. Apply NKBA Kitchen guidelines to bath design.
3. Apply NKBA graphic standards to drawings.
Professional Interior Design: Materials and Finishes

TTG 452

The range of interior finish materials will be explored. You will learn the correct application and installation of material and will have a hands-on introduction to available products.

**Course Outcomes:**

1. Demonstrate an understanding of the most common finish materials.
2. Demonstrate an understanding of the correct application of the most common finish materials.
3. Illustrate how the most common finish materials are installed.

Remodeling and Interior Finishing

TTG 380

This course is designed as an advanced carpentry course, emphasizing remodeling and interior finishing of residential buildings. Topics include insulation, drywall installation and finishing, painting and wall coverings, cabinetry and countertops, trim and casing installation, floor finishing, tile, and remodeling techniques.

This course is co-listed with a credit course by the same name.

**Course Outcomes:**

1. Demonstrate an ability to install and finish drywall.
2. Identify various wall covering types.
3. Describe tile installation process.

Renewable and Sustainable Energy Technologies

TTG 514

This course is designed to introduce students to the theory, principles, and applications of renewable and sustainable energy technologies. Topics include solar thermal and solar photovoltaic systems, hydropower, wind turbines, geothermal, bio-fuels, the Hydrogen economy, and climate change.

**Course Outcomes:**

1. Describe the operation of a solar PV system.
2. Describe the operation of a solar thermal.
3. Describe the effects of combustion on the atmosphere and the climate.
4. Describe the operation of a wind turbine.
## Residential Electrical Wiring

**TTG 481**  
This course is designed as an advanced electrical course, emphasizing electrical wiring of residential buildings. Topics include electrical theory, residential design and layout, electrical service calculation and installation, National Electrical Code, device wiring and installation, lighting, and swimming pool wiring.  

This course is co-listed with a credit course by the same name.  

**Course Outcomes:**  
1. Identify electrical service components.  
2. Describe series and parallel circuits.  
3. Demonstrate an ability to install residential receptacles according to a typical layout.

## Residential HVAC System Design

**TTG 057**  
Intended for advanced HVAC students, this course covers the design and selection of equipment for residential heating and cooling systems.  

**Course Outcomes:**  
Size ductwork using duct sizing tables.  
Describe air flow properties and characteristics.  
Identify supply and return ducts.

## Roland Vinyl Cutter

**TTG 545**  
This course is designed to teach students applications using the Roland Vinyl Cutter and CoralDraw software. Topics include safety procedures, machine setup, and operation.  

**Course Outcomes:**  
1. Demonstrate knowledge of Vinyl Cutter CoralDraw software.  
2. Demonstrate Safety procedures.  
3. Demonstrate machine setup and operation.
Solar PV Design and Installation
TTG 521
This continuing education course is designed for electricians and general public and provides an overview of the fundamentals necessary to design and install a solar photovoltaic electrical system and prepares student to take the NABCEP PV Entry Level Exam. Topics include: grid-tied and battery systems; sizing; mounting; equipment; permitting; code requirements; and financial and environmental incentives.

Course Outcomes:
1. Describe various PV mounting systems.
2. Describe the operation of a grid-tied PV system.
3. Identify financial incentive associated with PV systems.

Solar PV Electrical Installation
TTG 509
An overview of the fundamentals necessary to design and install a solar photovoltaic electrical system. This course will cover residential grid-tied solar PV systems, including design, installation, equipment, permitting and NEC issues, and financial and environmental incentives.

Course Outcomes:
1. Identify components of a residential solar PV system.
2. Describe the operation of an inverter.
3. Apply provisions of NEC Article 690 to a solar PV project.

Sustainability and Energy Conservation Technology
TTG 041
This course is an introduction to various materials, systems, and methods of construction that conform to conserving natural resources. Students will discuss an in-depth analysis of the variety of energy-saving techniques, based on both residential and commercial use in the United States and around the world.

Course Outcomes:
1. Describe various "green" building materials.
2. Recognize residential-specific "green" technologies.
3. Recognize commercial-specific "green" technologies.
Technical Drafting and Drawing

TTG 504

This course is designed to introduce the basic drawing and drafting techniques that are employed as the foundation for all graphic communication for interior designers. Topics include how to use drafting equipment and techniques; architecturally letter using lettering equipment; compare architectural drafting standards and NKBA graphic standards; identify orthographic, paraline, and 3-dimensional drawings; and determine which professionals are responsible for the drawings in a construction set.

Course Outcomes:

1. Demonstrate the ability to use drafting equipment and techniques.
2. Demonstrate the ability to architecturally letter using lettering equipment.
3. Demonstrate the ability to compare architectural drafting standards and NKBA graphic standards.
4. Demonstrate the ability to identify orthographic, paraline, and 3-dimensional drawings.
5. Demonstrate the ability to determine which professionals are responsible for the drawings in a construction set.

Vines to Wines

TTG 539

This continuing education course designed for general public introduces students to the foundations of grape growing and wine making. Students learn to differentiate between the major types of grapes and wines of the world. Restaurateurs learn the characteristics of a variety of wines and will be able to make recommendations to customers. Topics include: requirements of grape growing; anatomy and development of grapevines; historical reasons for success in various regions of the world.

Course Outcomes:

1. Describe cultural and climatic requirements of grape growing.
2. Evaluate historical reasons for successful wine production in different regions of the world.
3. Explain the importance of specific horticultural techniques in creating wines with good flavor and aroma.
4. Identify the anatomy and development of grapevines.
5. Identify the differences in grape and wine production in the Mid-Atlantic.

Welding Advanced

TTG 458

This course is a hands-on introduction to various welding and cutting processes such as GTAW (gas tungsten arc welding), GMAW (gas metal arc welding), CAG (carbon arc gouging), and CAC (carbon arc cutting). You will learn to weld and cut materials such as mild steel, aluminum, and stainless steel. Textbooks are the same as used in prior welding classes. You must score 90 percent or above on the safety test given at the first class. Prerequisite: Successful completion of Welding Fundamentals and/or Welding II.

Course Outcomes:

1. Demonstrate the ability to weld using GMAW and GTAW welding machines on non-ferrous metals in a flat position.
2. Demonstrate the ability to weld using GMAW and GTAW welding machines on ferrous metals in a flat position.
3. Demonstrate the ability to...
Welding Fundamentals

TTG 236

A hands-on introduction to commonly used fundamental welding techniques. Note: Students must furnish their own eye and ear protective devices. A Montgomery College statement of successful completion will be awarded to students who score 70 percent or higher on the final evaluation. All students must score 90 percent or above on the safety test given at the first class. Textbooks are available at the Rockville Campus Bookstore. Prerequisite: Welding Safety or permission of instructor.

Course Outcomes:
Outcomes are not available.

Welding II

TTG 317

This course is a continuation of the Welding Fundamentals course. The emphasis is on welding 3/8" mild steel plate Vee groove fit-up using E6010 electrodes, and then advancing to Low Hydrogen electrodes in preparation for AWS Structural Steel certification. Prerequisite: Successful completion of Welding Fundamentals or permission of the instructor. All students must pass the safety test with 85% or above at the first class meeting.

Course Outcomes:
Upon completion of this course student should be able to:
1. Demonstrate the ability to properly set up welding and cutting equipment while following the correct safety rules and precautions.
2. Explain the various methods of joint fit-up and design.
3

Welding Safety

TTG 178

Course description is not available.

Course Outcomes:
Outcomes are not available.