Maryland CTE Program of Study

**Automotive Technology Maintenance and Light Repair-Plus**

**Secondary CTE Program of Study Proposal Form**

Maryland State Department of Education

Division of Career and College Readiness

200 West Baltimore Street

Baltimore, Maryland 21201-2595

This agreement is between the Division of Career and College Readiness (DCCR), Maryland State Department of Education, and the local school system listed below.

**LOCAL SCHOOL SYSTEM INFORMATION**

Complete the information requested below, including the original signature of the CTE Local Director.

|  |  |
| --- | --- |
| Local School System (LSS) and Code: |  |
| Name of CTE local director: |  | Phone: |  |
| LSS Career Cluster: |  |
| LSS Program Title: | Automotive Technology Maintenance and Light Repair-Plus |
| Pathway Options: |  |  |  |
| Value Added [x]  yes [ ]  no This program provides students the opportunity to earn early college credit. The academic and Options: technical course sequences for both secondary and postsecondary programs are included herein. [x]  yes [ ]  no Enclosed is a copy of the articulation agreement (Copy required for CTE program approval if the program is articulated with a postsecondary education provider). [x]  yes [ ]  no This program provides students with the opportunity to earn an industry-recognized credential. The credential is identified herein.  |
| Program Start Date: |  |  |  |
| Signature of CTE Local Director: |  | Date: |  |
| Signature of Local Superintendent: |  | Date: |  |

**TO BE COMPLETED BY MSDE/DCCR**

|  |  |
| --- | --- |
| Date Program Proposal received by CTE Systems Branch: |  |
| CTE Control Number: |  | Fiscal Year: |  |
| CIP Number: | Program: 47.0645  | Pathway Option 1:  | PathwayOption 2:  | PathwayOption 3: |
| MSDE Cluster Title: |  |

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| --- | --- | --- |
| **Approval Starts FY: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |  |  |
|  |  |  |
| Signature, Assistant State Superintendent, Career & College Readiness |  | Date |

**CTE Secondary Program Proposal Contents**

**STEP 1A: PROGRAM ADVISORY COMMITTEE MEMBERS AND THEIR AFFILIATIONS**

Complete the list of the Program Advisory Committee (PAC) members. Members should include employers, local workforce development representatives, economic development personnel, business, or labor representatives, and the remainder should include secondary and postsecondary, academic and technical educators and other stakeholders. Place a check in the appropriate box to indicate the role each person plays. Include all of the information requested for each entry. Use this form or a locally developed form – either one is acceptable as long as all information is provided.

# Program Advisory Committee List

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| **Membership: First entry should be the industry representative who is leading the PAC.** |
| PAC Leader Name: |  | Representation: |
| Title: |  | [ ]  Industry [ ]  Secondary [ ]  Postsecondary  |
| Affiliation: |  |
| Address1: |  |
| Address2: |  |
| City, State, Zip: |  | State: |  | Zip |  |
| Phone: |  | Fax: |  |
| Email: |  |
| Area of Expertise: |  |
| Role: | [ ]  Work-based Learning [ ]  Curriculum Development [ ]  Skills Standards Validation [ ]  Staff Development |
| [ ]  Program Development  | [ ]  Other (specify):  |  |
| Name: |  | Representation: |
| Title: |  | [ ]  Industry [ ]  Secondary [ ]  Postsecondary  |
| Affiliation: |  |
| Address1: | . |
| Address2: |  |
| City, State, Zip: |  | State: | MD | Zip |  |
| Phone: |  | Fax: |  |
| Email: |  |
| Area of Expertise: |  |
| Role: | [ ]  Work-based Learning [ ]  Curriculum Development [ ]  Skills Standards Validation [ ]  Staff Development |
| [ ]  Program Development  | [ ]  Other (specify):  |  |
| Name: |  | Representation: |
| Title: |  | [ ]  Industry [ ]  Secondary [ ]  Postsecondary  |
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| Email: |  |
| Area of Expertise: |  |
| Role: | [ ]  Work-based Learning [ ]  Curriculum Development [ ]  Skills Standards Validation [ ]  Staff Development |
| [ ]  Program Development  | [ ]  Other (specify):  |  |
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| Phone: |  | Fax: |  |
| Email: |  |
| Area of Expertise: |  |
| Role: | [ ]  Work-based Learning [ ]  Curriculum Development [ ]  Skills Standards Validation [ ]  Staff Development |
| [ ]  Program Development  | [ ]  Other (specify):  |  |
| Name: |  | Representation: |
| Title: |  | [ ]  Industry [ ]  Secondary [ ]  Postsecondary  |
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| Phone: |  | Fax: |  |
| Email: |  |
| Area of Expertise: |  |
| Role: | [ ]  Work-based Learning [ ]  Curriculum Development [ ]  Skills Standards Validation [ ]  Staff Development |
| [ ]  Program Development  | [ ]  Other (specify):  |  |
| Name: |  | Representation: |
| Title: |  | [ ]  Industry [ ]  Secondary [ ]  Postsecondary  |
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| City, State, Zip: |  | State: |  | Zip |  |
| Phone: |  | Fax: |  |
| Email: |  |
| Area of Expertise: |  |
| Role: | [ ]  Work-based Learning [ ]  Curriculum Development [ ]  Skills Standards Validation [ ]  Staff Development |
| [ ]  Program Development  | [ ]  Other (specify):  |  |
| Name: |  | Representation: |
| Title: |  | [ ]  Industry [ ]  Secondary [ ]  Postsecondary  |
| Affiliation: |  |
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| City, State, Zip: |  | State: |  | Zip |  |
| Phone: |  | Fax: |  |
| Email: |  |
| Area of Expertise: |  |
| Role: | [ ]  Work-based Learning [ ]  Curriculum Development [ ]  Skills Standards Validation [ ]  Staff Development |
| [ ]  Program Development  | [ ]  Other (specify):  |  |

STEP 1B: DOCUMENTED LABOR MARKET DEMAND

Check the appropriate box below.

[x]  Demand exists

The PAC will review labor market information on a local, regional and/or state basis. Check this box if demand exists for the identified occupations. The labor market information does not need to be provided with the proposal as long as there is a demand for employees according to data provided by the Department of Labor, Licensing and Regulation (DLLR) or documented by employers in letters or other correspondence.

[ ]  If evidence for labor market demand is not readily available, attach documentation to the proposal.

Check this box, if there is a unique labor market demand for a program and data are not available from the Department of Labor, Licensing and Regulation (DLLR). If the occupation is new or emerging and no data exist, supporting evidence is submitted with the proposal (i.e. document local, national, or regional trends, local circumstances, or provide letters from employers or local economic/workforce development offices documenting employment demand including the projected number of openings by pathway).

**STEP 2A: PROGRAM OVERVIEW**

After determining the cluster and pathway options, identify the standards used to develop the CTE program of study. Describe the program to be developed in detail based on what students are expected to know and be able to demonstrate as a result of participating in the program.

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| **Program Title: Automotive Technology** **Maintenance and Light Repair-Plus (AT MLR Plus)** **Title and source of the skills standards for this program: National Automotive Technicians Education Foundation (NATEF**[**) http://www.natef.org/Home.aspx**](file:///C%3A/Documents%20and%20Settings/jdavis/Local%20Settings/Temporary%20Internet%20Files/Content.Outlook/LDA1R7JY/%29%20%20http%3A/www.natef.org/Home.aspx) |
| **Program Overview:** The Automotive Technology MLR Plus CTE Program of Study (POS) is an instructional program that incorporates the NATEF program accreditation standards and task lists for their accreditation levels: **MLR** (Maintenance and Light Repair) in five repair areas, and **AST** (Automotive Service Technician) in three repair areas. The program prepares students for further education and careers in the Transportation Equipment Pathway and Automotive Technology**. Safety & Service Information and Workplace/Employability Skills (A-0) are basic to all NATEF accreditation levels and require the same 43 tasks regardless of accreditation level - MLR, MLR+, AST or Master Automotive Service Technician (MAST).** MLR Plus is **taught by ASE Certified** Automotive Instructors.Under the **AT** **MLR Plus POS** model**,the five NATEF areas taught to the MLR accreditation** **level are**: Engine Repair (A-1), Automatic Transmission/Transaxle (A-2), Manual Transmission & Rear Axles (A-3), Heating & Air Conditioning (A-7), and Engine Performance (A-8); **the three NATEF areas taught to the AST accreditation level are**: Suspension & Steering (A-4), Brakes (A-5) , and Electrical/Electronic Systems (A-6). **The MLR Plus, 5 Credit program of study (POS) requires approximately 675 hours of combined laboratory and classroom instruction**.Students participating in the AT **MLR Plus** POS receive training in the following learning objectives in the automotive lab as measured by Job Sheet and Worksheet completion along with passing the **ASE MLR** **Student Certification Exam**:1. Develop workplace (employability) skills by demonstrating completion of required academic and performance skills;
2. Identify safety requirements and recognize safety signs and symbols. Apply appropriate information to respond, use shop equipment safely and take appropriate actions;
3. Demonstrate the ability to identify appropriate industry procedure/reference/estimation/training materials (both computerized and hardbound) to locate appropriate instructions and perform according to the stated guidelines;
4. Identify and interpret the construction and operation of gasoline engine systems (**A-1**). Service engine systems at the NATEF **MLR** level;
5. Identify and interpret the construction and operation of automatic transmissions and transaxles (**A-2)** . Perform in-vehicle routine maintenance, inspections, repairs, and external adjustments at the **NATEF** **MLR** level;
6. Identify and interpret the construction and operation of the manual drive train, clutch, axles, & final drive (**A-3**). Perform in-vehicle routine maintenance, inspections, repairs, and external adjustments at the **NATEF MLR** level ;
7. Identify and interpret the operation of automotive suspension systems (**A-4)**. Diagnose and repair malfunctions in automotive suspension systems at the **NATEF** **AST** level;
8. Identify and interpret the operation of all automotive brake systems (**A-5**). Diagnose and repair malfunctions in hydraulic brake systems at the **NATEF** **AST** level;
9. Identify and interpret the operation of all automotive electrical and electronic systems (**A-6**). Diagnose and repair malfunctions in these systems at the **NATEF AST** level;
10. Identify & interpret principles & functions of heating, ventilation, and air-conditioning systems (**A-7**). Perform needed maintenance on these systems at the **NATEF** **MLR** level;
11. Identify and interpret computerized gasoline-engine controls and performance systems (**A-8**). Perform needed maintenance on these systems at the **NATEF MLR** level;
12. Work in teams to analyze and solve challenging simulated and real- world repair problems utilizing late model vehicles and state-of-the-art diagnostic tools and equipment. Under the supervision of **ASE certified automotive instructors**, students troubleshoot, solve and repair complex problems as members of teams and individually.

The High School will:1. **Employ ASE Certified Automotive Instructors** **to teach the POS.**
2. Maintain the program’s Automotive Technology NATEF Accreditation status. (If NATEF Accreditation is withdrawn or lapses, CTE program approval will be withdrawn.)
3. Agree to require students to take the **ASE MLR Student Certitification exam.**
4. Agree to require students to take the **ASE individual students exams at the AST level for Brakes (A5), Suspension & Steering (A4), and Electrical/Electronics Systems Repair (A6).**
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**STEP 2B: COURSE DESCRIPTIONS AND END-OF-COURSE ASSESSMENTS**

Insert each CTE completer course title. Describe each course based on what students are expected to know and be able to demonstrate as a result of their participation. Check the assessment instrument(s) that will be used to document student attainment of the knowledge and skills included in each course and specify additional information as appropriate.

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| **Course Title:  Electrical / Electronics and HVAC (One Course - Two Credits)** **Description: NATEF AST A6, Electrical & Electronic Systems Repair:** This technical course is designed to teach the principles of electricity and electronics and apply them at the **NATEF AST level**. It builds on the measurement of electrical parameters, such as voltage, current, resistance, power, magnetism, electromagnetism, and magnetic induction to connect with Physical Science courses. Students are taught the concept of Ohm’s law in both application and mathematical theory. Detailed topics include the use of a digital multimeter (DMM) for the analysis of series, parallel, and series-parallel circuits. Specific automotive systems covered include batteries, charging and starting systems, lighting, gauges, accessories, electronics, automotive computers and solid-state devices, along with communication systems. Students are taught how to apply electrical/electronic principles to repair car and truck electrical systems using a diagnostic strategy.Students will understand and be able to:* Identify and demonstrate a working knowledge of basic electrical concepts and units including resistance, voltage, & current and principles of electricity and magnetism & their interrelationship & application using course instructional materials.
* Demonstrate the ability to use the Digital Multimeter (DMM) to measure voltage, amperes, and ohms in an automotive classroom, using a S.E.T Project Board or trainer, as measured by building the circuits.
* Demonstrate the ability to measure and analyze voltage drops across a load in a circuit in a classroom, using a S.E.T (Specialized Electronics Training) Project Board or trainer as measured by correctly building the circuit.
* Demonstrate the ability to build series, parallel, and series-parallel circuits and apply the principles of Ohm’s and Kirchhoff Laws to perform circuit analysis and diagnosis in a classroom, using a S.E.T Project Board or trainer as measured by correctly building the circuits, answering the fill-in-the-blank questions and solving the Ohm’s Law equations.
* Apply combinations of algebra and statistics techniques to use in formulas to solve for simple and complex equations for the unknown quantity in series, parallel, and series-parallel circuits on a S.E.T Project Board or trainer.
* Demonstrate ability to build a circuit containing a diode & transistor and measuring effects it has on a DC powered circuits.
* Use wiring diagrams during diagnosis of electrical circuit problems and identify and use automotive symbols, schematics, and diagrams.
* Research the system breakdown using technical information to determine diagnostic procedures. Follow strategy-based diagnostic routines. Generate solutions to problems and determine needed repairs while recognizing when assistance is needed. Document the diagnostic procedures and results.
* Identify wiring properties and service wiring and fusible links by performing techniques to cut and strip wires along with the procedures to join components or wires by soldering and using various types of connectors and terminals.
* Identify and interpret the operation of battery starting and charging systems. Diagnose and repair malfunctions in battery starting and charging systems.
* Diagnose and repair malfunctions in electrical components, gauges, and warning devices.

**Description: NATEF MLR A7, Heating and Air Conditioning Service** The course content is designed to teach the principles of automotive heating and air conditioning operation, and service at the **NATEF MLR** level. This module builds on the fundamental principles of refrigeration, refrigerant compressor, and refrigerant flow. Students are taught the difference between refrigerants R134a and R12 and the difference between PAG and 525 refrigerant oil. Courseware explains the function and application of an engine coolant and describe the uses of the scan equipment in communicating with body HVAC computers. Students will be able to perform needed maintenance on HVAC systems.Students will understand and be able to: * Identify & interpret principles & functions of heating, ventilation, and air-conditioning systems. Perform needed maintenance and service testing on systems at the **NATEF MLR level**.
* Inspect the general condition of tools, equipment, systems, and inventory. Follow an inspection process. Respond to warning conditions indicated using diagnostic scan tools.

**Description: NATEF Supplemental Tasks Course (A0)**This content module is designed to teach students the safety and tool requirements in the automotive shop. Specific instruction in the use of hand and power tools along with all safety precautions will be provided. Students also learn basic automotive shop communication, procedures, how to prepare a vehicle for service, and complete an automotive shop repair order (RO).Students will understand and be able to:* Identify safety requirements and recognize safety signs and symbols. Apply appropriate information to respond, use safety equipment correctly, and take appropriate actions.
* Identify and demonstrate safe and correct use of tools, precision measuring tools, diagnostic scan tools, and automotive shop equipment.
* Identify standard and metric designation in the automotive lab as measured by Job Sheets and Worksheet completion.
* Define basic automotive shop communication, procedures, and service information under classroom and lab conditions.
* Explain how to prepare a vehicle for service and complete an automotive shop repair order (RO) using course instructional materials as measured by completion of the Repair Order (RO) Job Sheet.
* Qualify for SP2 Certification.

**End–of-Course Assessment** Check the assessment instruments that will be used to document student attainment of the course knowledge and skills.[ ]  Teacher-designed end-of-course assessment[ ]  School system-designed end-of-course assessment[ ]  Partner-developed exam: (specify)      [ ]  Licensing exam: (specify)      [ ]  Certification or credentialing exam: (specify)       [x]  ASE MRL Student Certification Exam for Heating and Air Conditioning Service (A7). ASE Student Certification Exam at the AST level for Electrical & Electronics Systems Repair (A6). There is no ASE Student Certification Exam for the NATEF Supplemental Tasks (A0). However, students are required to perform all 43 NATEF supplemental tasks and qualify for SP2 Certification. |

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| **Course Title:** **Suspension & Steering and Brakes (One Course - Two Credits)****Description: NATEF AST (A4), Suspension & Steering** This technical course is designed to teach the principles of automotive suspension/steering systems and 4-wheel suspension alignment. It builds on the concepts of geometry, gear reduction, hydraulics laws, and characteristics of liquids and how they apply to the operation and diagnosis of power steering and suspension systems. Steering column operation and diagnosis including supplemental restraint system service are included. The course covers the fundamentals of short/long-arm, and strut suspensions, including: caster, camber, thrust angle, toe-in, steering axis inclination (SAI), including angle, toe-out on turns (turning angle/radius), and how they apply to steering, suspension, and 4-wheel alignment. Wheel balance terms are specifically explained: static balance, dynamic balance, tramping, and radial force variation. Students learn strategy-based diagnostic routines to help interpret and verify customer concerns and proper operation and to perform tests and inspections to determine the causes and make corrections related to suspension/steering/wheel systems and alignment. These areas include steering columns, power steering, wheels/tires, short/long-arm/strut suspensions, and 4-wheel alignment. Through the inspection, testing, or measurement of component processes, students will apply this knowledge to determine needed repairs and correctly repair a vehicle.Students will understand and be able to:* Identify and interpret the operation of steering and suspension. Service malfunctions in the steering column, power non-rack-and-pinion and power rack-and-pinion steering gear, and long- and short-arm and strut suspension.
* Identify and interpret wheel alignment and the operation of wheels and tires. Service malfunctions in wheel alignment, wheels, and tires.
* Inspect the general condition of tools, equipment, systems, and inventory. Follow an inspection process. Respond to warning conditions indicated.
* Research the system breakdown using technical information to determine diagnostic procedures. Follow strategy-based diagnostic routines. Generate solutions to problems and determine needed service while recognizing when assistance is needed. Document the diagnostic procedures and results.

**Description: NATEF AST (A5) Brakes** This technical content is designed to teach the principles of automotive hydraulic brake systems. It builds on the essential laws of physics, motion, forces, hydraulics, thermodynamics, and chemical reactions and how these principles apply to the operation and diagnosis of automotive brake systems. This course covers the energy conversion of motion changed to heat energy (when you apply brakes), the effects of weight and speed on braking and stopping distance, thermal expansion, friction, force, and coefficient of friction as they apply to braking systems. Courseware covers the fundamentals and service of disc/drum brakes including how they operate, brake-fluid properties, diagnosis, component replacement/repair/adjustment, disc/drum machining, power-assist units, and the fabrication (ISO or double flaring) of brake lines. The content also covers computer-controlled anti-locking brake system (ABS) operation and diagnosis. The student is taught strategy-based diagnostic routines for interpreting and verifying customer concerns and proper operation. The student performs tests and inspections using special tools and scan tools to determine the cause of problems and make corrections related to hydraulic brakes and will communicate electronically with anti-lock brake systems (ABS). Through the inspection, testing, or measurement of components process, the student will be able to apply this knowledge to determine needed repairs and repair vehicle.Students will understand and be able to:* Identify and interpret the operation of hydraulic brake systems. Diagnose and repair malfunctions in hydraulic brake systems.
* Identify and interpret the operation of drum/disc brakes and power-assist units. Service malfunctions in drum/disc brakes and power-assist units.
* Identify and interpret the operation of anti-lock brake systems. Service malfunctions in anti-lock brake systems.
* Inspect the general condition of tools, equipment, systems, and inventory. Follow an inspection process. Respond to warning conditions indicated.
* Research the system breakdown using technical information to determine diagnostic procedures. Follow strategy-based diagnostic routines. Generate solutions to problems and determine needed repairs while recognizing when assistance is needed. Document the diagnostic procedures and results.

**End- of- Course Assessment**Check the assessment instruments that will be used to document student attainment of the course knowledge and skills.[ ]  Teacher-designed end-of-course assessment[ ]  School system-designed end-of-course assessment[ ]  Partner-developed exam: (specify)      [ ]  Licensing exam: (specify)      [ ]  Certification or credentialing exam: (specify)      [x]  Recognized examination: ASE Student Certification exams at the **AST level for Steering & Suspension (A4),** and **Brakes (A5).**  |
| **Course Title: MLR Powertrain and Engine Repair/Performance (One Course - One Credit)****Description: NATEF MLR (A1) Engine Repair Service** This course is designed to teach the principles of automotive engine operation and **NATEF MLR** level service. It builds on the essential laws of physics, thermodynamics, and chemical reactions and how these principles apply to the operation of engine systems. It also covers general engine design and operation, cylinder head/valve train, cylinder block, lubrication, and cooling systems. The student is taught to verify customer concerns, proper operation, and perform tests and inspection at the **NATEF MLR level** based on the **NATEF MLR (A1)** task list. Through the inspection, testing, or measurement-of-components process, the student is taught to apply this knowledge to determine needed repairs and repair vehicles.Students will be understand and be able to:* Identify and interpret the construction and operation of a gasoline engine. Service the engine at the **NATEF MLR level.**
* Inspect the general condition of tools, equipment, systems, and inventory. Follow an inspection process. Respond to warning conditions indicated.
* Identify and interpret the construction and operation of gasoline engine valve train systems. Service engine valve train systems at the **NATEF MLR level** based on the **NATEF A1 MLR** task list.
* Identify and interpret the construction and operation of gasoline engine cooling & lubrication systems. Service cooling and lubrication systems at the **NATEF (A1) MLR level**.

**Content Description: NATEF MLR (A2) Automatic Transmission/Transaxle Service** The technical content is designed to teach the principles of automotive automatic transmission/transaxle operation and **NATEF MLR level** service. It builds on the essential laws of physics and motion, including friction, force, inertia, lever, gear ratios, planetary gears, momentum, reduction, overdrive, speed, work, torque, and power and how they apply to the operation of an automatic transmission. The course covers the fundamental laws of hydraulics and characteristics of liquids as they apply to the operation of an automatic transmission/transaxle. It also covers transmission/transaxle general design and operation as well as inspection and service of in-vehicle service. Students are taught the hydraulic and mechanical operation of transmissions/transaxles with electronic valve bodies. Students will apply this knowledge to interpret and verify customer concerns and proper operation, and will perform service using special tools.Students will understand and be able to: * Identify and interpret the construction and operation of automatic transmissions and transaxles. Perform in-vehicle routine maintenance, inspections, repairs, and external adjustments at **NATEF MLR level** based on the **NATEF (A2) MLR** task list.
* Inspect the general condition of tools, equipment, systems, and inventory. Follow an inspection process. Respond to warning conditions indicated.

**Description: NATEF MLR (A3) Manual Transmission and Rear Axle Service** This technical content is designed to teach the principles of automotive manual transmission/transaxle operation and **NATEF MLR level** service. This course builds on the essential laws of physics and motion including friction, force, inertia, levers, gear ratios, momentum, reduction, overdrive, speed, work, and torque and how they apply to the operation of manual transmissions/transaxles, drive components, and final drives. This course will cover transmission/transaxle general design and operation and service at the **NATEF MLR level** based on the **(A3) MLR** task list. Courseware will further cover the operation, diagnosis, and service of drive shafts, constant velocity (CV) joints, four-wheel-drive bearings, differentials and four-wheel-drive systems. Students will be taught to perform **NATEF MLR (A3)** level service on transmissions/transaxles, drive shafts, final drives, CV joints, and transfer cases. Students will be able to apply this knowledge using strategy-based diagnostic routines, to interpret and verify customer concerns, check for proper operation.Students will understand and be able to:* Identify and interpret the construction and operation of the manual drive train and clutch. Service manual drive train and clutch assemblies and components at the **NATEF MLR level** based on the **NATEF (A3) MLR** task list.
* Identify and interpret the construction and operation of final drives, axles, and four-wheel drives/all-wheel drives. Repair malfunctions in final drive, axles, and four-wheel drive/all-wheel drive assemblies and components at the **NATEF MLR level** based on the **NATEF (A3) MLR** task list.
* Inspect the general condition of tools, equipment, systems, and inventory. Follow an inspection process. Respond to warning conditions indicated.

**Description: NATEF MLR (A8) Engine Performance Maintenance** A technical course designed to teach the principles of automotive engine performance and **NATEF MLR (A8) level** service. This course builds on the essential laws of physics, thermodynamics, and chemical reactions and teaches how these principles apply to the operation of engine performance systems. This course covers distributor-less (electronic ignition) and distributor ignition systems, fuel management, exhaust emission control, and computer input and output signals and identifies the different types of sensors used by automotive engine computers. The student is taught to interpret and verify customer concerns, confirm proper operation, and perform maintenance and inspection using special tools and scan tools at the **NATEF MLR level**. Courseware also covers diagnostic trouble codes (DTC) and access and use of electronic service information (ESI). The student learns to locate and interpret vehicle component identification numbers (VIN, vehicle certification labels, and calibration decals), check and adjust (where applicable) ignition system timing and timing advance/retard, emission component service, and computerized engine control system data and service.Students will understand and be able to:* Identify and interpret computerized gasoline-engine controls and performance systems. Service emissions systems at the **NATEF (A8) MLR level** based on the **NATEF (A8) MLR task list**.
* Inspect the general condition of tools, equipment, systems, and inventory. Follow an inspection process. Respond to warning conditions indicated.

**End-of-Course Assessment** Check the assessment instruments that will be used to document student attainment of the course knowledge and skills.[ ]  Teacher-designed end-of-course assessment[ ]  School system-designed end-of-course assessment[ ]  Partner-developed exam: (specify)      [ ]  Licensing exam: (specify)      [ ]  Certification or credentialing exam: (specify)      [x]  Recognized examination: (specify) Either the comprehensive **MLR** Student Certification exam, or the individual ASE Student Exams for Engine Repair Service (A1), Automatic Transmission/Transaxle Service (A2), and Manual Transmission and Rear Axle Service (A3). (A1, A2 and A3 ASE student exams are optional.)  |

**STEP 2C: END-OF-PROGRAM ASSESSMENT**

Check the assessment instruments that will be used to document student attainment of the program knowledge and skills. Include and identify assessments leading to industry recognized credentials if available and appropriate.

[ ]  Teacher-designed end-of-program assessment

[ ]  School system-designed end-of-program assessment

[ ]  Partner-developed exam: (specify)

[ ]  Licensing exam: (specify)

[ ]  Certification or credentialing exam: (specify)

[x]  Nationally-recognized examination: (specify) **MLR Student Certification Exam**

**STEP 2D: Program Sequence Matrix**

(Include the program sequences for High School, Associate’s Degree, and Bachelor’s Degree programs.) Identify the pathway options. Complete the matrix for the 9-12 CTE program of study, plus, for Tech Prep programs include the matrix for the two- or four-year college program of study. Indicate which courses receive CTE credit by placing the number of credits in parentheses after each CTE course title. Place an asterisk (\*) next to the course identified as the concentrator course indicating that the student has completed 50% of the program.

The program matrix defines a planned, sequential program of study that consists of a minimum of four credits in CTE coursework including work-based learning and/or industry-mentored projects. Work-based learning experiences or industry-mentored projects must be included in the program to obtain approval. The program matrix includes the recommended academic and CTE courses identified for the pathway and postsecondary linkages (i.e., dual enrollment, transcripted and articulated credit).

CTE programs typically begin after ninth grade and do not include career exploration courses. Courses such as computer applications and keyboarding are not included in the completer sequence because they provide prerequisite skills for both academic courses and CTE programs. Academic courses are counted only if they are tailored to serve mainly CTE students and have been revised to reflect industry skill standards. Technology Education or Advanced Technology Education courses are not acceptable for credit in the career and technology education program sequence.

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| **Pathway/Program:** | **Automotive Technology** **Maintenance and Light Repair- Plus**  | **CIP Number (For MSDE Use)** | **47.0645** |
| **Graduation Requirements** | **Grade 9** | **Grade 10** | **Grade 11** | **Grade 12** |
| English – 4 | English 9 | English 10 | English 11 | English 12 |
| Social Studies - 3 | US Government | World History | US History |  |
| Mathematics - 4  | Algebra 1 | Geometry | Algebra 2 | Rigorous Math |
| Science – 3 | Physical Science | Biology | Chemistry |  |
| Physical Education -.5Health Education - .5 | .5 PE | .5 Health |  |  |
| Fine Arts - 1 | .5 Fine Arts | .5 Fine Arts |  |  |
| Technology Education – 1 | TechnologyEducation | Transportation, Distribution, and Logistics (TDL) *optional* |  |  |
| CTE Completer Program – 5\*concentrator course |  | Electrical/Electronics and HVAC (2) | Suspension & Steering and Brakes (2)\* | Powertrain and Engine Repair/Performance (1)(Optional Work-based Learning or Capstone) (1) |
| Foreign Language - 2 and/orAdvanced Tech Ed - 2 | Spanish 1 | Spanish 2 |  |  |
| **Provide a list of examples of careers students are preparing to enter and postsecondary options:** Automobile Service Tech, Automobile Master Mechanic, Automobile Speciality Tech, Electronic Equipment Installer & Repairer - Motor Vehicle.**\*Concentrator Course**\*\*\*Work-Based Learning (WBL) is an integral component of the program. WBL should be incorporated into the program dependent upon LSS delivery system (i.e. integrated or capstone WBL experience). |

**Program Sequence Matrix**

Two Year College Program Sequence – Program Overview

|  |
| --- |
| **Two Year College Program Sequence – Program Overview**Many local school systems provide postsecondary matrices in their program of study guides to inform students, parents, and counselors of the opportunities available to those enrolled in the program. *A copy of the Articulation Agreement is required to be submitted with the proposal prior to program approval. (See Attachment 1)*Describe the program to be developed in detail based on what students are expected to know and be able to demonstrate as a result of participating in the program. |
| Community College of Baltimore County (CCBC), Catonsville offers an Associate of Applied Science Degree - 70 hrs required - Upon completion of the Automobile Technology curriculum, students may transfer to a B.S. degree program in transportation at Pennsylvania College of Technology, enter the job market as well-prepared, high-level collision repair technicians or entrepreneurs.**Program Title: Automotive Technology, Certificate or AAS****College/Institution: Community College of Baltimore County-Catonsville** |
| **Recommended Sequence – Complete the program matrix for the postsecondary sequence for the Automotive Technology (MLR Plus) program of study. Indicate which course receives articulated or transcripted credit by PLACING THE NUMBER OF CREDITS IN PARENTHESES after each course title.**  |
| **Semester 1** | **Semester 2** |
| AUTO 100 Introduction to Automotive Technology **(5)\***AUTO 131 Electrical, Suspension, Electronic Systems 4ENGL 101 Craft of Composition 3AUTO 141 Engines & Related Systems 5 | AUTO 136 Repairing Automobile Electrical Systems 5CSIT 101 Computer Information Technology 3MATH 135 Algebra and Trigonometry 3 |
| **Semester 3** | **Semester 4** |
| AUTO 161 Repairing Automobile Electronics 5AUTO 126 Brake Systems 4CMNS 101 Speech | AUTO 171 Repairing Automobile Suspension Systems 4AUTO 241 Repairing Automobile Engine-Related Systems 4 |
| **Semester 5**AUTO 156 Manual Transmissions 4AUTO 101 Heating & AC Systems 3PSYC 101 Psycology | **Semester 6**AUTO 151 Automatic Transmissions 5SOCL 141 Racial & Cultural Minorities 3ENVS 101 Environmental Science 3General Education Electives 9-10\***The 5 hours in parentheses indicate articulated credit based on successfully passing the CTE Automotive Technology MLR Plus Program with a B or better and passing all Student ASE exams**. |
| **Provide a list of examples of careers students are preparing to enter:** Automobile Lead Technicians, Automobile Team Leaders, Automobile Service Advisors, Diagnosticians or Secure Upper-Level Automobile Positions. |

**Program Sequence Matrix**

Four Year College Program Sequence – Program Overview

|  |
| --- |
| **Four Year College Program Sequence – Program Overview** **Complete this matrix if the program includes a four year degree option.****Many local school systems provide postsecondary matrices in their program of study guides to inform students, parents, and counselors of the opportunities available to those enrolled in the program. *A copy of the Articulation Agreement is required to be submitted with the proposal prior to program approval.*****Describe the program to be developed in detail based on what students are expected to know and be able to demonstrate as a result of participating in the program.** |
| **Program Title: B.S. Degree in Transportation****College/Institution: Pennsylvania College of Technology**  |
| **Recommended Sequence – Complete the program matrix for the postsecondary sequence for the AT program of study. Indicate which courses receive articulated or transcripted credit by placing the number of credits in parentheses after each course title.**  |
| **Semester 1** | **Semester 2** |
| First Semester Credits[AMT111](http://www.pct.edu/catalog/courses/amt111.shtml) Manual Transmission and Transaxle Principles 3 [AMT112](http://www.pct.edu/catalog/courses/amt112.shtml) Brake Systems **3** [AMT113](http://www.pct.edu/catalog/courses/amt113.shtml) Steering and Suspension **3** [AMT119](http://www.pct.edu/catalog/courses/amt119.shtml) Fundamentals of Automatic Transmissions 3 [AMT242](http://www.pct.edu/catalog/courses/amt242.shtml) Vehicle Safety Inspection 1 [MTH124](http://www.pct.edu/catalog/courses/mth124.shtml) Technical Algebra and Trigonometry I 3 or[MTH180](http://www.pct.edu/catalog/courses/mth180.shtml) College Algebra and Trigonometry I 3 [FIT](http://www.pct.edu/catalog/courses/fitelc.shtml) Fitness and Lifetime Sports Elective 1 Total Credits 17  | Second Semester Credits[AMT109](http://www.pct.edu/catalog/courses/amt109.shtml) Automotive Electrical Fundamentals **3** [AMT121](http://www.pct.edu/catalog/courses/amt121.shtml) Automotive Fuel and Emission Control Systems **2** [AMT122](http://www.pct.edu/catalog/courses/amt122.shtml) Engine Principles 3 [AMT126](http://www.pct.edu/catalog/courses/amt126.shtml) Engine Electrical Systems **4** [CSC124](http://www.pct.edu/catalog/courses/csc124.shtml) Information, Technology, and Society 3 [ENL111](http://www.pct.edu/catalog/courses/enl111.shtml) English Composition I 3 Total Credits 18 |
| **Semester 3** | **Semester 4** |
| Third Semester Credits[AMT104](http://www.pct.edu/catalog/courses/amt104.shtml) Hybrid Electric Vehicle 1 [AMT236](http://www.pct.edu/catalog/courses/amt236.shtml) Engine Performance 4 [AMT266](http://www.pct.edu/catalog/courses/amt266.shtml) Engine Repair 4 [AMT264](http://www.pct.edu/catalog/courses/amt264.shtml) Powertrain Electronics 3 [ENL201](http://www.pct.edu/catalog/courses/enl201.shtml) Technical and Professional Communication 3 [HUM](http://www.pct.edu/catalog/courses/humelc.shtml) Humanities Elective 3 or[SSE](http://www.pct.edu/catalog/courses/sseelc.shtml) Social Science Elective 3 or[ART](http://www.pct.edu/catalog/courses/artelc.shtml) Art Elective 3 or[FOR](http://www.pct.edu/catalog/courses/forelc.shtml) Foreign Language Elective 3 or[AAE](http://www.pct.edu/catalog/courses/aaeelc.shtml) Applied Arts Elective 3 or[IFE](http://www.pct.edu/catalog/courses/ifeelc.shtml) International Field Experience Elective 3 Total Credits 18  | Fourth Semester Credits[AMT243](http://www.pct.edu/catalog/courses/amt243.shtml) Automotive Chassis and Wheel Service 6 [AMT274](http://www.pct.edu/catalog/courses/amt274.shtml) Automotive Air Conditioning Systems & Service 3 [AMT276](http://www.pct.edu/catalog/courses/amt276.shtml) Electrical/Electronic Accessory Service 4 [PHS103](http://www.pct.edu/catalog/courses/phs103.shtml) Physics Survey 3 or[PHS114](http://www.pct.edu/catalog/courses/phs114.shtml) Physics with Technological Applications 4 Total Credits 16 |
| **Junior Year:**Fifth Semester Credits[ABM310](http://www.pct.edu/catalog/courses/abm310.shtml) Automotive Management and Customer Service 3 [ACC113](http://www.pct.edu/catalog/courses/acc113.shtml) Introduction to Financial Accounting 3 [ECO111](http://www.pct.edu/catalog/courses/eco111.shtml) Principles of Macroeconomics 3 [MGT115](http://www.pct.edu/catalog/courses/mgt115.shtml) Principles of Management 3 [CHM100](http://www.pct.edu/catalog/courses/chm100.shtml) Fundamentals of Chemistry 4  or [MSC106](http://www.pct.edu/catalog/courses/msc106.shtml) Introduction to Metallurgy 4 [SAF110](http://www.pct.edu/catalog/courses/saf110.shtml) Occupational Health and Safety 2 Total Credits 18Sixth Semester Credits[ABM350](http://www.pct.edu/catalog/courses/abm350.shtml) Automotive Management Strategic Planning  and Personnel 3 [ABM355](http://www.pct.edu/catalog/courses/abm355.shtml) Advanced Topics in Automotive Technology 3 [MGT330](http://www.pct.edu/catalog/courses/mgt330.shtml) Managerial Decision Making 3  or [MGT301](http://www.pct.edu/catalog/courses/mgt301.shtml) Business Law I 3 [MTH160](http://www.pct.edu/catalog/courses/mth160.shtml) Elementary Statistics with Computer  Applications 4 [SPC101](http://www.pct.edu/catalog/courses/spc101.shtml) Fundamentals of Speech 3  or [SPC201](http://www.pct.edu/catalog/courses/spc201.shtml) Interpersonal Communication 3 Total Credits 16 | **Senior Year:**Seventh Semester Credits[ABM450](http://www.pct.edu/catalog/courses/abm450.shtml) Automotive Managerial Analysis 3 [ABM455](http://www.pct.edu/catalog/courses/abm455.shtml) Automotive Technical Training & Workforce Development 3 [MGT249](http://www.pct.edu/catalog/courses/mgt249.shtml) Small Business Management 3  or [MGT248](http://www.pct.edu/catalog/courses/mgt248.shtml) Supervision and Human Relations 3 [HRM300](http://www.pct.edu/catalog/courses/hrm300.shtml) Human Resource Management 3 [OEA](http://www.pct.edu/catalog/courses/oeaelc.shtml) Open Elective 3 [HUM](http://www.pct.edu/catalog/courses/humelc.shtml) Humanities Elective 3  or [SSE](http://www.pct.edu/catalog/courses/sseelc.shtml) Social Science Elective 3  or [ART](http://www.pct.edu/catalog/courses/artelc.shtml) Art Elective 3  or [FOR](http://www.pct.edu/catalog/courses/forelc.shtml) Foreign Language Elective 3  or [AAE](http://www.pct.edu/catalog/courses/aaeelc.shtml) Applied Arts Elective 3  or [IFE](http://www.pct.edu/catalog/courses/ifeelc.shtml) International Field Experience Elective 3 Total Credits 18Eighth Semester Credits[ABM495](http://www.pct.edu/catalog/courses/abm495.shtml) Senior Project 3 [PHL210](http://www.pct.edu/catalog/courses/phl210.shtml) Ethics 3 [ART](http://www.pct.edu/catalog/courses/artelc.shtml) Art Elective 3 [FIT](http://www.pct.edu/catalog/courses/fitelc.shtml) Fitness and Lifetime Sports Elective 1 [OEA](http://www.pct.edu/catalog/courses/oeaelc.shtml) Open Elective 3 [HSC](http://www.pct.edu/catalog/courses/hscelc.shtml) Humanities/Social Science Cultural Diversity Elective 3 Total Credits 16 |
| **Provide a list of examples of careers students are preparing to enter:** Management Positions in Customer Relations, Credit and Finance, Personnel, Sales, Marketing, Inventory Control and Fleet Manager. |

STEP 2E: VALUE-ADDED OPTIONS

Fill in the name of the partnering college or agency. Specify the credential that students will earn. Under value-added, indicate the number of credits or hours granted. This information is required before a program can be designated as a CTE articulated program of study.

|  |  |  |  |
| --- | --- | --- | --- |
| **Option** | **Partner** | **Credential** | **Value added for CTE completers** |
| Dual Enrollment |  |  |  |
| Transcripted Credit |  |  |  |
| Articulated Credit | **CCBC Catonsville** | **Automobile Technology (Auto Tech) AAS Degree** | **5 Credit Hours earned for AUTO 100 for successfully completing the CTE program of study with a B, passing four ASE Student Certification exams, as well as a portfolio review and assessment by the CCBC Automotive faculty. Upon verification, articulation will be conditionally offered upon completion of the SP2 Safety Certification, and a subsequent B in Auto 131 &141 at CCBC. (Global Program).** |
| Articulated Credit | **Penn College** | **Auto Tech AAS Degree, Auto Tech Two-Year Certificate or Auto Tech Management BS Degree** | **Up to 15 Credit Hours earned for successfully completing the CTE program of study with a B and passing the ASE Student Certification exams.**  |
| Credit by Exam |  |  |  |
| AP |  |  |  |
| Apprenticeship  | Approved by MATC\*\* |  |  |
| Certifications(Student) | ASE/NATEF | -**Maintenance & Light Repair****-*Brakes******-Electrical/Electronics******-Suspension & Steering*** |  |
| License |  |  |  |
| Degree |  |  |  |
| Other (specify) |  |  |  |

\*To obtain credit for Automobile Technology Courses through Dual enrollment, the High School Instructor must be accepted as CCBC Adjunct Professor or students must take the course at CCBC and students must pay discounted Dual Enrollment Tuition fee

\*\*MD Apprenticeship and Training Council

**STEP 2F: INDUSTRY-MENTORED PROJECT OR WORK-BASED LEARNING (WBL) OPPORTUNITIES**Check each box that applies.

PAC members and other industry partners provide supervised (WBL) experiences and/or industry-mentored projects for all students who demonstrate performance of the competencies necessary to enter into this phase of the program. Supervised work-based learning experiences are required for all students demonstrating readiness to participate. For the few who do not participate, alternative capstone experiences should be provided (i.e., in school work experiences, a culminating project, or another experience comparable in rigor). Each type of work-based learning is defined in the glossary. Job shadowing is **not** acceptable for credit in a CTE program.

1. [ ]  Integrated WBL 2. [x]  Capstone WBL 3. [ ]  Registered Apprenticeship
4. [x]  Internship 5. [ ]  Industry-Mentored Project 6. [ ]  In-school clinic or school-based enterprise

**STEP 2G: STUDENT ORGANIZATIONS PROVIDED TO STUDENTS IN THE PROGRAM**

Check each box that applies, or specify if “Other” is selected.

Students will develop and apply technical and academic skills, as well as Skills for Success, through participation in:

[ ]  DECA [ ]  FFA [ ]  SkillsUSA [ ]  FBLA [ ]  HOSA [ ]  OTHER (specify)

STEP 3: COMPLETE THE INSTRUCTIONAL PROGRAM DATA SHEET (with examples)

|  |  |
| --- | --- |
| Local School System (LSS) and Code: |  |
| Name of Local Director of CTE: |  | Phone: |  |
| LSS Program Title: | **Automotive Technology** **Maintenance & Light Repair- Plus**  | CIP Code: | **47.0645** |

*STEP 3.1 - DATA SHEET: Pathway Options*

|  |  |
| --- | --- |
| **1.** | **Automotive Technology** **Maintenance & Light Repair (MLR) - Plus**  |
| **2.** |  |
| **3.** |  |
| **4.** |  |

STEP 3.2 - DATA SHEET: *Instructional Program Credit by Grade(s)*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Credits per year per pathway option as reflected by Course Sequences** | **9** | **10** | **11** | **12** | **TOTAL** |
| 1. **Automotive Technology** **MLR- Plus**
 |  | **2** | **2** | **1** | **5** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**Total number of credits for program completion: 5**

**\*Work-Based learning which Includes Capstone Practicum**

STEP 3.3 - DATA SHEET: Career and Technology Education Program Sites

|  |  |  |
| --- | --- | --- |
| **Pathway Options** | **School Name(s) Sites** | **School Number** |
|  |  |  |
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