

Automotive Technician 2

COURSE OUTLINE - UC

DESCRIPTION:

Automotive Technician 2 is the capstone course in the transportation sector of the System Diagnostic and Service pathway. It builds on Automotive Technician 1 to prepare students for entry-level employment as Automotive General Service Technicians. Students will acquire broad skills set for troubleshooting equipment as well as vehicle diagnosis and maintenance related to engine performance and repair, transmissions/transaxle, drive train and axles, suspension/steering, brakes, electrical/electronic systems and heating/air conditioning systems. Successful completion of course competencies will provide students with a solid foundation of the National Automotive Technicians Education Foundation (NATEF) standards, hands-on training in the automotive field and the opportunity to obtain industry certifications including OSHA cards certifying 10 hours of competency training in personal and occupational safety on the job site. Activities in this course include work-based learning that connects students to industry, the local community and pre-apprenticeship opportunities. Students must successfully complete Automotive Technician 1 and Automotive Technician 2 as part of the minimum requirements for articulation.

INFORMATION:

PRE-REQUISITE:	Automotive Technician 1
LENGTH:	One Year
SECTOR:	Transportation
PATHWAY:	System Diagnostic and Service
ARTICULATED:	Yes: after completion of Automotive Technician 2 at RCC
UC A-G APPROVAL:	Yes - College-Preparatory Elective (G) / Interdisciplinary

O*NET SOC CODES:

41-2022.00	Specialists Parts Salesperson
49-3023.00	Automotive Service Technicians and Mechanics
49-3031.00	Bus and Truck Mechanics and Diesel Engine Specialists
53-6031.00	Automotive and Watercraft Service Attendants

Orientation
<ul style="list-style-type: none"> A. Introduce the course and facilities. B. Discuss the syllabus and major objectives. C. Explain applicable classroom management procedures, and any operational guidelines. D. Review instructor/student expectations. E. Explain attendance requirements and procedures. F. Review grading and student evaluation procedures. G. Discuss the work-based learning aspect of the program, if applicable. H. Discuss the “next steps” related to additional education, training, and employment. I. Review classroom safety, emergency and disaster procedures.
1. Communication Skills
<ul style="list-style-type: none"> A. Demonstrate positive verbal communication skills using appropriate vocabulary, demeanor, and vocal tone in the classroom and/or worksite. B. Read and interpret written information and directions. C. Practice various forms of written communication appropriate to the occupation. D. Practice positive body language skills. E. Practice professional verbal skills for resolving a conflict. F. Demonstrate active listening skills including techniques for checking for understanding, and for obtaining clarification of directions.
2. Interpersonal Skills
<ul style="list-style-type: none"> A. Demonstrate positive teamwork skills by contributing to a group effort. B. Practice the importance of diversity awareness and sensitivity in the workplace. C. Define sexual harassment in the workplace and identify the employee’s role and responsibility. D. Practice participation skills. E. Identify different personality types and demonstrate flexibility and adaptability working with diverse individuals. F. Practice business and social etiquette skills appropriate to the occupation. G. Evaluate and discuss the role of business and personal ethics in decision making based on various job-related scenarios. H. Demonstrate the use of time management skills.
3. Employability Skills
<ul style="list-style-type: none"> A. Demonstrate appropriate attendance and punctuality practices for the classroom (and worksite, if applicable). B. Prepare a resume, cover letter, and job application. C. Demonstrate interviewing techniques in seeking employment, using appropriate tone, body language and professional dress and

grooming standards.

- D. Identify strategies for employment retention.
- E. Identify and analyze sources of job information, including electronic sources and the impact of social networking on employability.
- F. Identify the need for continuing education, professional development, and professional growth in chosen field.
- G. Identify appropriate procedures for leaving a job.
- H. Review company policies and current trends in employee compatibility screening, drug screening, and background checks.

4. Leadership

- A. Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.
- B. Work with peers to promote divergent and creative perspectives.
- C. Demonstrate how to organize and structure work, individually and in teams, for effective performance and the attainment of goals.
- D. Explain multiple approaches to conflict resolution and their appropriateness for a variety of situations in the workplace.
- E. Employ ethical behaviors and actions that positively influence others.
- F. Analyze the short-term and long-term effects a leader's actions and attitudes can have on productivity, morale, and organizational culture.

5. Personal and Occupational Safety

- A. Demonstrate procedures to be followed in case of emergencies.
- B. Describe and discuss the procedure for reporting a work-related hazard or injury (worker's comp), including ways to report a potential safety hazard to a supervisor.
- C. Identify and discuss cyber ethics, cyber safety, and cyber security.
- D. Apply personal safety practices to and from the job.
- E. Recognize the effects of substance abuse in the workplace.
- F. Explain the importance of CAL-OSHA in the industry.
- G. Recognize good housekeeping and ergonomics as safety issues.
- H. Identify safety hazards commonly found in the workplace environment.
- I. Explain the importance and role of the Environmental Protection Agency (EPA).

6. Automotive Service Careers

- A. Examine job outlook in automotive service.
- B. List personal characteristics and aptitudes required for an automotive technician.
- C. Compare and contrast skills and tasks required for technicians and various positions in different segments of the automotive industry.
- D. Identify education, training, and income for entry-level jobs.
- E. Name professional organizations for technicians; describe membership and continuing education requirements.

7. Shop Safety / OSHA-10

- A. Differentiate Federal OSHA from CAL-OSHA.
- B. Summarize employee rights and employer duties under CAL-OSHA.
- C. Identify the priorities and process for an OSHA inspection.
- D. Follow general shop safety rules and identify procedures for safe handling of tools and equipment.
- E. Emphasize electrical hazards of working with electronic equipment, electronic vehicle systems, and high voltage circuits.
- F. Describe procedures for proper handling, storing, and disposing of hazardous waste, chemicals, and flammable materials in accordance with local, state, and federal safety and environmental regulations.
- G. Wear appropriate clothing, accessories, and hairstyles for shop/lab activities and understand the limitations of personal protection equipment (PPE).
- H. Recognize how to correctly work and walk on surfaces to avoid, control, and protect against falls, slips and trips.
- I. Apply effective strategies to prevent heat illness.
- J. List components of injury and illness prevention program.
- K. Demonstrate knowledge of material safety data sheets (MSDS).
- L. Demonstrate emergency preparedness by following posted evacuation routes and Emergency Action Plans (EAP).
- M. Describe first aid procedures and treatment for fires, hazardous materials, and accidents.
- N. Pass a safety test and take OSHA-10 certification test.

8. Automotive Math

- A. Demonstrate knowledge of the appropriate use of mathematical functions and measurement techniques commonly used in the automotive industry.
- B. Discuss the use and importance of measurement devices and mathematics in calibration processes, systems, and techniques.
- C. Select and apply the applicable mathematical functions, computations, and measurements to perform various diagnostic, maintenance, and operation procedures.
- D. Demonstrate mathematical computations using standard and metric systems.
- E. Demonstrate the safe and proper use and interpretation of precision measurement tools, scales, devices, and systems, such as dial indicators, and micrometers used to design, fabricate, diagnose, maintain, and repair vehicles following recommended industry standards.
- F. Accurately complete basic mathematical functions and formulas using whole numbers, fractions, decimals, greater than/less than, graphs and tables.

9. Engine Repair

- A. Retrieve and record stored OBD I and OBD II diagnostic trouble codes; follow flow chart, diagnose, and clear codes.
- B. Diagnose basic operation and performance of an engine.
- C. Diagnose basic mechanical issues such as, smoke and knocks.

- D. Install engine covers using gaskets, seals, and sealers as required.
- E. Remove and replace timing belt; verify correct camshaft timing.
- F. Perform common fastener and thread repair, to include remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.
- G. Recognize hybrid vehicle internal combustion engine service precautions.
- H. Adjust valves (mechanical or hydraulic lifters).

10. Automatic Transmission and Transaxle

- A. Retrieve and record OBDII diagnostic trouble codes for automatic transmission.
- B. Adjust and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.
- C. Describe the operational characteristics of a continuously variable transmission (CVT).
- D. Describe the operational characteristics of a hybrid vehicle drive train.

11. Manual Drive Train and Axle

- A. Retrieve and record OBDII diagnostic trouble codes for manual transmissions.
- B. Check and adjust clutch operation.
- C. Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals.
- D. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.
- E. Inspect drive axles.
- F. Inspect and replace wheel studs.
- G. Inspect front-wheel bearings and locking hubs.
- H. Check for leaks at drive assembly seals; check vents; check lube level.

12. Brakes

- A. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, loose fittings and supports; determine necessary action.
- B. Remove, clean, and inspect linings and brake pads, measure brake drum diameter; determine necessary action.
- C. Clean and inspect linings, brake pads, and rotor; measure rotor thickness, thickness variation, and lateral runout, check brake pad wear indicator; determine necessary action.
- D. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.
- E. Check parking brake operation and parking brake indicator light system operation; determine necessary action.
- F. Compare and contrast the operation of hydraulic, drum, and disc brake systems.

Hydraulic System

- G. Measure brake pedal height, travel, and free play (as applicable); determine necessary action.
- H. Identify components of brake warning light system.

- I. Bleed and/or flush brake system.
- J. Test brake fluid for contamination.

Drum Brakes

- K. Refinish brake drum and measure final drum diameter; compare with specifications.
- L. Remove, clean, inspect, and measure brake drum diameter; determine necessary action.
- M. Refinish brake drum and measure final drum diameter; compare with specifications.
- N. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
- O. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.
- P. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments.

Disc Brakes

- Q. Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action.
- R. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.
- S. Remove, inspect, and replace pads and retaining hardware; determine necessary action.
- T. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.
- U. Remove and reinstall rotor.
- V. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.
- W. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.
- X. Retract and re-adjust caliper piston on an integral parking brake system.
- Y. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.

Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.)

- Z. Inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.
- AA. Check parking brake cables and components for wear, binding, and corrosion.
- BB. Replace wheel bearing and race.

13. Electrical/Electronic Systems

- A. Perform solder repair of electrical wiring.
- B. Identify location of hybrid vehicle high voltage circuit disconnects (service plug) location and safety procedures.
- C. Disarm and enable the SRS for vehicle service.
- D. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.
- E. Identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.
- F. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.
- G. Perform charging circuit voltage drop tests; determine necessary action.

14. Certification / Pre-apprenticeship

- A. Research NATEF, ASE, or the Equipment and Engine Training Council for certifications/trainings offered.
- B. Locate opportunities for apprenticeships/pre-apprenticeships in the automotive industry.
- C. Compare and contrast requirements for Automotive Service Excellence (ASE) and NATEF certifications.
- D. Prepare students for certification on Heating and Air Conditioning.
- E. Complete Automotive Service Pollution Prevention Training (SP/2).
- F. Take OSHA-10 Certification (SP/2).

15. Portfolio Design

- A. Develop personal marketing and computer skills by refining your digital portfolio for post-secondary and employment acceptance.
- B. Compile best samples of original works (in photographs and video) and documents for a variety of purposes, which shows a progression in the acquisition of knowledge and/or skills.
- C. Demonstrate knowledge of competencies through journaling or summary of selected works or documents.
- D. Revise professional resume and cover letter to align with skills and objective statements of the relevant industry.
- E. Dress professionally and practice interviewing techniques using portfolio materials.
- F. Assemble industry and employability documents (resume, cover letter, certifications, recommendation letters, etc.).
- G. Create a "leave behind" book or folder.
- H. Display portfolio materials during a fair, community event, competition, or professional panel review.
- I. Evaluate and utilize feedback to improve portfolio.

Key Assignments

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
1. Students will participate in mock interviews that represent current industry practices (e.g., skills demonstrations, resumes, applications, portfolios, personal websites, etc.).	1A, B, D 3B, C, D, I, J 6A-E	2 3 10	2 3 10		LS 11-12.6 SLS 11-12.2
2. In teams, students will create a safety manual based on pre-assigned safety topics such as: fire safety, shop safety procedures and ventilation, electrical safety. They will explain and present safety manual to beginning students in automotive general service technician class. Safety and cleanliness of shop areas will be assessed regularly. Pass safety test and take OSHA-10 certification test.	7A-M 14F	1 4 5	2 4 5	C2.0	WS 11-12.6 WS 11-12.7
3. Accurately use a ruler and a precision measuring device. Select the proper types of bolts, nuts, and washers for a given task.	7D-G 8A-F	1 5 10	2 5 10	C2.0	A-CED 4 RLST 11-12.3 RLST 11-12.4
4. Students will use diagnostic information to affect engine repair. (Students will communicate action taken to clients, i.e. classmates and teacher. Students will use written and oral communication skills, analytical, attention to detail, problem solving and application of industry knowledge skills.)	1A - F 2A, D, I, J 3A, D 5B, G 9A-G	1 4 5 6 11 12	2 4 5 6 10	C2.0 C3.0 C4.0 C6.0	LS 11-12.6 WS 11-12.6 WS 11-12.7 RSTS 11-12.4 RLST 11-12.3 RLST 11-12.10 SEP 4, 8 CC 2 ETS 1.B
5. Students will use diagnostic information to affect transmission repair. (Students will communicate action taken to clients, i.e. classmates and teacher. Students will use written and oral communication skills, analytical, attention to detail, problem solving and application of industry knowledge skills.)	1A - F 2A, D, I, J 3A, D 5B, G	1 4 5 6	2 4 5 6	C2.0 C3.0 C4.0 C8.0	LS 11-12.6 WS 11-12.6 WS 11-12.7 RSTS 11-12.4

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
	10A-D	11 12	10		
6. Identify and describe the function of all automotive drive train systems components. Demonstrate how to evaluate, diagnose, and repair various drive train issues.	1A - F 2A, D, I, J 3A, D 5B, G 11A-H	1 4 5 6 11 12	2 4 5 6 10	C2.0 C3.0 C4.0 C8.0	LS 11-12.6 WS 11-12.6 WS 11-12.7 RSTS 11-12.4 RLST 11-12.3 RLST 11-12.10 SEP 4, 8 CC 2 ETS 1.B
7. Students will diagnose, service and repair traction control and anti-lock brake systems.	1A - F 2A, D, I, J 3A, D 5B, G 12A-Y	1 4 5 6 11 12	2 4 5 6 10	C2.0 C3.0 C4.0 C8.0	LS 11-12.6 WS 11-12.6 WS 11-12.7 RSTS 11-12.4
8. Students will clean and service a battery including the case, cables, connections, and check electrolytes.	1A - F 2A, D, I, J 3A, D 5B, G 13A-G	1 2 5 6 11 12	4 5 6 10	C1.0 C2.0 C4.0 C5.0	WS 11-12.6 WS 11-12.7 RSTS 11-12.4 RLST 11-12.3 RLST 11-12.10 SEP 4, 8 CC 2 LS 2.D PS 4.C WS 11-12.4
9. Research the National Automotive Technicians Education	1A - F 2A, D, I, J	1 4	2 4	C2.0 C3.0	LS 11-12.6 WS 11-12.6

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
foundation or the Equipment and Engine Training Council to determine the training, testing, and certifications offered.	3A, D 5B, G 14A-F	5 6 11 12	5 6 10	C4.0 C6.0	WS 11-12.7 RSTS 11-12.4 RLST 11-12.3 RLST 11-12.10 SEP 4, 8 CC 2 ETS 1.B

Standards Assessed in this Program

Career Ready Practices

1. Apply appropriate technical skills and academic knowledge.
2. Communicate clearly, effectively, and with reason.
3. Develop an education and career plan aligned to personal goals.
4. Apply technology to enhance productivity.
5. Utilize critical thinking to make sense of problems and persevere in solving them.
7. Act as a responsible citizen in the workplace and the community.
8. Model integrity, ethical leadership, and effective management.
9. Work productively in teams while integrating cultural/global competence.
10. Demonstrate creativity and innovation.
11. Employ valid and reliable research strategies.
12. Understand the environmental, social, and economic impacts of decisions.

Anchor Standards

2.0 Communications

- Acquire and use accurately sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

3.0 Career Planning and Management

- Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.

4.0 Technology

- Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the sector workplace environment.

5.0 Problem Solving and Critical Thinking

- Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.

6.0 Health and Safety

- Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the sector workplace environment.

7.0 Responsibility and Flexibility

- Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the sector workplace environment and community settings.

8.0 Ethics and Legal Responsibilities

- Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms.

9.0 Leadership and Teamwork

- Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution.

10.0 Technical Knowledge and Skills

- Apply essential technical knowledge and skills common to all pathways in the sector following procedures when carrying out experiments or performing technical tasks.

Pathway Standards

Transportation - Systems Diagnostics and Service Pathway

C1.0 Demonstrate the practice of personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards.

C2.0 Practice the safe and appropriate use of tools, equipment, and work processes.

C3.0 Use scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems.

C4.0 Perform and document maintenance procedures in accordance with the recommendations of the manufacturer.

C5.0 Apply and understand appropriate business practices.

C6.0 Demonstrate the application, operation, maintenance, and diagnosis of engines, including, but not limited to, two- and four-stroke and supporting subsystems.

C7.0 Demonstrate the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards.

C8.0 Demonstrate the function and principles of automotive drivetrain, steering and suspension, brake, and tire and wheel components and systems in accordance with national industry standards.

Common Core State Standards

ENGLISH LANGUAGE ARTS

Language Standards

LS 11-12.6: Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the (career and college) readiness level, demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

LS 2.D

Reading Standards for Literacy in Science and Technical Subjects

RLST 11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

RLST 11-12.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context.

RLST 11-12.10: By the end of grade 12 read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.

Speaking and Listening Standards

SLS 11-12.2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions, and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

SLS 11-12.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners, building on others ideas and expressing their own clearly and persuasively.

SLS 11-12.1d: Respond thoughtfully to diverse perspectives, synthesize comments, claims and evidence made on all sides of an issue, resolve contradictions when possible, and determine what additional information or research is required to deepen the investigation or complete the work.

Writing Standards

WS 11-12.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

WS 11-12.6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback including new arguments and information.

WS 11-12.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem, narrow or broaden the inquiry when appropriate, synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

MATHEMATICS

Algebra- Creating Equations

A-CED 4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance R .

SCIENCE

Crosscutting Concept

CC 2: Cause and effect: Mechanism and explanation

Engineering, Technology, and the Applications of Science

ETS 1.B: Developing Possible Solutions

Physical Sciences

PS 3.A: Definitions of Energy

PS 3.B: Conservation of Energy and Energy Transfer

PS 4.C: Information Technologies and Instrumentation

Scientific and Engineering Practices

SEP 4: Analyzing and interpreting data

SEP 8: Obtaining, evaluating, and communicating information