

RARITAN VALLEY COMMUNITY COLLEGE ACADEMIC COURSE OUTLINE

AUTC 104 – Automotive Electrical Systems I

I. Basic Course Information

- A. Course Number and Title: AUTC 104 – Automotive Electrical Systems I
- B. New or Modified Course: Modified
- C. Date of Proposal: Fall 2022
- D. **Effective Term: Fall 2023**
- E. Sponsoring Departments: *Science and Engineering Department*
- F. Semester Credit Hours: 3
- G. Weekly Contact Hours: 5 Lecture: 2
Laboratory: 3
Out of class student work per week: 5.5
- H. Prerequisite (s) ☐ Corequisite (s) ☒ **OR** Prerequisite (s) and Corequisite (s) ☐
Corequisites: AUTC 101 – Automotive Introduction, Fundamentals, and Safety
AUTC 109 – Brake Systems
AUTC 201 – Engine Systems & Emissions Control I
(Students must be registered in the same section for each course)
- I. Additional Fees: None
- J. Name and Telephone Number or Email Address of Department Chair and Divisional Dean at time of approval:
Department Chair: Marianne Baricevic, Marianne.baricevic@raritanval.edu
Divisional Dean: Sarah Imbriglio, sarah.imbriglio@raritanval.edu

II. Catalog Description

Corequisites: AUTC 101 – Automotive Introduction, Fundamentals, and Safety
AUTC 109 – Brake Systems
AUTC 201 – Engine Systems & Emissions Control I
(Students must be registered in the same section for each course)

Principles of electricity, circuitry and service are included in this course. It will cover batteries, starting and charging systems, lighting and accessory systems as well as laws relating to power and consumption of electricity including Kirchhoff's Law, Ohm's Law, and Watt's Law. Skills in trouble-shooting the automotive electrical system will be developed with the use of modern testing and service equipment.

In the lab, students will learn a hands-on strategy to perform basic maintenance of electrical components and learn how to use a variety of hand tools and precision measurement tools. Students will be required to wear clothing appropriate for auto shop safety at all classes. Safety glasses will also be required at all classes.

III. Statement of Course Need

- A. Automotive technicians are vital to our mobile and transport-dependent community. Understanding electrical systems in automobiles and the ability to diagnose and maintain electrical components are integral elements for the education of well-trained technicians in the field, as vehicles have moved from mechanical to electro-mechanical in their design and operation. This course is intended to enhance the student's knowledge beyond understanding.
- B. Lab assignments for the course will introduce students to the basic engine power plant of the vehicle and basic maintenance and repair of engine systems, while maintaining instruction that reinforces the safety practices in a demonstrative environment.
- C. Course transferability: The course transfers as one of the core fundamental courses for the Automotive Technology major and includes a laboratory component; for New Jersey schools go to the NJ Transfer website, www.njtransfer.org. For all other colleges and universities, go to their individual websites.

IV. Place of Course in College Curriculum

- A. Free Elective
- B. This course meets the program requirement for the Automotive Technology Certificate and the Associate of Applied Science in Automotive Technology.
- C. Course transferability; for New Jersey schools go to the NJ Transfer website, www.njtransfer.org. For all other colleges and universities go to their individual sites.

V. Outline of Course Content

- A. Fundamentals of Electricity
- B. Ohm's Law

- C. Kirchhoff's Law
- D. Watt's Law
- E. Other Electrical Laws
- F. Series, Parallel, and Series-Parallel Circuits
- G. Batteries, Theory, Testing, and Service
- H. Charging Systems Theory, Testing, and Service
- I. Starting System Theory, Testing, and Service
- J. Semi-conductors
- K. Servicing Accessory and Aftermarket Systems
- L. Wiper/washer, Horn, Power Accessory Systems
- M. Proper Trim and Panel Removal
- N. Maintaining and Servicing:
 - 1. Alternators and Generators
 - 2. Interior and Exterior Lighting
 - 3. Replacing Fuses, Circuit Breakers, Fusible Links, Relays, Switches and Resistors

VI. A. Course Learning Outcomes

At the completion of the course, students will be able to:

1. Explain the structure and function of electrical systems used in automobiles.
2. Compare and contrast electrical system components used in vehicles.
3. Inspect, test, and replace electrical system components according to manufacturer's specifications.
4. Examine electrical system components and identify appropriate tools and diagnostic equipment used during diagnosis and repair.
5. Compare computerized and solid-state controls in use in automobiles.
6. Apply proper safety precautions for individuals, components and vehicles.
7. Analyze and service electrical circuits and systems within an automobile.
8. Perform lab experiments and tasks to competent skill level as listed on the NATEF curriculum standards.
9. Identify techniques to troubleshoot, repair, maintain, and solve problems with automotive electrical systems (GE NJ 4)
10. Apply quantitative reasoning to problems with the maintenance of automotive electrical systems (GE NJ 2)
11. Discuss issues involving automotive electrical systems (GE NJ 1)
12. Apply principles of electricity and electrical current to electrical systems in automobiles (GE NJ 3)

NATEF Standards: AVI Electrical/Electronic Systems

- a. General: Electrical System Diagnosis
 - i. Research vehicle service information including vehicle service history, service precautions, and technical service bulletins.

P-

- ii. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1
- iii. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance. P-1
- iv. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1
- v. Demonstrate proper use of a test light on an electrical circuit. P-1
- vi. Use fused jumper wires to check operation of electrical circuits. P-1
- vii. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems. P-1
- viii. Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action. P-1
- ix. Inspect & test fusible links, circuit breakers, & fuses; determine needed action. P-1
- b. Battery Diagnosis and Service
 - i. Perform battery state-of-charge test; determine needed action. P-1
 - ii. Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action. P-1
 - iii. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs. P-1
 - iv. Perform slow/fast battery charge according to manufacturer's recommendations. P-1
 - v. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply. P-1
- c. Starting System Diagnosis and Repair
 - i. Perform starter current draw tests; determine needed action. P-1
 - ii. Perform starter circuit voltage drop tests; determine needed action. P-1
 - iii. Inspect and test starter relays and solenoids; determine needed action. P-2
 - iv. Remove and install starter in a vehicle. P-1
 - v. Inspect and test switches, connectors, and wires of starter control circuits; determine needed action. P-2
- d. Charging System Diagnosis and Repair
 - i. Perform charging system output test; determine needed action. P-1

- ii. Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions. P-1
 - iii. Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1
 - iv. Remove, inspect, and/or replace generator (alternator). P-1
 - v. Perform charging circuit voltage drop tests; determine needed action. P-1
- e. Lighting Systems Diagnosis and Repair
 - i. Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action. P-1
 - ii. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1

B. Assessment Instruments

- 1. lectures
- 2. demonstrations
- 3. laboratory work
- 4. instructional videos/DVDs
- 5. laboratory performance
- 6. examinations
- 7. NATEF task list
- 8. Online modules
- 9. Manufacturer programs

VII. Grade Determinants

- A. Lab performance
- B. Examinations
- C. Class participation
- D. Technical writing
- E. Interactive simulations
- F. Module completion
- G. Homework assignments

Primary formats, modes, and methods for teaching and learning that may be used in the course:

- A. Lecture/discussion
- B. Small-group work
- C. Group discussion
- D. Computer-assisted instruction

- E. Laboratory
- F. Simulation/role playing
- G. Demonstration
- H. Student collaboration
- I. Individual assignments
- J. Electude
- K. Manufacturer training

VIII. Text and Materials

- A. Suggested Text: Automotive Technology: Principles, Diagnosis, and Service Plus MyAutomotiveLab with Pearson eText -- Access Card Package / Edition 5 by James D. Halderman (Author), Prentice Hall Publishing ISBN-10: 0134009088 / ISBN-13: 9780134009087
- B. Students will be required to wear clothing appropriate for auto shop safety at all classes. Student are required to wear a standard industry uniform. Safety glasses will also be required at all classes.
- C. The Automotive Program utilizes online curriculum and online industry service and repair information from the following sources:
 - I. AllData
 - II. Snap On Industries
 - III. Shop Key Pro.
 - IV. Electude
 - V. Manufacturer Training
- D. Various Automotive Magazines
- E. Students are provided the use of RVCC technology during the course

Please note: The course outline is intended only as a guide to course content and resources. Do not purchase textbooks based on this outline. The RVCC Bookstore is the sole resource for the most up-to-date information about textbooks.

IX. Resources

- A. Reference books
- B. AllData
- C. Shop Key Pro
- D. Snap On Industries
- E. NAPA Pro-Link
- F. Published Automotive Magazines

- G. Lab/Shop Tools and Equipment
- H. CDX Interactive Courseware
- I. Safety equipment
- J. Lubricants and various automotive fluids
- K. Sample automotive system components
- L. Instructional videos/DVDs
- M. Auto mechanics shop facility at RVCC workforce building
- N. Electude
- O. Manufacturer Training