Butler County Community College
Business, Technology, and Workforce Development

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COURSE OUTLINE
Auto Electrical Systems I

Course Description:
AT102 Auto Electrical Systems 1. 3 Credit Hours. This course will enable the student to understand the principles upon which all electrical systems are based. The student will be able to define OHM and Kirchoff's laws and apply them to automotive circuits. The student will be able to define the terminology and symbols utilized in automotive circuits. The student will learn about automotive battery construction, chemistry and testing procedures, and semiconductor /electronic circuit principles.

Course Relevance:
The principles learned in this course are the underlying basis for all automotive circuits; successful comprehensions of these principles allow the student to diagnose electrical component / system problems or failures.

Required Materials:
Layne, K. (1986). Automotive Engine Performance: Tuneup, Testing, and Service, Volume 1 (2nd ed.) Englewood Cliffs, NJ: Prentice Hall Career & Technology

Learning Outcomes:
Through the comprehension and application of electrical principles to the diagnosis of automotive electrical problems the student should be capable of correcting problems in the field. Comprehension of electrical / electronic principles will allow the student to select and utilize the tools / instruments required for proper diagnosis. Comprehension of these principles will allow the student to move freely across product line diagnosis without intimidation by seemingly "new" technology.

Learning PACT
Through the student involvement in this course, the student will develop and document his/her achievement of the following PACT skills:
Primary skills (developed and documented):
1. Problem solving:
   - Through the selecting and using the tools / instruments needed to diagnose electrical / electronic problems, the student will demonstrate comprehension of fundamental electrical principles.
2. Critical Thinking:
   - Through using a systematic / analytic thought process in the solution of electrical problems, the student will demonstrate critical thinking skills.

3. Listening Skills:
   - Through recognition of the need for clear, concise communication between the consumer and the technician, the student will develop listening skills.
4. Ethical conduct:
   - Through understanding for the need to perform an effective repair in a timely, cost effective manner, the student will develop ethical conduct skills.

Secondary skills (developed but not documented):

Writing
Reading
Computer literacy
Dealing with diversity
Coping with technological change

Assessment Tasks:

These learning outcomes and primary Learning PACT skills will be demonstrated by:

1. In a field related environment, demonstrating the comprehension of electrical / electronic principles through the successful diagnosis of assigned projects.
2. In a field related environment, selecting and using the proper test equipment needed to analyze and diagnose electronic component function.
3. In a field related environment, demonstrating the testing and replacement of primary starting circuit components

Course Content:

I. Themes - Key recurring concepts that run throughout this course:
   A. Cost effectiveness
   B. Quality of repair
   C. Safety in the work environment
   D. Logical/systematic thought process

II. Issues - Key issues that will be addressed in this course: areas of conflict that must be understood in order to achieve the intended outcome:
   A. The need to protect other components during the repair process.
   B. The need for proper / low resistance connection / splicing methods
   C. Time management for effective repair
   D. Cost analysis
   E. The need for a systems approach to diagnosis and repair

III. Concepts – Key concepts that must be understood to address the issues:
   A. Ohms Law
   B. Kirshoffs Law
   C. Circuit analysis
   D. Test instrument operation
   E. Component operation

IV. Skills / Competencies - Actions that are essential to achieve the course outcomes:

A. Use wiring diagrams during diagnosis of electrical circuit problems
B. Check electrical circuits with a test light; determine needed repairs
C. Check voltage drop in electrical/electronic circuits using a digital multimeter (D.M.M.); determine needed repairs
D. Check current flow in electrical/electronic circuits using an ammeter; determine needed repairs
E. Check electrical circuits using jumper wires; determine needed repairs
F. Locate shorts, grounds, opens and resistance problems in electrical circuits; determine needed repairs
G. Measure and diagnose the cause(s) of abnormal key-off battery drain; determine needed repairs
H. Inspect and test fusible links, circuit breakers, and fuses; service as needed
I. Inspect and test switches, connectors, relays and wires of electrical circuits; repair or replace as needed
J. Perform battery state-of –charge test; determine needed service
K. Perform battery capacity (load, high rate discharge) test; service as necessary
L. Maintain or restore electronic memory functions
M. Inspect, clean, fill and install battery
N. Perform slow/fast battery charge
O. Inspect and clean battery cables, connections, clamps, hold-downs; repair or replace as needed
P. Start a vehicle using jumper cables or an auxiliary power supply

Learning Units:

I. Demonstrate comprehension of Ohms Law using variables in voltage, resistance and current within the equation
II. Identify series, parallel and combination (series/parallel) circuits
III. Comprehension of battery chemistry during discharge
IV. Demonstrate safe work practices as applied to electrical systems
V. Demonstrate the proper usage of appropriate circuit/component test equipment.
VI. Demonstrate the application of a structured/analytical approach to electrical system diagnosis.

Learning Activities:

Independent and collaborative learning activities will be assigned within the classroom and lab environment to assist the student in achieving the desired outcomes. Class discussion, lecture, reading assignments and supportive lab activities will also contribute to the learning process.

Grade Determination:
Grade determination will be based on the student's performance of assigned tasks within the classroom/lab environment. Attendance, group participation, attitude towards fellow students and assigned tasks will be reflected in the final grade. Lab tasks (competencies) will be evaluated (rated) on the competency profile.