I. OVERVIEW
The following information will appear in the 2010 - 2011 catalog

AUTEC 368 A6: Automotive Electricity/Electronic Systems 1 3.5 Units
Formerly listed as: AUTEC - 368: A6: Automotive Electricity/Electronic Systems 1
Corequisite: or satisfactory completion of Concurrent enrollment in or satisfactory completion of AUTEC 311.

Introduction to automotive electrical systems. Course covers basic fundamentals: Ohm's law, starting and charging systems, batteries, alternators and starters. Course also cover principles of operation, testing, adjusting, and rebuilding procedures for electrical systems.

Materials Fee Required
Field trips are not required. (A-F Only) Lecture /Lab

II. LEARNING CONTEXT
Given the following learning context, the student who satisfactorily completes this course should be able to achieve the goals specified in Section III, Desired Learning:

A. COURSE CONTENT

1. Required Content:

   a. Electrical fundamentals
      i. Electrical and electron theory
      ii. Sources of electricity
      iii. Conductors, semiconductors and insulators
      iv. Units of electrical measurement

   b. Electrical circuits
      i. Series circuits
      ii. Parallel circuits
      iii. Series/parallel circuits
      iv. Ohm's Law
      v. Kirchoff's Laws

   c. Capacitance and magnetism
      i. Capacitor construction, operation and uses
      ii. Factors of capacitance
      iii. Fundamentals of magnetism and electromagnetism
iv. Electromagnetic induction

d. Automotive wiring
   i. Wire and cable types
   ii. Fuses and circuit protection devices
   iii. Terminals and connectors
   iv. Wire repair techniques

e. Digital meters
   i. Test lights
   ii. Digital multimeters
   iii. AC/DC clamp on meters
   iv. Electrical unit prefixes

f. Batteries
   i. Battery purpose and construction
   ii. Battery types
   iii. Cell voltage
   iv. Chemical action in the cells
   v. Specific gravity
   vi. Direction of current flow
   vii. Battery testing and service

g. Cranking system
   i. Electric motor principles
   ii. Starter motor types and operation
   iii. Cranking circuit operation
   iv. Permanent magnet motors
   v. Gear reduction motors
   vi. Starter drive types
   vii. Cranking system diagnosis and service

h. Charging system
   i. Principles of generator operation
   ii. Generator types and operation
iii. Voltage regulation
iv. Battery condition and charging voltage
v. Temperature compensation
vi. Computer controlled generators
vii. Charging system diagnosis and service

2. **Required Lab Content:**

a. Demonstrate safe working practices

b. Select and correctly use various automotive test equipment to include;
   i. Test light
   ii. Digital multimeter
   iii. Battery load tester
   iv. Battery charger
   v. Starter/alternator tester
   vi. Armature tester

c. Consult appropriate sources to obtain manufacturer's repair and service information

d. Battery testing and service
   i. Battery service safety considerations
   ii. Battery maintenance
   iii. Battery voltage test
   iv. Hydrometer test
   v. Load test
   vi. Battery charging
   vii. Jump starting
   viii. Battery electrical drain test
   ix. Battery date codes

e. Cranking system diagnosis and service
   i. Cranking system troubleshooting
   ii. Cranking system voltage drop testing
iii. Control circuit testing  
iv. Amperage draw test  
v. Starter motor removal, overhaul and installation  
vi. Starter motor bench testing  

f. Charging system diagnosis and service  
i. Charging system troubleshooting  
ii. Accessory drive belt inspection  
iii. AC voltage check  
iv. AC current ripple check  
v. Charging system voltage drop testing  
vi. Generator output test  
vii. Generator removal, overhaul and installation  
viii. Generator bench testing  

B. ENROLLMENT RESTRICTIONS  
1. Co-requisites  
Concurrent enrollment in or satisfactory completion of AUTEC 311.  

2. Requisite Skills  
*Before entering the course, the student will be able to:*  
a. Identify the various types of hand and power tools used in the automotive industry as well as their uses.  
b. Research various repair manuals and service publications to acquire information on repairs and maintenance of vehicles.  
c. Demonstrate the proper and safe use of tools and equipment used in the automotive laboratory.  
d. Describe the basic automotive systems and their respective function.  

C. HOURS AND UNITS  

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<th>INST METHOD</th>
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<th>UNITS</th>
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<tr>
<td>Lab</td>
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D. **METHODS OF INSTRUCTION (TYPICAL)**

Instructors of the course might conduct the course using the following method:

1. Deliver lectures on the course material using visual aids to enhance presentations.
2. Laboratory demonstrations of equipment usage and diagnostic procedures.
3. Handouts.
4. Individual and group research projects assigned to students.

E. **ASSIGNMENTS (TYPICAL)**

1. **EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS**
   
   Time spent on coursework in addition to hours of instruction (lecture hours)

   Students will be assigned approximately 2 hours of reading each week.
   Students must also complete weekly homeworks and prepare for class quizzes and tests.

2. **EVIDENCE OF CRITICAL THINKING**

   Assignments require the appropriate level of critical thinking

   Students will disassemble a starter motor and analyse the internal parts for wear to determine its condition during operation.
   A rebuilt starter turns but will not disengage from the flywheel. The most likely cause is--------.
   a) The shift fork installed backward
   b) The solenoid contact installed backward
   c) A defective starter drive
   d) A missing solenoid plunger return spring

F. **TEXTS AND OTHER READINGS (TYPICAL)**


III. **DESIRED LEARNING**

A. **COURSE GOAL**

   As a result of satisfactory completion of this course, the student should be prepared to:

   describe the operating principles and testing methods of automotive battery, starting, and charging systems.

B. **STUDENT LEARNING GOALS**

   Mastery of the following learning goals will enable the student to achieve the overall course goal.

1. **Required Learning Goals**

   Upon satisfactory completion of this course, the student will be able to:

   a. Explain the basic electrical principles of voltage, amperage and resistance.
   b. Describe the proper test procedure when using voltmeters, ammeters and ohmmeters.
   c. Determine battery state of charge.
   d. Identify the components of automotive cranking and charging systems.
   e. Demonstrate how to troubleshoot automotive cranking and charging systems to locate a specific problem.
f. Disassemble a starter motor and analyze the internal parts for wear to determine its condition during operation.

g. Disassemble an alternator and analyze the internal parts for wear to determine its condition during operation.

h. Conduct all equipment vehicle tests with safety and craftsmanship as the prime guideline.

2. **Lab Learning Goals**

   **Upon satisfactory completion of the lab portion of this course, the student will be able to:**

   a. Demonstrate competence in the selection and use of electrical test equipment.

   b. Perform inspection, maintenance and test procedures for automotive batteries.

   c. Demonstrate competence in diagnosing cranking system faults and recommending appropriate repairs.

   d. Demonstrate competence in diagnosing charging system faults and recommending appropriate repairs.

3. **Recommended Learning Goals**

   **Upon satisfactory completion of the course (when the related recommended content is covered) the student will be able to:**

   a. Solve electrical problems using manufacturer's specifications as the standard.

IV. **METHODS OF ASSESSMENT (TYPICAL)**

   A. **FORMATIVE ASSESSMENT**

      1. Textbook chapter review questions.

      2. Mid-term examination.

      3. Laboratory assignments.

   B. **SUMMATIVE ASSESSMENT**

      1. Final examination.

      2. All laboratory task sheets successfully completed.