Creating by: Christopher Mayville

Updated by:

Canino School of Engineering Technology

Department: Mechanical & Energy Technologies

Semester/Year: Fall 2018
A. **TITLE:** Powersports Engine Diagnostics

B. **COURSE NUMBER:** MSPT 113

C. **CREDIT HOURS:** 3 credit hour(s) per week for 15 weeks
- One hour (50 minutes) of lecture per week
- Three times
- Two to three hours of lab or clinical per week
- Two hours of recitation per week
- 40 hours of internship

D. **WRITING INTENSIVE COURSE:** Yes ☒ No ☐

E. **GER CATEGORY:** None ☐ Yes ☒ GER
   *If course satisfies more than one: GER*

F. **SEMESTER(S) OFFERED:** Fall ☐ Spring ☒ Fall & Spring ☐

G. **COURSE DESCRIPTION:**

With the completion of this course of study, the student will be able to diagnose and repair a machine with a no-start condition resulting from a fuel or ignition problem. Knowledge and understanding of sophisticated engine fuel and ignition systems is the focus of this course. Students study primary ignition circuits, secondary firing, points and condenser, magneto, capacitor discharge, hall-effect and transistor theory. Electronic computer scanners, gages and other diagnostic devices are used throughout the course. Study of fuel systems begins with fuel delivery and includes electronic fuel injection.

H. **PRE-REQUISITES:** None ☐ Yes ☒ If yes, list below:

MSPT 101-Powersports Service, MSPT 112-Powersports Electrical Systems, MSPT 122-Powersports Electrical Systems Lab, or with permission of instructor

   **CO-REQUISITES:** None ☐ Yes ☒ If yes, list below:

MSPT 114-Powersports Engine Diagnostics Lab, or with permission of instructor
I. **STUDENT LEARNING OUTCOMES:** (see key below)

By the end of this course, the student will be able to:

<table>
<thead>
<tr>
<th><strong>Course Student Learning Outcome [SLO]</strong></th>
<th><strong>Program Student Learning Outcome [PSLO]</strong></th>
<th><strong>GER [If Applicable]</strong></th>
<th><strong>ISLO &amp; SUBSETS</strong></th>
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<tbody>
<tr>
<td>Demonstrate knowledge and understanding of ignition systems.</td>
<td>MSPT SO 1</td>
<td>ISLO ISLO ISLO</td>
<td>Subsets Subsets Subsets</td>
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<td>Demonstrate procedures necessary in servicing engine ignition systems.</td>
<td>MSPT SO 1, MSPT SO 2</td>
<td>ISLO ISLO ISLO</td>
<td>Subsets Subsets Subsets</td>
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<td>Demonstrate knowledge and understanding of engine fuel injection systems.</td>
<td>MSPT SO 2</td>
<td>ISLO ISLO ISLO</td>
<td>Subsets Subsets Subsets</td>
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<td>Demonstrate procedures necessary in servicing fuel injection systems.</td>
<td>MSPT SO 2</td>
<td>ISLO ISLO ISLO</td>
<td>Subsets Subsets Subsets</td>
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<td>Apply electrical knowledge to engine performance sensors and the modules that control them.</td>
<td>MSPT SO 1, MSPT SO 2</td>
<td>ISLO ISLO ISLO</td>
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<tr>
<th>KEY</th>
<th>Institutional Student Learning Outcomes [ISLO 1–5]</th>
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<tbody>
<tr>
<td>ISLO #</td>
<td>ISLO &amp; Subsets</td>
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</table>
| 1 | Communication Skills  
Oral [O], Written [W] |
| 2 | Critical Thinking  
Critical Analysis [CA], Inquiry & Analysis [IA], Problem Solving [PS] |
| 3 | Foundational Skills  
Information Management [IM], Quantitative Lit./Reasoning [QTR] |
| 4 | Social Responsibility  
Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T] |
| 5 | Industry, Professional, Discipline Specific Knowledge and Skills |

*Include program objectives if applicable. Please consult with Program Coordinator*
J. **APPLIED LEARNING COMPONENT:** Yes ☐ No ☒

If YES, select one or more of the following categories:

- Classroom/Lab ☐
- Internship ☐
- Clinical Placement ☐
- Practicum ☐
- Service Learning ☐
- Community Service ☒
- Civic Engagement ☐
- Creative Works/Senior Project ☐
- Research ☐
- Entrepreneurship (program, class, project) ☐

K. **TEXTS:**


L. **REFERENCES:**

Shop manuals of manufacturers

M. **EQUIPMENT:** None ☐ Needed: Standard repair equipment

N. **GRADING METHOD:** A-F

O. **SUGGESTED MEASUREMENT CRITERIA/METHODS:**

Quizzes, exams, homework

P. **DETAILED COURSE OUTLINE:**

1. **Introduction**
   a. Course overview
   b. Course requirements

2. **Basic Ignition Overview**
   a. Types (Magneto, Capacitor discharge, Battery/DC powered)
   b. Ignition system components
   c. Ignition system operation

3. **IGNITION PRIMARY SYSTEMS**
   a. CDI charging and signal
   b. Points and condenser
   c. Pickup coil (pulse generator)
   d. Hall Effect sensors
   e. Magnetic crankshaft position sensors
f. Optical sensors (marine engines)

4. IGNITION SECONDARY SYSTEMS
   a. Secondary windings of a coil (field build-up vs field collapse)
   b. Distributor cap and rotor if equipped
   c. Spark plug wires and spark plugs

5. FUEL SYSTEM INTRODUCTION
   a. Operating principles/requirements
   b. Stoichiometry
   c. Fuel characteristics

6. FUEL DELIVERY SYSTEMS
   a. Mechanical Systems
   b. Electrical Systems

7. COMPUTERIZED ENGINE CONTROL
   a. Operating principles/requirements
   b. Interaction of system components
   c. Electronic system service procedures

8. FUEL INJECTION SYSTEMS - ELECTRONIC
   a. Theory and operating principles
   b. Battery powered
   c. Battery-less
   d. Direct Injection

9. FUEL INJECTION SYSTEMS – MECHANICAL
   a. Compact diesel engines

Q. LABORATORY OUTLINE: None ☒ Yes ☐