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### SET 179.01: Marine Powerheads and Lower Units

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**THE UNIVERSITY OF MONTANA  
COLLEGE OF TECHNOLOGY  
INDUSTRIAL TECHNOLOGY DEPARTMENT**

**COURSE SYLLABUS**

**COURSE NUMBER AND TITLE:** SET 179T Marine Powerheads and Lower Units

**DATE REVISED:** 2010

**SEMESTER CREDIT:** 6

**CONTACT HOURS PER SEMESTER:** 187 (7 ½ week class)  
Lecture hours per week: 10  
Lab hours per week: 15

**PREREQUISITES:** SET 178T Marine Electrical and Fuel Systems

**INSTRUCTOR:** Mike Steffenson  
**E-mail:** [michael.steffenson@mso.umt.edu](mailto:michael.steffenson@mso.umt.edu)  
**Phone:** 406-243-7693  
**Office Location:** T & T II, West Campus  
**Office Hours:** By appointment OR as posted on Faculty Office Door

**RELATIONSHIP TO PROGRAM:** Recreational Power Equipment technicians must have the fundamental knowledge and skills necessary to service and repair personal watercraft and outboard motors. This course, along with the prerequisites, provides the foundation necessary for entry level technicians to be successful on the job.

**COURSE DESCRIPTION:**

Theory of design, function and components of outboard motor powerheads and lower units. Includes basic rigging, power trim and tilt, propping, and personal watercraft design, function, and maintenance.

**STUDENT PERFORMANCE OUTCOMES:**

Occupational Performance Objectives

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

1. Remove, rebuild, and replace an outboard motor powerhead.
2. Remove, rebuild, and replace a personal watercraft engine.
3. Complete R & R of a personal watercraft drive system.
4. Complete R & R of outboard motor lower unit.
5. Pressure test hydraulic power trim & tilt systems and troubleshoot common hydraulic problems.
6. Replace outboard motor throttle and shift cables.
7. Disassemble, reassemble, and repair common styles of rewind starters.
8. Using the serial and model number, determine the model year of unit, and be able to locate the part numbers of components. .

## **STUDENT PERFORMANCE ASSESMENT METHODS AND GRADING PROCEDURES:**

### **Grading Scale:**

- A= 93-100
- B= 86-92
- C= 75-85
- D= 65-74
- F= Below 65

**NOTE: Courses must be passed with a 'C minus (C-)' or greater to count toward degree/certificate requirements.**

The following criteria will be used for grading this course:

1. Written Tests 25%
2. Written Final Test 15%
3. Lab 45%
  - a. Accuracy and quality of required worksheet completion
  - b. Good use of lab time and following instructions
  - c. Use of shop manuals and forethought
4. Complete, neat and organized notebook of all handout materials and notes; and a notebook of all completed job sheets. 5%
5. Demonstrating skills on a daily basis 5%
6. Lab organization, management, and neatness 5%

### **Safety:**

1. College of Technology safety rules will be followed at all times. Each student will receive a copy of the safety rules. A copy of the rules are posted on the classroom bulletin board.
2. Safety glasses will be worn at **ALL** times when working in the lab, and in the classroom when working with storage batteries, chemicals, and when soldering.
3. Failure to follow the rules can result in removal from class.

### **EXPECTATIONS FOR STUDENT SUCCESS IN THE RPE PROGRAM:**

1. Attitude is everything
2. Regular attendance is critical; tardiness is unacceptable.
3. Take good notes.
4. Pay attention.
5. Study all assigned material on a regular basis and for tests

### **HOW VARIOUS ASSESSMENT METHODS WILL BE USED TO IMPROVE THE COURSE:**

1. Student course evaluations
2. Peer feedback
3. Advisory committee feedback

### **ATTENDANCE POLICY:**

1. If a student will not be able to attend class, the instructor **MUST** be called at 243-7693 to notify the instructor of the absence.
2. The student is responsible to make-up all assignments, lab work, etc. missed during the absence.
3. Test dates and times will be announced in advance.
4. There will be no make-up tests except for extreme extenuating circumstances.

**REQUIRED TEXTBOOKS:**

Understanding the Outboard Motor 2<sup>nd</sup> Edition; Author: Stagner; Publisher: Prentice Hall Mercury/Mariner Student Training Notebook (when available)

**REQUIRED SUPPLIES:** Digital multi-meter with a minimum of 10 amp DC capabilities.

**ACADEMIC INTEGRITY:** All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at <http://www.umt.edu/SA/VPSA/index.cfm/page/1321>.

**DISABILITY ACCOMMODATION:** Eligible students with disabilities will receive appropriate accommodations in this course when requested in a timely way. Please contact me after class or in my office. Please be prepared to provide a letter from your DSS Coordinator. For more information, visit the Disability Services website at <http://www.umt.edu/dss/> or call 406.243.2243 (Voice/Text).

**NOTE: Faculty reserves the right to modify syllabi and assignments as needed based on faculty, student, and/or environmental circumstances.**

**COURSE OUTLINE**

1. Marine two-stroke cycle operation
  - A. Intake/compression stroke
  - B. Power/exhaust stroke
  - C. Designs and methods of porting
    1. Reed valve induction
    2. Piston port induction
    3. Cross flow design
    4. Loop scavenging
2. Powerhead
  - A. Piston and rings
  - B. Rods and bearings
  - C. Seals
  - D. Blocks
  - E. Cylinder evaluation and measuring
  - F. Cylinder honing
  - G. Cooling systems
  - H. Crankshafts
3. Mid –section and lower units
  - A. Exhaust housing design
  - B. Lower unit
    1. Operating principles
    2. Design
    3. Troubleshooting problems
    4. Shifting
    5. Lubricants
    6. Leakage testing
    7. Seal and bearing replacement
4. Trim & tilt systems
  - A. Manual trim
  - B. Power trim

5. Propeller Performance
  - A. What a propeller does
  - B. How it works
  - C. Propeller terms
  - D. Types
  - E. Selection
6. Personal watercraft
  - A. Design
  - B. Engines
  - C. Jet pumps
  - D. Cooling systems
  - E. Maintenance
  - F. Storage
7. Outboard and personal watercraft ID
  - A. Year and model identification
  - B. Parts retrieval using microfiche
8. Rewind starters
  - A. Designs
  - B. Repair
    1. Rope replacement
    2. Spring replacement