

## COURSE OUTLINES

### Outboard Engine Electrical System

Course Title

SE122

Dept. & Course No.

#### I. COURSE DESCRIPTION:

This course covers electrical system associated with marine engine including the charging circuit, starting circuit and ignition circuit. Theories of operation and maintenance/repair are discussed and applied. (1 credit lec, 2 credit lab).

#### II. SEMESTER CREDITS:   3

#### III. CONTACT HOURS PER WEEK:   2     3     5   Lec Lab Total

#### IV. PREREQUISITES: SE112 & SE113

#### V. STUDENT LEARNING OUTCOMES:

#### VI. COURSE CONTENT:

Upon the completion of the course, the students will be able with 65% accuracy to:

1. Explain different types of electrical systems; remove, install, service, repair, and maintain these systems.
  2. Explain and demonstrate charging system of outboard motors.
  3. Differentiate magneto and electrical ignition system, explain their functions, troubleshoot; service, repair and maintain these system of outboard.
- A. Electrical System
    1. Battery
    2. Starter motor
    3. Solenoids
    4. Fuse
  - B. Charging System
    1. Rectifier
    2. Battery
    3. Wiring diagram
  - C. Ignition System
    1. Magneto
    2. Electronic
    3. Power pack
    4. Ignition coil
    5. Spark plug
    6. Magnets
    7. High tension wire

4. Explain and demonstrate starting circuits

D. Starting System

1. Primer switch
2. Start in-neutral Switch.
3. Wire and cables

## VII. MATERIALS AND EQUIPMENTS

- A. Outboard Engines
- B. Outboard Special Tools
- C. Growler (testing equipment)
- D. Timing light
- E. Sand paper #180
- F. Spark plug
- G. Ignition coils
- H. Power pack
- I. Starter motors
- J. Routine classroom materials

## VIII. TEXTS AND REFERENCES

A. Text(s)

Small Gas Engine

Roth, Alfred C: Small Engine South Holland, Illinois:  
The Goodheart-Wilcox Inc., 2007

B. References

BIA Marine Service Manuals of Recommended Practice  
Chicago, Illinois: Boating Industrial Association, 1994

## IX. METHOD OF INSTRUCTION

- A. Lecture
- B. Guest speaker
- C. Laboratory work
- D. Audio/Visual
- E. Demonstration/discussion
- F. Individualized instruction
- G. Reinforcement/enrichment activities

The components with corresponding weight in percent included in the computation of the total grade:

Final Exam .....	15%
Mid-term .....	15%
Tests and homework .....	20%
Projects .....	<u>50%</u>
Total .....	100%

Transmutation of percent to letter grade is as follows:

90 - 100 = A
80 - 89 = B
70 - 79 = C
65 - 69 = D
0 - 65 = F

## TASKS

SE122 – Outboard Engine Electrical System

Course No. & Title

Credits:  $\frac{2}{\text{Lec}}$   $\frac{1}{\text{Lab}}$   $\frac{48}{\text{Ttl Lab Hrs.}}$

SLO #1

12 hrs

1. Remove and identify types of starter motors
2. Disassemble and assemble starters
3. Service, repair and maintain the starter
4. Remove & install type of fuse required for the starter
5. Select the right type of batteries as well as amount of amperage and the voltage

SLO #2

12 hrs

1. Remove & test the system with volt meter
2. Service & repair the entire system
3. Follow/route the entire wiring system (wiring diagram)

SLO #3

12 hrs

1. Remove and install ignition system
2. Disassemble and assemble ignition system
3. Troubleshoot, repair & test run the system
4. Check and adjust or change malfunction parts
5. Low tension system, test & repair wiring, test & repair sensor  
Coil, service power packs & ignition coil

SLO #4

12 hrs

1. Remove and service push-to-prime switch
2. Remove, demonstrate and test neutral in-switch only
3. Identify types of neutral in-switch only and install
4. Remove, clean, test and reconnect wires and cables

**Course Level Achievement  
Form A**  
(Used for shop courses as well as other program courses)  
**SE122 OUTBOARD ENGINE ELECTRICAL SYSTEM**

Student's Name (Print): \_\_\_\_\_

Semester/Year: \_\_\_\_\_

Instructor's Name (Print): \_\_\_\_\_

**Directions:** Evaluate the student using the rating scale below and check the appropriate numbers to indicate the degree of competency. The numerical ratings of 5,4,3,2, and 1 are not intended to represent the traditional school grading system of A,B,C,D, and F. The descriptions associated with each of the numbers focus on the level of student performance for each of the competencies listed below.

- Rating Scale:
- 5. Excellent
  - 4. Above Average
  - 3. Average
  - 2. Below Average
  - 1. Unacceptable

**SE 122 – Outboard Engine Electrical System**

COMPETENCY	RATING				
1. Troubleshoot, test, repair electrical system	5	4	3	2	1
2. Troubleshoot, test, repair starter motor	5	4	3	2	1
3. Troubleshoot, test, repair alternator	5	4	3	2	1
4. Perform battery testing and servicing	5	4	3	2	1
5. Test, adjust, replace wiring and switch	5	4	3	2	1

I certify that the student has completed all the competencies in this course and has achieved an average rating as shown on the right.

\_\_\_\_\_  
Instructor's Signature

\_\_\_\_\_  
Date

### **1. Troubleshoot, test, repair electrical system**

- 5 Perform all the tasks below with 90-100% accuracy.
  - Perform troubleshoot and test electrical system of outboard motor such as ignition system, starter system, alternator charging system and battery system.
  - Perform removal of each different electrical component, inspect and test with volts meter & OHM meter.
  - Perform installation of each electrical component and wire completely.
  - Perform cleaning and repair if necessary.
- 4 Perform all the tasks above with 80-89% accuracy.
- 3 Perform all the tasks above with 70-79% accuracy.
- 2 Perform all the tasks above with 65-69% accuracy.
- 1 Perform all the tasks above with below 65% accuracy.

### **2. Troubleshoot, test, repair starter motor**

- 5 Perform all the tasks below with 90-100% accuracy.
  - Perform troubleshooting of starter motor
  - Perform removal of the different types of starter motor
  - Perform disassembly, cleaning, inspection and repair
  - Perform reassembly of the starter motor
- 4 Perform all the tasks above with 80-89% accuracy.
- 3 Perform all the tasks above with 70-79% accuracy.
- 2 Perform all the tasks above with 65-69% accuracy.
- 1 Perform all the tasks above with below 65% accuracy.

### **3. Troubleshoot, test, repair alternator**

- 5 Perform all the tasks below with 90-100% accuracy.
  - Perform troubleshooting and testing of alternator
  - Perform removal of alternator from the motor
  - Perform disassembly, cleaning, inspection and repair
  - Perform reassembly and install to the motor
- 4 Perform all the tasks above with 80-89% accuracy.
- 3 Perform all the tasks above with 70-79% accuracy.
- 2 Perform all the tasks above with 65-69% accuracy.
- 1 Perform all the tasks above with below 65% accuracy.

**4. Perform battery testing and servicing**

- 5 Perform all the tasks below with 90-100% accuracy.
  - Perform battery test by visual inspection for condition such as broken, cracks, or distorted container.
  - Perform hydrometer test
  - Perform terminal voltage test
  - Perform capacity test
- 4 Perform all the tasks above with 80-89% accuracy.
- 3 Perform all the tasks above with 70-79% accuracy.
- 2 Perform all the tasks above with 65-69% accuracy.
- 1 Perform all the tasks above with below 65% accuracy.

**5. Test, adjust, replace wiring and switch**

- 5 Perform all the tasks below with 90-100% accuracy.
  - Perform testing between the wiring of different components of an engine.
  - Perform testing of different switch between terminals
  - Perform engine wiring, replacing wiring that are broken
  - Perform testing and adjusting neutral safety switch only
- 4 Perform all the tasks above with 80-89% accuracy.
- 3 Perform all the tasks above with 70-79% accuracy.
- 2 Perform all the tasks above with 65-69% accuracy.
- 1 Perform all the tasks above with below 65% accuracy.