COURSE OUTLINES

Diagram Reading and Testing — Course Title

SE 222 — Dept. & Course No.

I. COURSE DESCRIPTION:
This is a continuation of SE122. It covers small engine and outboard engine wiring diagrams and designs. It provides students with a practical approach to industry-wide electrical testing, diagnostic and repair techniques using diagnostic charts, wiring diagrams, service manuals, and manufacturers repairs procedures. (2 credits lec., 1 credit lab).

II. SEMESTER CREDITS: 3

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

IV. PREREQUISITES: SE122

V. STUDENT LEARNING OUTCOMES:

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

1. Service and repair different types of a boat electrical system.
2. Explain magneto & electrical systems; explore their functions, test & troubleshoot the system.
3. Explain and demonstrate the use of wiring diagrams.
4. Service test and repair small gas engine wiring.

VI. COURSE CONTENT:

A. Electrical System
   1. Battery
   2. Running light
   3. Bilge pump

B. Magneto System
   1. Power pack
   2. Rectifier
   3. Magneto
   4. Spark plug & high tension wire

C. Wiring Diagrams
   1. Schematic
   2. Pictorial
   3. Circuit symbols

D. Small engine wiring
   1. Primary windings
   2. Secondary windings
   3. High tension wire
   4. Wire type thickness

5. Explain and demonstrate the use of diagnosis equipments.

E. Diagnosis equipments
   1. OHM meter
   2. Multi meters
   3. Battery charger
   4. Hydrometer
   5. Volt meter

VII. MATERIALS AND EQUIMENTS

A. OHM Meter
B. Crawler (testing equipment)
C. Battery charger
D. Soldering gun
E. Soldering lead
F. Bilge gun
H. Boats
I. Outboard engine
J. Sand papers

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 Services Manuals of Recommended Practice
Chicago, Illinois: Boating Industrial Association, 1994

IX. METHOD OF INSTRUCTION

A. Lecture
B. Laboratory work
C. Demonstration/discussion
D. Reinforcement/enrichment activities

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

Attendance	15%
Final Exam	15%
Mid-term	15%
Tests and homework	10%
Projects	45%
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

SE222 Diagram Reading and Testing — **Credits:** 2 Lec / 1 Lab / 48 Total Lab Hrs.
Course No. & Title

SLO #1 — 6.9 hrs

1. Demonstrate, test and install electric bilge pump
2. Sketch and install running light
3. Demonstrate types of batteries as well as amount of amperage and voltage

SLO #2 — 6.9 hrs

1. Practice and test the entire electrical system
2. Test and repair wiring
3. Use both schematic & pictorial diagrams for tune-up/troubleshoot

SLO #3 — 6.9 hrs

1. Route the entire wiring system
2. Translate the right circuit symbols for different electrical components

SLO #4 — 6.9 hrs

1. Demonstrate the use of primary & secondary windings
2. Demonstrate the application of the high tension wire

SLO #5 — 6.9 hrs

1. Demonstrate and sketch the complete schematic drawing of:
    - Breaker points
    - Condenser
    - Ignition coil
    - Switches
    - Direct current/Alternating current

SLO #6 — 6.9 hrs

1. Explain and demonstrate different types of wiring diagram applicable With different types of engines
2. Demonstrate and apply types of wiring diagram

SLO #7 — 6.9 hrs

1. Demonstrate different types of testing equipments, such as multi-meter, battery Charger, voltmeter, OHM meter and hydrometer
2. Demonstrate and use meters for different types of testing procedures.

Course Level Achievement
Form A
(Used for shop courses as well as other program courses)
SE222 DIAGRAM READING & TESTING

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 222 – Diagram Reading & Testing

COMPETENCY	RATING				
1. Perform service and repair boat electrical system	5	4	3	2	1
2. Demonstrate the use of volts & OHM meter to test the entire electrical system	5	4	3	2	1
3. Use and understand wiring diagrams	5	4	3	2	1
4. Service, testing and repair small gas engine wiring	5	4	3	2	1
5. Use of diagnosis equipments	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. **Perform service and repair boat electrical system**

5 Perform all tasks below with 90-100% accuracy.

- Perform and service battery
- Perform and install electrical fuse panel
- Perform and service, repair & install running light, anchor light and stern light
- Perform and service bilge pumps

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. **Demonstrate the use of volts & OHM meter to test the entire electrical system**.

5 Perform all tasks below with 90-100% accuracy.

- Perform, service and test out put reading of the power pack
- Perform, service and test out put reading of rectifier assembly
- Perform the removal of the spark plug
- Perform cleaning, inspection and install the spark plug

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. **Use and understand wiring diagrams**

5 Perform all tasks below with 90-100% accuracy.

- Understand the general information provided in the wiring diagram
- Demonstrate the use of wiring diagram
- Demonstrate how to locate wiring using schematic diagram and pictorial diagram
- Understand the electrical circuit symbols.

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. **Service testing and repair small gas engine wiring**

5 Perform all tasks below with 90-100% accuracy.

- Perform removal of primary winding and secondary winding from electrical components. (Breaker point and condenser).
- Perform and service primary & secondary winding
- Perform cleaning, inspection and repair
- Perform reassembly of the windings

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. Use of Diagnosis Equipment.

5 Perform all tasks below with 90-100% accuracy.

- Demonstrate and apply the use of OHM meter
- Demonstrate and apply the use of volt meter
- Demonstrate and apply the use of hydrometer
- Demonstrate and apply the use of battery charger

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.