

College of Micronesia – FSM
P.O. Box 159
Kolonia, Pohnpei

Course Outline Cover Page

Engineering Knowledge – Motor II
 Course Title

ME 234
 Department and Number

Course Description: This course will provide the student with the knowledge and skills required to safely operate, maintain, and manage a propulsion plant and other related equipment and systems on a vessel not exceeding 750 kW propulsion power.

Prepared by: Brent Villiers

State: FSM-FMI

	Hours per Week	No. Of Weeks	Total Hours	Semester
Credits				
Lecture	3/6/12/24	16/8/4/2	48	3
Laboratory	3/6/12/24	16/8/4/2	48	1
Total Semester Credits:				4

Purpose of Course

Degree Requirement	_____XX_____
Degree Elective	_____
Advanced Certificate	_____
Certificate	_____
Remedial	_____
Other (Workshop)	_____

Prerequisite Course(s): ME 226 Engineering Knowledge - General, ME 227 Engineering Knowledge - Motor.

 Signature, Chairman, Curriculum Committee

 Date Approved by Committee

 Signature, President, COM-FSM

 Date Approved by the President

General Objective: On successful completion of this course, the student will be able to safely operate, maintain, and manage a propulsion plant and other related equipment and systems on a vessel not exceeding 750 kW propulsion power.

Learning Outcomes: On successful completion of this course the student will be able to:

1. Operate, maintain, and manage a marine diesel engine not exceeding 750kW, in accordance with manufacturer recommendations, technical specifications, and safety requirements.
2. Operate and maintain the fuel supply, fuel injection system, and related control equipment in accordance with manufacturer recommendations, technical specifications and safety requirements.
3. Manage the handling and storage of fuel in accordance to established procedures, technical specifications, safe and statutory requirements.
4. Ensure proper lubrication conditions are maintained in accordance to established procedures and technical specifications.
5. Maintain ideal and efficient cooling water circulation in accordance with technical specifications.
6. Identify the dangers associated with diesel engine operations and carry out structured and adequate monitoring and maintenance in accordance to technical specifications, manufacturer recommendations, and safety requirements.
7. Operate and maintain the reverse/reduction gears and transmission devices in accordance to manufacturer recommendations and safety requirements.

STUDENTS SHOULD BE MADE AWARE OF OCCUPATIONAL HEALTH AND SAFETY ISSUES IN ALL SITUATIONS AND BE EXPECTED TO DEMONSTRATE SAFE WORKING PRACTICES AT ALL TIMES.

Outline of Content:

This course contains:

1. Marine Diesel Engines
 - Two and four stroke engines
 - Timing diagrams
 - Components, functions, material and construction
 - Camshaft drives

- Indicator diagrams and peak pressure readings
 - Crankshaft deflections
 - Component wear
 - Turbocharger and intercoolers
 - Operational and maintenance
2. Fuel Systems
 - Fuel pump and injector
 - Injector timing and combustion
 - Engine performance and emission
 - Governors and operational settings
 - Operation and maintenance
 3. Fuel Oils and Handling
 - Flash, fire, auto ignition, and pour points
 - System safety devices
 - Quick closing valves
 - Emergency shut-offs
 - Contamination
 4. Lubricating Oil System
 - Contamination and microbiological degradation
 - Sampling, testing, interpretation, and actions
 5. Cooling Systems
 - Cooling system controls
 - Testing and treatment
 - Treatment chemicals
 - Corrosion and scaling
 - Thermal stress
 6. Diesel Engine Safety and Maintenance
 - Air start system
 - Alarm, interlock and shut down
 - Hazards and safety devices
 - Faults and remedial actions
 - Planned maintenance and condition monitoring
 7. Transmission
 - Flexible couplings
 - Clutches and couplings
 - Epicyclical gearboxes
 - PTO
 - Statutory regulations
 - Engine/gearbox matching

Learning Outcomes:	On completion of this course the learner will be able to:
Learning Outcome 1	Operate, maintain, and manage a marine diesel engine not exceeding 750kW, in accordance with manufacturer recommendations, technical specifications, and safety requirements.
Assessment criteria	<ol style="list-style-type: none"> 1.1 Timing diagrams of 2 and 4 stroke marine diesel engines are described. 1.2 Common camshaft drives and valve operating gear are explained. 1.3 Component material and their construction are described. 1.4 Various engine designs and configurations are identified. 1.5 The methods of obtaining and interpreting engine performance and calibration, including: <ul style="list-style-type: none"> • Indicator diagrams; • Peak pressure gauges • Crankshaft deflections; • Bearings wear; and • Liners, pistons and ring wear in accordance with technical specifications are demonstrated. 1.6 Operational procedures, maintenance (including washing and cleaning), monitoring, isolation, precautions, and advantages with turbo chargers and charge air coolers in accordance with manufacturer recommendations and safety requirements are demonstrated. 1.7 Operational precautions and correct management of diesel engines in accordance with manufacturer recommendations and safety requirements are demonstrated.
Conditions and Method of assessment	As specified in the Assessment Strategy listed at the end of this outline and by a combination of: <ul style="list-style-type: none"> • Written assessment • Calculations • Assignments • Oral assessment • Practical assessment

Learning Outcome 2	Operate and maintain the fuel supply, fuel injection system, and related control equipment in accordance with manufacturer recommendations, technical specifications and safety requirements.
Assessment criteria	<p>2.1 Operation, maintenance, and control of fuel injection pumps and fuel injectors in accordance with manufacturer recommendations and safety requirements are demonstrated.</p> <p>2.2 Injector timing adjustments in accordance with technical specifications and its affect on engine performance are explained.</p> <p>2.3 Speed control of marine diesel engines, including bridge/local control, through mechanical, hydraulic, pneumatic, and electronic/hydraulic governing is described.</p>
Conditions and Method of assessment	<p>As specified in the Assessment Strategy listed at the end of this outline and by a combination of:</p> <ul style="list-style-type: none"> • Written assessment • Calculations • Assignments • Oral assessment • Practical assessment
Learning Outcome 3	Manage the handling and storage of fuel in accordance to established procedures, technical specifications, safe and statutory requirements.
Assessment criteria	<p>3.1 Properties of fuel including flash point, fire point, auto ignition point, and pour point are explained.</p> <p>3.2 Operation, testing, and maintenance of the various safety devices, such as shut down devices, to comply with statutory requirements are demonstrated.</p> <p>3.3 The management of the quality of the fuel by:</p> <ul style="list-style-type: none"> • Sampling; • Testing; • Interpretation of results; • Recognition of fuel contamination; and • Taking remedial action to avoid and rectify contamination <p>in accordance with technical specifications and safety requirements are described.</p>

Conditions and Method of assessment	As specified in the Assessment Strategy listed at the end of this outline and by a combination of: <ul style="list-style-type: none"> • Written assessment • Calculations • Assignments • Oral assessment • Practical assessment
Learning Outcome 4	Ensure proper lubrication conditions are maintained in accordance to established procedures and technical specifications.
Assessment criteria	<p>4.1 Lubricating oil contamination, including microbiological degradation and remedial actions, are described in detail.</p> <p>4.2 Lubrication oil sampling, onboard testing, interpretation of onboard and laboratory test results, and required action in accordance to established procedures and technical specifications are demonstrated.</p> <p>4.3 Bearing lubrication, including hydrodynamic and boundary lubrication, are explained.</p>
Conditions and Method of assessment	As specified in the Assessment Strategy listed at the end of this outline and by a combination of: <ul style="list-style-type: none"> • Written assessment • Calculations • Assignments • Oral assessment • Practical assessment
Learning Outcome 5	Maintain ideal and efficient cooling water circulation in accordance with technical specifications.
Assessment criteria	<p>5.1 The basic operation of the control devices for the cooling water systems are described.</p> <p>5.2 Cooling water testing and treatment procedures, including the effects of chemical treatment on the cooling system, in accordance with technical specifications and safety requirements are explained.</p> <p>5.3 Causes of cooling system failure, (including thermal stresses and efficiency), their consequences, and appropriate actions are described.</p>

Conditions and Method of assessment	<p>As specified in the Assessment Strategy listed at the end of this outline and by a combination of:</p> <ul style="list-style-type: none"> • Written assessment • Calculations • Assignments • Oral assessment • Practical assessment
Learning Outcome 6	Identify the dangers associated with diesel engine operations and carry out structured and adequate monitoring and maintenance in accordance to technical specifications, manufacturer recommendations, and safety requirements.
Assessment criteria	<p>6.1 Air start methods for diesel engines are explained.</p> <p>6.2 Requirements and testing of alarms, interlocks, and shutdown devices in accordance with operational procedures and statutory requirements are demonstrated.</p> <p>6.3 Preparation and management of an effective maintenance schedule in accordance with manufacturer recommendations and technical specifications are described.</p> <p>6.4 Hazardous conditions, including scavenge fires, crank case explosions, and air start line explosions are identified and action to prevent and rectify these conditions are described.</p> <p>6.2 Safety devices incorporated in marine diesel engines including crank case relief valves, oil mist detectors, cylinder relief valves, and flame arresters/traps are explained.</p>
Conditions and Method of assessment	<p>As specified in the Assessment Strategy listed at the end of this outline and by a combination of:</p> <ul style="list-style-type: none"> • Written assessment • Calculations • Assignments • Oral assessment • Practical assessment

Learning Outcome 7	Operate and maintain the reverse/reduction gears and transmission devices in accordance to manufacturer recommendations and safety requirements.
Assessment criteria	<p>7.1 The operation of epicyclical gearboxes are explained.</p> <p>7.2 Coupling and dampers fitted to marine diesel engines are described.</p> <p>7.3 Engine and gearbox matching in accordance to established practices is explained.</p> <p>7.4 Basic PTO fitted to marine diesel engines are described.</p>
Conditions and Method of assessment	<p>As specified in the Assessment Strategy listed at the end of this outline and by a combination of:</p> <ul style="list-style-type: none"> • Written assessment • Calculations • Assignments • Oral assessment • Practical assessment
<u>Delivery strategy</u>	<p>The course provides for delivery by on and off-the-job training and assessment.</p> <p>Some areas of content may be common to more than one learning outcome, and therefore integration of training and assessment may be appropriate.</p> <p>Methods of instruction includes:</p> <ol style="list-style-type: none"> 1. Classroom lectures with handouts, course notes, overhead transparencies (or equivalent), slide presentations, video material, and whiteboard notes; 2. Tutorials; 3. Practical demonstrations; 4. Practical exercises; and 5. Laboratory work.
<u>Resource requirements</u>	<p>Delivery of the training will require:</p> <ul style="list-style-type: none"> • Classroom • Whiteboard • Overhead projector (or equivalent) • Video player • Access to an approved diesel powered vessel

- Appropriate models
- Appropriate testing equipment
- Appropriate tools and safety equipment

Assessment Method

Knowledge based criteria will be satisfied through a combination of calculations, written and oral assessments.
Skill based criteria will be satisfied through practical exercises.

Condition of Assessment

This course may be assessed on and off-the-job. Competence may be assessed in the following situations: classroom; laboratories; and appropriate vessels.

Evaluation:

Final Grade for this course will be based on meeting the course requirements at the following percentage rates:

96% - 100%	A – Superior
90% - 95%	B – Above Average
80% - 89%	C – Average
69% - 79%	D – Below Average
0 % - 69%	F – Failure

Attendance:

The COM-FSM attendance policy will apply.