

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

Course Outline Cover Page

Vessel Construction and Machinery II

Course Title

MM 230

Department and Number

Course Description: This course provides the student with the knowledge and skills required by the master of a vessel of less than 1600 gross tonnes to, manage structural related requirements to maintain seaworthiness of a vessel and operate in bridge control mode the propulsion unit and appropriate support systems and services.

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): MM 210 Vessel Construction & Machinery I

 Signature, Chairman, Curriculum Committee

 Date Approved by Committee

 Signature, President, COM-FSM

 Date Approved by the President

General Objective: By successfully completing this course, students will have been provided with the skills required by the master of a vessel of less than 1600 gross tonnes to, manage structural related requirements to maintain seaworthiness of a vessel and operate in bridge control mode the propulsion unit and appropriate support systems and services.

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

1. Identify and explain the functions and arrangements of the major structural components of large vessels.
2. Interpret plans pertaining to vessel construction and shipboard operations
3. Describe the characteristics and use of materials in the construction of vessels.
4. Explain the stresses acting on the vessel structure.
5. Describe special structural requirements and arrangements on various vessel types.
6. Outline the basic operation, layout, and hazards associated with marine diesel propulsion plants
7. Outline the basic operation, layout, and hazards associated with marine steam propulsion plants
8. Outline the basic layout and hazards associated with marine power generation plants.
9. Operate the steering gear and deck hydraulic systems on large vessels in accordance with operating instructions, technical specifications and safety requirements.
10. Operate the bilge, ballast, and cargo pumping systems on large vessels in accordance with established practices and statutory requirements, and explain the requirements of other relevant pumping systems.
11. Operation the bridge engine controls within safe operating limits, interpret bridge located machinery alarms, and monitor engine room watchkeeping procedure in accordance with established procedure, technical specifications, 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. Types of Ships

- General cargo vessels
- Container vessels
- Bulk carriers
- ro-ro vessels
- Tankers
- Offshore tenders

2. Structures

- Terminology
- Framing systems
- Keel, side, and bottom shell
- Forward and aft sections
- Stern frame and rudders
- Bulkheads and watertight doors
- Decks and hatches
- Double bottoms

3. Stresses

- Longitudinal and transverse forces
- Longitudinal bending
- Shear
- Sea condition and water pressure
- Racking and torsion
- Pounding and panting
- Localised and point loading
- Vibration and thermal affects
- Stress concentration
- Factors contributing to high stresses
- Structural arrangements and operational methods to reduce stresses

4. Damage and Fire Control

- Watertight integrity
- Flooding
- Spreading of fire

5. Ship Plans and Tables

- Docking plans
- General arrangement plans
- Tank plans and sounding tables
- Shell expansion plans
- Line and capacity plans

6. Material

- Steel and aluminium
- Characteristics
- Corrosion
- Brittle fracture

7. Propulsion and Power Systems

- Diesel propulsion systems
- Steam propulsion system

- Electrical distribution system
 - Operation and operational limits
 - Safety and requirements
8. Ancillary and Pumping systems
- Fresh and sea water systems
 - Lubricating oil system
 - Fuel oil system
 - Bilge system
 - Ballast system
 - Cargo system
 - Sewerage system
 - Domestic water system
 - Operation, operational checks, and maintenance
9. Hydraulic and Steering Systems
- Steering and emergency steering system
 - Deck machinery
 - Operation and operational checks
 - Safety and requirements
 - Failure
10. Operation and Controls
- Bridge control
 - Safety, alarms, and actions
 - Hazards
 - Watchkeeping
 - Safe working practices

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

Learning Outcome 1 **Identify and explain the functions and arrangements of the major structural components of large vessels.**

- Assessment criteria
- 1.1 Longitudinal, transverse, and composite systems of framing used in vessel construction are identified.
- 1.2 The affects of various sea conditions on the vessels structure are explained.
- 1.3 The general requirements and arrangements of:
- Keels;
 - Side and bottom shells;
 - Forward and aft sections;
 - Stern frames and rudders;
 - Bulkheads;
 - Watertight doors;
 - Decks;

	<ul style="list-style-type: none"> • Hatches; and • Double bottoms <p>in accordance with statutory requirements, safe stress limits, and accepted practices are described.</p>
	<p>1.4 The structural arrangement to prevent the spreading of fire and flooding on vessels in accordance with statutory requirements and established emergency procedures 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 test involving the use of sketching, diagram interpretation, short answer questions, descriptive answer questions, multiple choice questions • Oral questioning
Learning Outcome 2	Interpret plans pertaining to vessel construction and shipboard operations
Assessment criteria	<p>2.1 General arrangement plans, tank plans, and sounding tables are interpreted.</p> <p>2.2 Capacity and line plans are interpreted.</p> <p>2.3 Shell expansion and docking plans are interpreted.</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 test involving the use of sketching, diagram interpretation, short answer questions, descriptive answer questions, multiple choice questions • Oral questioning • Observation during practical exercises
Learning Outcome 3	Describe the characteristics and use of materials in the construction of vessels.
Assessment criteria	<p>3.1 The physical properties of steel and aluminium are explained.</p> <p>3.2 The sections of the structure using different materials and grades in accordance with established procedures and statutory requirements are identified.</p> <p>3.3 The advantages and disadvantages of steel and aluminium used in vessel construction are listed.</p>

	3.4	Contributing factors to brittleness and metal fatigue are identified
	3.5	Problems associated with close contact of dissimilar metals are explained.
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 test involving the use of sketching, diagram interpretation, short answer questions, descriptive answer questions, multiple choice questions • Oral questioning.
Learning Outcome 4		Explain the stresses acting on the vessel structure.
Assessment criteria	4.1	Dynamic and static stresses on the vessel structure are defined.
	4.2	Structural stresses, including those due to: <ul style="list-style-type: none"> • Longitudinal and transverse forces; • Longitudinal bending; • Shear; • Water pressure; • Racking; • Torsion; • Pounding; • Panting; • Localised and point loading; • Vibration and thermal affects; and • Stress concentration are described.
	4.3	The effects of the stresses described in 4.2 on the structure and strength of the vessel, and appropriate stiffening arrangements in accordance with accepted practices and statutory requirements are outlined.
	4.4	Factors contributing to high stress conditions of the structure are identified.
	4.5	Safe working practices to prevent high stress conditions are described.
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 test involving the use of sketching, diagram interpretation, short answer questions, multiple choice questions • Oral questioning

- Observation during practical exercises.

Learning Outcome 5 **Describe special structural requirements and arrangements on various vessel types.**

Assessment criteria	<p>5.1 Special structural requirements of:</p> <ul style="list-style-type: none"> • General cargo vessels; • Container vessels; • Bulk carriers; • ro-ro vessels; • Tankers; and • Offshore tenders <p>in accordance with established practices are outlined</p> <p>5.2 Structural layouts of the vessels described in 5.1 are described.</p>
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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 test involving the use of sketching, diagram interpretation, short answer questions, descriptive answer questions, multiple choice questions • Oral questioning
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Learning Outcome 6 **Outline the basic operation, layout, and hazards associated with marine diesel propulsion plants**

Assessment criteria	<p>6.1 Diesel propulsion plants and the function of the main components are described.</p> <p>6.2 The basic operating principles of diesel engines are described.</p> <p>6.3 The main ancillary systems, including fresh and seawater cooling, lubricating oil, fuel oil, and starting air, are outlined.</p> <p>6.4 Hazards and safety measures with diesel engines in accordance with safety and statutory requirements are identified.</p>
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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 test involving the use of sketching, diagram interpretation, short answer questions, descriptive answer questions, multiple choice questions • Oral questioning • Observation during practical exercises
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Learning Outcome 7	Outline the basic operation, layout, and hazards associated with marine steam propulsion plants
Assessment criteria	<p>7.1 Types, basic fittings, and basic operation of boilers are described.</p> <p>7.2 Steam distribution and return systems are outlined.</p> <p>7.3 The feed water system is outlined.</p> <p>7.4 Hazards and safety measures with steam plants in accordance with safety and statutory requirements are identified.</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 test involving the use of sketching, diagram interpretation, short answer questions, descriptive answer questions, multiple choice questions • Oral questioning • Observation during practical
Learning Outcome 8	Outline the basic layout and hazards associated with marine power generation plants.
Assessment criteria	<p>8.1 The power distribution system of a large vessel is outlined.</p> <p>8.2 Emergency power requirements and supplies on vessels are identified.</p> <p>8.3 Hazards, including fire and electrocution, and actions to be taken in accordance with safety and statutory requirements are described.</p> <p>8.4 Safe working practices associated with electrical equipment in accordance with safe and established practices 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 test involving the use of sketching, diagram interpretation, short answer questions, descriptive answer questions, multiple choice questions • oral questioning • observation during practical exercises

Learning Outcome 9	Operate the steering gear and deck hydraulic systems on large vessels in accordance with operating instructions, technical specifications and safety requirements.
Assessment criteria	<p>9.1 The basic operation of common types of steering gear systems are described.</p> <p>9.2 Statutory requirements of steering gear are identified</p> <p>9.3 Pre-sailing checks on steering gear in accordance with established procedures and statutory requirements are demonstrated.</p> <p>9.4 Actions to be taken during steering failure, including the operation of emergency steering, to ensure the safety of personal and the vessel are demonstrated.</p> <p>9.5 The operation and basic operational checks of hydraulic deck machinery, in accordance with manufacturer recommendations and safety requirements are demonstrated.</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 test involving the use of sketching, diagram interpretation, short answer questions, descriptive answer questions, multiple choice questions • Oral questioning • Observation during practical exercises
Learning Outcome 10	Operate the bilge, ballast, and cargo pumping systems on large vessels in accordance with established practices and statutory requirements, and explain the requirements of other relevant pumping systems.
Assessment criteria	<p>10.1 The bilge system of a large vessel, including the major components and their functions, is described.</p> <p>10.2 The basic ballast pumping system of a large vessel is described.</p> <p>10.3 The operation, checks, and maintenance of:</p> <ul style="list-style-type: none"> • cargo bilge system; • ballast pumping system; and • cargo pumping systems <p>appropriate to deck personal in accordance with established practices and statutory requirements are demonstrated.</p>

Conditions and Method of assessment	<p>10.4 The operation and requirements of sewerage and domestic water systems in accordance with statutory requirements are outlined.</p> <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 test involving the use of sketching, diagram interpretation, short answer questions, descriptive answer questions, multiple choice questions • Oral questioning • Observation during practical exercises
Learning Outcome 11	<p>Operation the bridge engine controls within safe operating limits, interpret bridge located machinery alarms, and monitor engineroom watchkeeping procedure in accordance with established procedure, technical specifications, and safety requirements.</p>
Assessment criteria	<p>11.1 Bridge located machinery alarms and engineer's safety alarms are correctly interpreted.</p> <p>11.2 The procedures of:</p> <ul style="list-style-type: none"> • Placing the main engine on bridge control; • Dealing with bridge control failure; and • Dealing with bridge located machinery and related alarms <p>in accordance with established procedure and safety requirements are demonstrated.</p> <p>11.3 The operational limitations of bridge-controlled machinery are identified.</p> <p>11.4 The importance and procedure of engine room watchkeeping, including UMS operation, 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 test involving the use of sketching, diagram interpretation, short answer questions, descriptive answer questions, multiple choice questions • Oral questioning • Observation during practical exercises

<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 include:</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; 5. Simulator exercises; and 6. 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 appropriate vessel in survey • Appropriate models • Approved simulator facilities • Appropriate tools and safety equipment.
Assessment Method	<p>Knowledge, skills and attitudes may be measured by using a combination of practical exercises, oral assessment, and written tests.</p>
Condition of Assessment	<p>This course may be assessed on-the-job and off the job. Competence may be assessed in the following situations: a vessel under survey; approved training vessel/facility; approved equipment laboratory; approved simulator facility.</p>

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.