

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

Course Outline Cover Page

Naval Architecture and Construction II
 Course Title

ME 232
 Department and Number

Course Description: This course will provide the student with the knowledge and skills required to explain the basic principles involved in vessel form definition, the calculation of the loading on structures due to liquid depths, carry out basic stability calculations and assess the stability of the vessel, calculate the basic ship resistance and propulsion requirements and manage structural related requirements to maintain seaworthiness of a vessel.

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 225 Naval Architecture and Construction I

Signature, Chairman, Curriculum Committee

Date Approved by Committee

Signature, President, COM-FSM

Date Approved by the President

General Objective: This course provides the student with the skills to control the operation of the ship and care for persons on board at the operational level. The course will provide the student with the knowledge and skills required to explain the basic principles involved in vessel form definition, the calculation of the loading on structures due to liquid depths, carry out basic stability calculations and assess the stability of the vessel, calculate the basic ship resistance and propulsion requirements and manage structural related requirements to maintain seaworthiness of a vessel.

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

1. Determine the basic principles involved in vessel form and dimensions.
2. Determine the change of hydrostatic pressure with liquid depth and the resulting loading on structures.
3. Carry out basic stability calculations and assess the stability of vessels.
4. Carry out basic trim calculations and assess the trim and draft of the vessel.
5. Determine the fundamental principles of ship resistance and propulsion requirements on vessels.
6. Identify and minimize the stresses acting on the vessel structure.
7. Manage the survey and maintenance of major structural components of vessels.
8. Manage the survey and maintenance of special structural requirements and arrangements on various vessel types.

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. **Displacement, TPC and Form Coefficients**
 - Displacement, volume, and TPC
 - Water plane area, mid-ship area, volume, and prismatic coefficients
 - Approximate integration methods
2. **Hydrostatic Pressure**
 - Hydrostatic pressure due to varying depth
 - Center of pressure of regular shapes
 - Hydrostatic load on immersed plates
3. **Transverse and Longitudinal Stability**
 - KM, KB, KG, GM, LCB, and LCF

- Righting lever
 - Adding, removing, and shifting weights
 - Using vessels lifting gear
 - Inclining experiment
 - Free surface effects and subdivision of tanks
 - GZ curves
 - IMO stability regulations and load lines
- 4. Trim**
- Center of flotation, longitudinal BM, GM, MCTC
 - Trim and change in trim due to: adding or shifting weights
 - Bilging compartments
- 5. Resistance and Propulsion**
- Law of similarity
 - Frictional and residuary resistance
 - Wetted surface area
 - Admiralty coefficient
 - Propeller diameter, pitch, and pitch angle
 - Wake, true slip, apparent slip
 - Cavitations
 - Thrust and power
- 6. Stresses and Damage Control**
- Longitudinal and transverse forces
 - Longitudinal bending and 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
 - Watertight integrity
 - Flooding and spreading of fire
- 7. 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
 - Maintenance, repair, dry docking and survey
- 8. Types of Ships**
- General cargo vessels
 - Container vessels

- Bulk carriers
- ro-ro vessels
- Tankers
- Offshore tenders

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

Learning Outcome 1 Determine the basic principles involved in vessel form and dimensions.

Assessment criteria

- 1.1 The form coefficients and their relationships are established and related problems solved.
- 1.2 Approximate integration methods are explained.
- 1.3 Using Simpson's rules, typical shipboard areas, volumes, and displacement are calculated.
- 1.4 TPC is defined and related problems, involving waterplane area, draft changes, and displacement, are solved.

Conditions and Method of assessment

As specified in the Assessment Strategy listed at the end of this outline and by a combination of:

- Written assessment
- Calculations
- Assignments
- Oral assessment
- Practical assessment

Learning Outcome 2 Determine the change of hydrostatic pressure with liquid depth and the resulting loading on structures.

Assessment criteria

- 2.1 The pressure of varying liquid depth is calculated.
- 2.2 The centers of pressure of regular shapes (rectangular, triangular, and circular) are calculated.
- 2.3 The hydrostatics loads on immersed plates of regular shapes on board vessels are calculated.

Conditions and Method of assessment

As specified in the Assessment Strategy listed at the end of this outline and by a combination of:

- Written assessment
- Calculations
- Assignments

- Oral assessment
- Practical assessment

Learning Outcome 3**Carry out basic stability calculations and assess the stability of vessels.**

Assessment criteria

- 3.1 Terms commonly used in relation to stability, including, KM, KB, KG, GM, and the righting lever, are defined and their relative positions established.
- 3.2 Stability at small angles of heel is defined and related problems solved.
- 3.3 Effects on the vessels stability due to:
 - Adding;
 - Removing;
 - Shifting weights; and
 - Using vessel's lifting gear to handle weights are calculated.
- 3.4 The preparation and conduction of inclining experiments on a vessel in accordance with statutory requirements are demonstrated.
- 3.5 Effects of slack tanks on a vessel's stability are calculated.
- 3.6 Effects of bilging different compartments are explained and simple problems involving box shaped vessels are solved.
- 3.7 Assignment of load lines is explained.
- 3.8 IMO stability criteria 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:

- Written assessment
- Calculations
- Assignments
- Oral assessment
- Practical assessment

Learning Outcome 4**Carry out basic trim calculations and assess the trim and draft of the vessel.**

Assessment criteria

- 4.1 LCF is defined and its relative position is established.
- 4.2 Trim, longitudinal BM and GM are explained and simple problems involving box shaped vessels are solved.

	4.3	Moment to change trim 1 cm (MCTC) is defined and related simple problems are solved.
	4.4	Effects on the vessels trim due to: <ul style="list-style-type: none"> • Adding; • Removing; • Shifting weights; and • Bilging are explained and simple problems are solved.
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		Determine the fundamental principles of ship resistance and propulsion requirements on vessels.
Assessment criteria	5.1	Dimensions and terms related to propellers, including diameter, pitch, pitch angle, and cavitation, are defined.
	5.2	Wake, true slip, apparent slip, and their relationships are defined and simple problems solved.
	5.3	Thrust, power, and their relationship are defined and calculated.
	5.4	Law of similarity is defined and simple problems solved.
	5.5	The total resistance of a vessel and it's relationship to the wetted surface are described.
	5.6	Admiralty coefficient is defined.
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

Learning Outcome 6	Identify and minimize the stresses acting on the vessel structure.
Assessment criteria	<p>6.1 Dynamic and static stresses on the vessel structure are defined.</p> <p>6.2 Structural stresses, including those due to:</p> <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 <p>are described.</p> <p>6.3 The effects of the stresses described in 6.2 on the structure and strength of the vessel, and appropriate stiffening arrangements in accordance with accepted practices and statutory requirements are outlined.</p> <p>6.4 Factors contributing to high stress conditions of the structure are identified.</p> <p>6.5 Safe working practices to prevent high stress conditions are described</p>
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 • Assignments • Oral assessment • Practical assessment
Learning Outcome 7	Manage the survey and maintenance of major structural components of vessels.
Assessment criteria	<p>7.1 Longitudinal, transverse, and composite systems of framing used in vessel construction are identified.</p> <p>7.2 The affects of various sea conditions on the vessels structure are explained.</p> <p>7.3 The general requirements, arrangements, and basic repair of:</p> <ul style="list-style-type: none"> • Keels; • Side and bottom shells;

- Shiplide fittings;
- Forward and aft sections;
- Stern frames and rudders;
- Bulkheads;
- Watertight doors;
- Decks;
- Hatches; and
- Double bottoms

in accordance with statutory requirements, safe stress limits, and accepted practices are described.

7.4 Survey and dry docking requirements of the items in 7.3 are explained.

7.5 The structural arrangement to prevent the spreading of fire and flooding on vessels in accordance with statutory requirements and established emergency procedures 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:

- Written assessment
- Assignments
- Oral assessment
- Practical assessment

Learning Outcome 8

Manage the survey and maintenance of special structural requirements and arrangements on various vessel types.

Assessment criteria

8.1 Special structural requirements of:

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

in accordance with established practices are outlined.

8.2 Structural layout of the vessels described in 8.1 is described.

Conditions and
Method of assessment

As specified in the Assessment Strategy listed at the end of this outline and by a combination of:

- Written assessment
- Assignments
- Oral assessment
- Practical assessment

Delivery strategy The course provides for delivery by on and off-the-job training and assessment. Some areas of content may be common to more than one learning outcome, and therefore integration of training and assessment may be appropriate.

Methods of instruction includes:

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.

Resource requirements Delivery of the training will require:

- Classroom
- Whiteboard
- Overhead projector (or equivalent)
- Video player
- Access to an appropriate vessels
- Appropriate models
- 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.