College of Micronesia – FSM
P.O. Box 159
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Course Outline Cover Page

Basic Radar — Course Title
MM 174 — Department and Number

Course Description: To develop the knowledge and skills necessary to enable the learner to be able to operate radar installations on board fishing and merchant vessels.

Prepared by: Brent Villiers **State:** FSM-FMI

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	8/16	2/1	16	1
Laboratory	18/9	4/8	72	1.5

Total Semester Credits: 2.5

Purpose of Course

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

Prerequisite Course(s): Nil

_____ _____
Signature, Chairman, Curriculum Committee **Date Approved by Committee**

_____ _____
Signature, President, COM-FSM **Date Approved by the President**

General Objective: To develop the knowledge and skills necessary to enable the learner to be able to operate radar installations on board fishing and merchant vessels.

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

1. Describe the basic principles of marine radar set.
2. Describe the factors that affect detection and presentation of a target on a radar display.
3. Set up and maintain the picture on a radar set typical of the type installed on small commercial vessels.
4. Interpret a radar display.
5. Use radar as an aid to navigation.
6. Apply the information obtained by radar for collision avoidance.

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. Fundamentals of radar
   - Propagation of radar waves
   - Factors affecting accuracy and performance
2. Setting up and maintaining displays
   - Start up checks
   - Correct use of controls
3. Detection of false information
   - False echoes, sea return etc.
4. Using radar for navigation
   - Range and bearing
   - Identification of critical echoes
   - Passage planning and landfalls

5. Using radar for collision avoidance
   - Acquire course and speed of other vessels
   - Time and distance of closest approach

   Detecting course and speed changes

6. Application of international rules for prevention of collision at sea
   - Safe speed
   - Poor visibility
   - Conduct to prevent collision

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

Learning Outcome 1 **Describe the basic principles of marine radar set.**

Assessment Criteria

1.1 The main components of a marine radar set are identified.
1.2 The fundamentals of radar theory are explained.
1.3 The differences between analog and digital radar sets are discussed.
1.4 The factors to be considered during installation of radar equipment are stated.

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
- Oral assessment

Learning Outcome 2 **Describe the factors that affect detection and presentation of a target on a radar display.**

Assessment criteria

2.1 The relationship between factors such as:
- Frequency
- Wavelength
- Pulse length
- Pulse repetition frequency

and radar performance and accuracy are described.

2.2 Factors affecting minimum and maximum radar ranges are described.

2.3 Factors affecting bearing and range discrimination are described

2.4 The relationship between factors such as:

- Scanner height
- Scanner size
- Scanner shape
- Scanner rotation speed

with respect to radar performance and accuracy are described.

2.5 The effect of weather conditions on radar performance and accuracy are described.

2.6 The effect target's characteristics have on its reflecting properties is explained.

2.7 An approximate radar horizon is calculated.

2.8 The types and causes of anomalous radar wave propagation are described.

2.9 The causes of blind arcs and sectors are identified.

2.10 The effects of blind arcs and shadow sectors or target detection and display 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
- Oral assessment
- Observation during practical sessions on a radar set.

Learning Outcome 3

Set up and maintain the picture on a radar set typical of the type installed on small commercial vessels.

Assessment criteria

3.1 The physical and radiation hazards of live radar equipment are explained.

3.2 Radar display controls are identified.

3.3 The function of radar controls is demonstrated.

3.4 Pre operational checks for radar operation are listed.

3.5 The correct sequence for switching on a radar set is demonstrated.

3.6 A radar set is tuned correctly and an optimum display picture is maintained.

3.7 The importance of regular checks of display performance is discussed.

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
- Oral assessment
- Observation during practical sessions on a radar set.

Learning Outcome 4 **Interpret a radar display.**

Assessment criteria

4.1 Fixed targets are identified on a radar display.

4.2 Moving targets are identified on a radar display.

4.3 Sea clutter is identified on a radar display.

4.4 Rain clutter is identified on a radar display.

4.5 Side lobe echoes are identified on a radar display.

4.6 Indirect echoes are identified on a radar display.

4.7 Multiple echoes are identifies on a radar display.

4.8 The effects of second set interference are identified on a radar set.

4.9 Blind arcs and shadow sectors are identified on a radar display.

4.10 The nature of second trace echoes 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
- Oral assessment
- Observation during practical sessions on a radar set.

Learning Outcome 5 **Use radar as an aid to navigation.**

Assessment criteria

5.1 The radar picture will be correlated correctly with navigational chart information.

5.2 The method of checking the accuracy of variable range marker is demonstrated.

5.3 Radar ranges and bearings are used to fix a vessel's position.

5.4 The hazards associated with fixes by radar bearings alone are discussed.

5.5 The importance of using visual means for checking radar positions is discussed.

5.6 Basic parallel indexing technique is used to monitor the track of a vessel.

5.7 Factors to be taken into account when using radar to make a landfall are listed.

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
- Oral assessment
- Observation during practical sessions on a radar set.

Learning Outcome 6 **Apply the information obtained by radar for collision avoidance.**

Assessment criteria

6.1 The importance of the early use of radar at night or during deteriorating visibility conditions is discussed.

6.2 Systematic radar observations are used to determine the relative movement of targets.

6.3 The relative movement of targets is used to determine the closest point of approach.

6.4 The importance of frequent recording of range and bearing of radar targets as an aid to collision avoidance is stated.

6.5 The content of rules 5, 6 and 7 outlined.

6.6 The content of rule 19 is correctly applied.

6.7 The maneuvering characteristics of a vessel are taken into account when planning collision avoidance activities.

Delivery strategy

The course provides for delivery by on or off-the-job training and assessment utilizing facilities that simulate conditions found on board merchant and small commercial vessels.

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 should include:

1. Classroom instruction;
2. Instructor demonstrations;
3. Participation in practical exercises;
4. Group work and
5. Simulations

Resource requirements

Delivery of the training will require:

- Classroom
- Overhead projector
- Video and monitor
- Radar set and or simulator
- Radar plotting equipment
- Copies of the International Rules for the Prevention of Collisions at Sea
- Learners guides

Assessment Strategy

Assessment Method

Learning outcomes may not be assessed separately. A holistic assessment strategy is proposed that attempts to ensure as much as possible that the assessment replicate conditions that learners may encounter in their workplace.

Practical assessment will be undertaken by observing the ability of learners to correctly apply the techniques taught in the course.

Condition of Assessment

Assessment may take place on or off-the-job.

Where assessment is conducted off-the-job, the environment, where possible will simulate the real work place situation.

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.