-SQA-SCOTTISH QUALIFICATIONS AUTHORITY

Hanover House
24 Douglas Street
GLASGOW G2 7NG

NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number- **0064252** **-Session-1986-87**

-Superclass- **XM**

-Title- **MARITIME GENERAL RADIOTELEPHONY: THEORY**

-DESCRIPTION-

Type and Purpose

A specialist module which enables the student to acquire the relevant theoretical knowledge for the statutory certificate enabling him/her to carry out an efficient radiocommunications service in the maritime mobile bands:

1605 - 4000 kHz;
4000 - 23000 kHz;
156 - 174 mHz;
1.5 - 6 gHz.

Preferred Entry Level

Standard Grade Science at Grade 5 or better

Learning Outcomes

The student should:

1. know the applications of basic electrical and electronic principles to radio communication equipment;

2. know the applications of radiocommunication to maritime MF, HF, VHF and satellite systems.

Content/ Context

Corresponding to the Learning Outcomes:

1. application of the following principles:

   electric current;
   effects of electric current;
   means of producing a voltage;
   resistance and resistors;
   Ohm's law;
   Kirchhoff's 1st and 2nd laws;

production of a sine wave;
Faraday's law of electromagnetic induction;
frequency;
period;
phase;
amplitude;
fundamental frequency and harmonics - complex waveforms;

capacitors and capacitance;
inductors and inductance;
effects of capacitance on voltage and current in an AC circuit;
capacitive reactance;
inductive reactance;
impedance;
series and parallel resonance;
selectivity;
concept of one-way conductivity in P-N junction;
half and full wave rectification;
transformer construction AF and RF;
transformer - principle of action;
Flemming's "Left Hand Rule;"
integrated circuits.

2. the radiocommunications system:

(a) block diagram of an amplitude modulated single side-band transmitter;

(b) need for and method of modulation (AM);

(c) comparison of SSB and DSB systems: advantages and disadvantages;

(d) modulation "envelopes" and frequency spectrum graphs for A3E, H3E, R3E and J3E. The effect of single tone and complex AF waveforms;

(e) need for microphone and filter to convert acoustic energy into electrical energy in the "commercial speech" range;

(f) construction and action of the carbon microphone and the rocking armature microphone;

(g) block diagram of basic VHF transmitter;

(h) the thermionic valve as an amplifier and the transmitter as:

(I) an amplifier;

(ii) a harmonic generator;

(iii) an oscillator;

(l) the antenna as an open-ended transmission line:

(l) half wave dipole;

(ii) quarter wave dipole;

(iii) typical ships' antenna rigs.

(j) electromagnetic radiation and polarisation;

(k) structure of the ionosphere and its effect on radio waves up to about 30 mHz;

(l) choice of frequencies at different times of day and season of year. Sunspot cycle;

(m) ground, sky and space waves; skip distances and dead space;

(n) effect of troposphere on radiocommunication at VHF;

(o) typical ranges on different frequency bands and the effect of power and height of antenna. Anomalous propagation;

(p) block diagrams of double superheterodyne receiver including R/F amplifier SSB filter, carrier re-insertion oscillator, automatic gain control and beat frequencies oscillator;

(q) ganging and tracking;

(r) second channel and adjacent channel interference;

(s) need for and methods of de-modulation (AM and FM);

(t) need for loudspeaker/phones to convert electrical energy into acoustic energy;

(u) construction and action of moving coil loudspeaker and telephone receiver (moving coil and rocking armature);

(v) limiter and frequency discriminator as main difference between FM receiver and SSB receiver;

(w) block diagram of maritime satellite communications system and its usefulness for direct connection into the international telecommunications system;

(x) teleprinter and telex as an integral part of the maritime mobile service on MF, HF and in the satellite communications system.

Suggested Learning and Teaching Approaches

Relating to the Learning Outcomes:

1. investigative laboratory environment where demonstrations, experiments and experimentation set the learning approach for students. A partly didactic approach in the form of short lectures, talks or discussions could be used.

2. a didactic approach in the form of lectures as appropriate but investigative use of a laboratory equipped with MF, HF, VHF, and UHF/SHF transmitters and receivers is essential. Lectures should be given in the laboratory so that the student and the teacher may relate the radiocommunications theory to practical components and units.

Assessment Procedures

All learning outcomes must be validly assessed.

The student must be informed of the tasks which contribute to summative assessment. Any unsatisfactory aspects of performance should, if possible, be discussed with the student as and when they arise.

Acceptable performance in the module will be satisfactory achievement of the performance criteria specified for each learning outcome.

The following abbreviations are used below:

LO Learning Outcome
IA Instrument of Assessment
PC Performance Criteria

LO1 IA Objective/multiple choice test.

PC The student displays adequate knowledge of the content.

LO2 IA Written/oral test.

PC Given block diagrams/sketches/simple circuit diagrams of maritime systems, the student explains:

(a) the principles of the systems;

(b) the appropriate applications of the system.