-SQA-SCOTTISH QUALIFICATIONS AUTHORITY

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NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number- **0064202** **-Session-1986-87**

-Superclass- **XL**

-Title- **INTRODUCTION TO RADIO AND AUDIO SYSTEMS**

-DESCRIPTION-

Type and Purpose

A general module which introduces the student to radio and audio systems. It is designed for those intending to pursue further studies in all aspects of radio and TV servicing and telecommunications.

Preferred Entry Level

Standard Grade 5 Science.

Learning Outcomes

The student should:

1. know the fundamental properties of waves and apply these to sound and electromagnetic waves;
2. know the types, applications and techniques, of transmission systems;
3. know the systems of operation of basic radio receivers and transmitters;
4. know common types of feeder and aerials;
5. know the basic principles of audio sound recording.

Content/ Context

Corresponding to the Learning Outcomes:

1. wave forms, wave motion, wavelength, frequency, amplitude, peak to peak, average, rms, periodic time. Complex a.c. waves, d.c. component, fundamental frequency and harmonic components.

   Nature of sound waves.

Nature of electromagnetic waves. Analogy with light waves. Limitations of transmissions at low frequencies. Reflection, refraction, absorption, interference.

2. types of transmission in common use, Amplitude, Frequency and Pulse Modulation types.

   Explanation of sidebands, bandwidth, depth of modulation, modulation index, deviation.

   Applications in speech, music, radio and television.

   Applications of frequency bands in radio frequency spectrum.

3. block diagrams of a.m. and f.m. transmitters.

   a.m. microphone a.f. amp, carrier wave oscillator, mixer, r.f. amp, power amplifier stage and aerial circuits.

   f.m. microphone, pre-emphasis, a.f. amp, frequency modulator, carrier wave oscillator, multipliers, r.f. amp, power amplifier stage and aerial circuits.

   Block diagrams of a.m. and f.m. receivers.

   a.m. R.F. amplifier, mixer and local oscillator, I.F. amplifiers, de-modulator, a.f. amplifier and output stage.

   f.m. R.F. amplifier, mixer and local oscillator, I.F. amplifier/limiters, discriminator, de-emphasis a.f. amplifier and output stage.

4. co-axial, twin feeder construction details and comparison. Travelling waves on matched line. Mismatches lines, reflection and concept of standing waves. Dipole and quarter-wave aerials. Concept of current and voltage distributions. Basic introduction to directivity and gain. Yagi array. Polar diagrams.

5. record/replay principles: heads, bias, equalising, tape speed.

   Operation: reel to reel, cassette audio recorders. Mechanical: tape transport systems. Interconnection of equipment. Block diagrams of audio tape recorder.

Suggested Learning and Teaching Approaches

This module should be conducted in a practical environment using simple standard items of equipment e.g. domestic radios, audio cassette recorders with oscilloscopes, signal generators, microphones etc.

For Learning Outcome 3, group discussions could take place on the requirements of:

(a) a transmitter;

(b) a receiver.

Leading to the build up of block diagrams of required systems and their uses. Reference to diagrams of actual practical equipment would be advantageous.

Examination and comparison of different types of feeder should take place for Learning Outcome 4 with demonstrations of travelling and standing waves showing effects of different loads and hence the need for matching.

Introduction of the aerial as an o/c transmission line. Demonstration and discussion of the standing wave distribution on a half wave dipole and a quarter wave vertical aerial.

For Learning Outcome 5, group discussion should take place on the requirements of an audio recording system leading to the build up of block diagrams.

Reference should be made to diagrams of practical audio cassettes.

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 Reports based on practical exercises.

PC The student correctly:

(a) identifies the relationship between:

(i) velocity;
(ii) wavelength;
(iii) frequency;

(b) identifies the frequency limits of the human ear;

(c) demonstrates the properties of em waves (e.g. light waves) for:

(i) reflection;
(ii) refraction;
(iii) absorption/attenuation;
(iv) interference.

LO2 IA(1) Assignment report.

PC From available data, the student should successfully describes the practical applications of each part of the radio frequency spectrum.

IA(2) Short answer test.

The student correctly describes types, applications and techniques of transmission systems.

LO3 IA Written/graphics exercise.

PC For AM and FM transmitters and receivers, the student:

(a) draws accurate block diagrams;

(b) describes the function and purpose of each of the elements of the system.

LO4 IA(1) Graphics exercise.

PC The student produces accurate graphs of:

(a) standing waves for open circuit and short circuit loads;

(b) standing waves on half wave and quarter wave lines.

IA(2) Short answer test.

PC The student correctly describes common types of feeder and aerials.

LO5 IA Short answer test.

PC The student correctly describes the basic principles of audio sound recording.

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