

-SQA-SCOTTISH QUALIFICATIONS AUTHORITY

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NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number- 0064204 -Session-1986-87

-Superclass- XM

-Title- TELECOMMUNICATIONS: LINE TRANSMISSION

-DESCRIPTION-

Type and Purpose A specialist module which enables the student engaged in the telecommunications industry to further his/her knowledge of the systems and principles of line transmission.

Preferred Entry Level 04201 Principles of Telecommunication Systems

Learning Outcomes The student should:

1. know the network requirements for the interconnection of subscribers;
2. know the elements of modulation and multiplexing;
3. know the factors affecting signal transmissions and the use of filters;
4. know the purpose of, and methods applied to, separating and recombining send and receive transmissions;
5. use test equipment for line transmissions.

Content/ Context Corresponding to the Learning Outcomes:

1. Telephone networks. Use of overhead and underground cables, distribution points, cross connection points, local exchanges. Connections of subscribers using local exchanges, group switching centres and transit network.

Connection of telex customers using area and zone exchanges. Supervisory tones, calling signals. Step by step exchange, switching systems. Matrix switching exchange, switching systems.

2. The use of transmitters and receivers. The carbon granule transmitter and rocking armature receiver. Moving coil loudspeaker. The need and functions for modulation and demodulation. Frequency spectrum for power, speech, video, radio and light frequencies.

Amplitude modulation principles, carrier and sidebands, frequency spectrum graph, depth of modulation, bandwidth. Single side band suppressed carrier system. Comparison of dsb and ssbc for bandwidth and power and signal to noise ratio.

Frequency modulation principles. Frequency deviation, Carson's rule for bandwidth.

Pulse modulation systems, PAM, PWM, and PPM. Use of modems on data circuits. The signals used in the applications of am and angle modulation to data transmission. The signals used in frequency shifts to telegraphy circuits.

Multiplexing, space, frequency and time division systems analogue and digital signals. Composition and frequencies of:

- (a) a CCITT 12 channel group;
- (b) a standard super group;
- (c) a typical hyper group.

Sampling of analogue signals for conversion to digital form. Diagram of the construction of the CCITT digital hierarchy.

3. primary and secondary line constants. Effects of constants on attenuation and phase shift.

Properties and filter configurations, BS symbols for:

- (a) low pass;
- (b) high pass;
- (c) band pass;
- (d) band stop.

Uses of filters.

4. Need for separate send and receive paths. Diagrams of line amplifiers, line balance and transformer windings for two to four wire circuits. Methods of signal separations and recombinations. Instability conditions, Losses, including overall transmission loss.
5. electronic test equipment, signal generators, oscilloscopes, etc. Use of signal sources and oscilloscope to examine typical waveforms.

Suggested Learning and Teaching Approaches

This module encompasses the basic systems used in simple telecommunication transmission systems. A didactic approach should be supplemented by practical activities investigating networks using simple test equipment. The "in house" telephone system could be used as an illustration of network systems. Visits to exchanges would be helpful. The content of the module is suitable for student centred learning methods to be exploited to the full.

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 Written short answer test.

PC The student correctly describes the network requirements for the interconnection of subscribers.

LO2 IA Written short answer test.

PC The student correctly describes the elements of:

(a) modulation;

(b) multiplexing.

- LO3 IA Written short answer test.
- PC The student correctly describes the factors affecting signal transmissions and the use of filters.
- LO4 IA Written short answer test.
- PC The student correctly:
- (a) states the purpose of separating and recombining send and receive transmissions;
 - (b) lists methods used.
- LO5 IA(1) Written/graphical reports based on a practical exercise taken from each of the Learning Outcomes 1, 2, 3 and 4.
- PC The student:
- (a) records the exercise accurately;
 - (b) interprets results correctly;
 - (c) draws valid conclusions.
- IA(2) Observation checklist based on the operation of the practical exercises.
- PC The student should:
- (a) uses the test instruments correctly;
 - (b) avoids damage to components and systems;
 - (c) observes approved safety precautions.