

Unit 303

Telecommunications engineering

Unit summary

This unit is about engineering communication systems problems and their engineering solutions. It is also about the promise and probable limitations of evolving communication technologies.

Aim

The unit aims to enable the candidate to analyse, compare and utilise communication systems in order to meet specifications.

Prerequisites

It is expected that candidates will have a working knowledge of the principles of telecommunications systems engineering as exemplified by the Graduate Diploma subject 9107-219 Telecommunication systems engineering.

Learning outcomes

There are **five** outcomes to this unit. The candidate will be able to:

- Analyse switching and transmission systems
- Compare quantitatively methods of coding
- Utilise optical communication design principles
- Understand key constraints in mobile communications
- Utilise satellite communication design principles

Guided learning hours

It is recommended that 300 hours should be allocated for this unit. 120 of those hours are actual taught hours. This may be on a full time or part time basis.

Key Skills

No Key Skills were identified for this unit.

Occupational Standards

This unit has been mapped to the following National Occupational Standards:

- 1.1.1 Identify the requirements of clients for engineering products or processes
- 1.1.2 Produce specifications for engineering products or processes
- 1.3.1 Undertake research into engineering products or processes
- 1.3.2 Evaluate the results of research
- 1.4.3 Create designs for engineering products or processes
- 1.4.4 Evaluate designs for engineering products or processes
- 2.1.1 Determine the production requirements of engineering products and processes
- 2.2.2 Solve production problems with engineering solutions
- 2.3.1 Monitor the production process
- 2.3.2 Evaluate the production process
- 3.1.1 Determine the installation requirements for engineering products or processes
- 3.1.2 Specify installation methods and procedures to achieve installation requirements
- 4.1.1 Determine the operational requirements of engineering products or processes
- 4.1.2 Specify operational methods and procedures to achieve operational requirements
- 4.2.2 Solve operational problems with engineering solutions
- 4.3.2 Evaluate operational processes
- 5.1.1 Determine the maintenance requirements of engineering products or procedures
- 5.3.2 Evaluate maintenance processes
- 6.1.1 Analyse the risks arising from engineering products and processes
- 6.2.1 Assure the quality of engineering products or processes
- 8.1.1 Maintain and develop own engineering expertise

Unit 303

Telecommunications engineering

Outcome 1

Analyse switching and transmission systems

Knowledge requirements

The candidate knows how to:

- 1 analyse and investigate time and space switch problems
- 2 understand the principles of operation of digital telephone exchanges
- 3 analyse routing systems
 - a permanent circuits
 - b virtual circuits
- 4 design alternative routing systems
- 5 utilise traffic theory including Erlang's model
- 6 understand the causes of system congestion
- 7 analyse and rectify distortion and interference
 - a SQNR
 - b delay distortion
 - c aliasing
 - d inter-symbol interference
- 8 compute bandwidth and implement filtering techniques

Unit 303

Outcome 2

Telecommunications engineering

Compare quantitatively methods of coding

Knowledge requirements

The candidate knows how to:

- 1 process sound, picture and multi-media data
- 2 instigate bandwidth reduction techniques
- 3 determine spectral and power efficiency
 - a PSK
 - b FSK
 - c QPSK
 - d spectra
- 4 determine binary error rates
- 5 operate demodulation techniques

Unit 303

Telecommunications engineering

Outcome 3

Utilise optical communication design principles

Knowledge requirements

The candidate knows how to:

- 1 evaluate propagation in optical fibres
 - a dispersion
 - b attenuation
- 2 determine optimum wavelengths in optical fibres
- 3 analyse the benefits and limitations of transmitters, LED's and lasers
- 4 check the function of
 - a detectors
 - b PINS
 - c avalanche diodes
- 5 determine noise, impulse and frequency responses
- 6 determine bandwidth in optical communication systems
- 7 implement WDM-modulation for multi-channel use.

Unit 303

Outcome 4

Telecommunications engineering

Understand key constraints in mobile communications

Knowledge requirements

The candidate knows how to:

- 1 recognise the implications of service requirements on system design
- 2 determine present and future targets
- 3 determine cell and cluster sizes
- 4 express the multipath problem
- 5 analyse modulation, speech and channel coding for
 - a GSM systems
 - b 3G systems
 - c UMTS systems
- 6 manipulate data and appreciate network layer principles of
 - a GSM systems
 - b UMTS systems

Unit 303

Outcome 5

Telecommunications engineering

Utilise satellite communication design principles

Knowledge requirements

The candidate knows how to:

- 1 analyse satellite orbits, look angles and coverage
- 2 analyse transponder and earth station design
- 3 analyse propagation and link budgets
- 4 assess digital transmission, modulation and multiple access
- 5 recognise mobile radio applications of satellite systems
- 6 recognise broadband applications of satellite systems

Unit 303 Telecommunications engineering

Recommended reading list

Core texts	Author(s)	Publisher	ISBN
Digital Communication	Glover, Grant	Prentice Hall	0130893994
Other useful texts			
Introduction to the Wireless Loop	Webb W	Artech House	1580530710
Networks and Telecommunications	Clark MP	John Wiley	0471973467
Telecommunication Engineering	Dunlop J, Smith DG	Chapman Hall	0412562707
Digital Communications	Proakis	McGraw-Hill Education	0072321113
Digital Communication	Sklar	Prentice Hall	0130847887
Introduction to Communication Systems	Stremler	Addison Wesley	0201516519
Mobile Wireless Communications	Schwartz	Cambridge University Press	0521843472