

**NEW ZEALAND INSTITUTES OF TECHNOLOGY AND POLYTECHNIC
QUALIFICATIONS IN INFORMATION & COMMUNICATIONS TECHNOLOGY**

PRESCRIPTION: MW610 MOBILE WIRELESS SYSTEMS

AIM OF MODULE:	Students will gain an understanding of mobile wireless systems.
CREDITS:	14
KNOWLEDGE ASSUMED FROM:	MW600 Mobile Wireless Principles
STUDENT LEARNING HOURS:	140
CONTENT REVISED:	2010
PRESCRIPTION EXPIRY DATE:	November 2013

Level and Assessment Schedule

TOPICS	Highest Skill Level				Suggested Assessment Percentage
	R	C	A	P	
1. Trunk Radio		*			5
2. Pagers		*			5
3. Wireless LANs			*		35
4. Cellular Networks			*		35
5. Bluetooth		*			5
6. Very Small Aperture Terminal (VSAT)		*			5
7. Global Positioning System (GPS)		*			5
8. Synchronous Digital Hierarchy (SDH)			*		5
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LEARNING OUTCOMES

The student will:

- C 1. Describe the National Trunk Radio System and explain its application.
- C 2. Describe the Pager network and explain its application.
- A 3. Describe the wireless LAN standards, explain their application and examine a typical installation.
- A 4. Describe the major cellular network specifications, explain their applications and study a cellular network site.
- C 5. Describe the Bluetooth wireless specification, and explain how it can be applied.
- C 6. Describe a typical VSAT system and explain its application.
- C 7. Describe GPS and explain a typical application.
- A 8. Describe SDH, explain its application to modern wireless networks and assess a network provider's site.

CONTENT

1. Trunk Radio

- A description of the National Trunk Radio System and an explanation of its application will include;
 - the frequency bands, modulation processes and types of aerial used
 - typical repeater coverage
 - voice and data facilities available
 - the choice of network for a typical business application

2. Pagers

- A description of the pager network and an explanation of its application will include;
 - the frequency bands, modulation processes and types of aerial used
 - typical repeater coverage and types of message coding used
 - reception problems associated with buildings
 - the choice of the network for a typical business application

3. Wireless LANs

- A description of the wireless LAN standards and an explanation of their application will include;
 - Infrared LANs
 - LAN extension, cross-building interconnect, nomadic access, ad hoc

networks

- Spread Spectrum LANs, frequency bands and power levels permitted in New Zealand
- IEEE 802.11 Wireless Standard and its architecture
- Provision of services, associated providers and the services supported
- IEEE 802.11 Medium Access Control including:
 - Reliable data delivery
 - Access control including:
 - Distributed Coordination Function
 - Point Coordination Function
 - MAC frames
- Security including privacy and authentication mechanisms
- IEEE 802.11 Physical Layer including:
 - specifications including:
 - Direct sequence spread spectrum and IEEE 802.11b
 - Frequency hopping spread spectrum
 - Infrared
 - IEEE 802.11a Orthogonal FDM
- Examining a typical installation

4. Cellular Networks

- A description of the major cellular network specifications and their application will include;
 - Cellular geometries, frequency reuse, cell splitting, microcells and general operation
 - mobile propagation effects in terms of signal strength and fading
 - the concept of “Handoff” including traffic and signal strength considerations
 - transmitted RF power control (open loop versus closed loop)
 - Global System for Mobile communications (GSM) including:
 - overall GSM architecture elements included in the mobile station
 - base station and network subsystems and their functions
 - the functions of the mobile station including speech encoding, TDMA coding and GMSK modulation
 - the GSM signalling protocol architecture including LAPD
 - General Packet Radio Service (GPRS) and the relationship of GPRS with GSM
 - the GPRS network including the GPRS protocol layers, GPRS identities and GPRS air interface
 - packet transfer operations

- Code Division Multiple Access (CDMA) including advantages and disadvantages
- concept of a Radio Activated Key Entry (RAKE) receiver
- forward and reverse Link
- examination of a cellular network site

5. Bluetooth

- A description of the Bluetooth specification and an explanation of how it can be applied will include;
 - typical applications of this technology and the core protocol layers
 - the radio specification (how this allows for the existence of many networks within a small area)
 - an overview of the baseband specification

6. Very Small Aperture Terminal (VSAT)

- A description of a typical VSAT system and an explanation of its application will include;
 - wideband remote communication applications
 - a typical VSAT system including:
 - Aerial size and gain
 - Frequency range and bandwidth
 - Modulation process
 - Services provided

7. Global Positioning System (GPS)

- A description of a GPS and an explanation of a typical application will include;
 - the number of satellites in use, their position, frequency band and output powers
 - how the GPS receiver decodes the received signal and calculates its position

8. Synchronous Digital Hierarchy (SDH)

- A description of SDH and an explanation of its application to modern networks will include;
 - the advantages of SDH over Plesiochronous Digital Hierarchy (PDH)
 - SDH transport capabilities including ATM, FDDI and DQDB
 - the Synchronous Transport Mode Level 1 (STM-1) frame structure
 - utilising an add drop multiplexer to achieve direct synchronous multiplexing
 - assessing implementations at a network provider's site

TEACHING/LEARNING METHODS

- Site visits to actual installations should be made, where available.

LEARNING RESOURCES

Suggested textbook:

- Wireless Communications and Networks (2nd Edition) William Stallings. ISBN-13: 978-0130422323 (Published by Prentice Hall, January 10, 2002)