Course Name : Electronics Engineering Group

Course Code : EJ/ET/EN/EX/DE/ED/EI

Semester : Sixth for ET/EN/EX/EJ/DE and Seventh for ED/EI

Subject Title : Mobile Communication

Subject Code : 17657

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	---	--	25@	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

The 21st century has brought the rapid growth of cell phones, LAN and wireless appliances. Wireless communication is driving the whole world towards greater integrity. RF spectrum in higher bands is available for mobile communications. Mobility awareness in civilized societies, global standardization of wireless devices and products are leading towards huge growth.

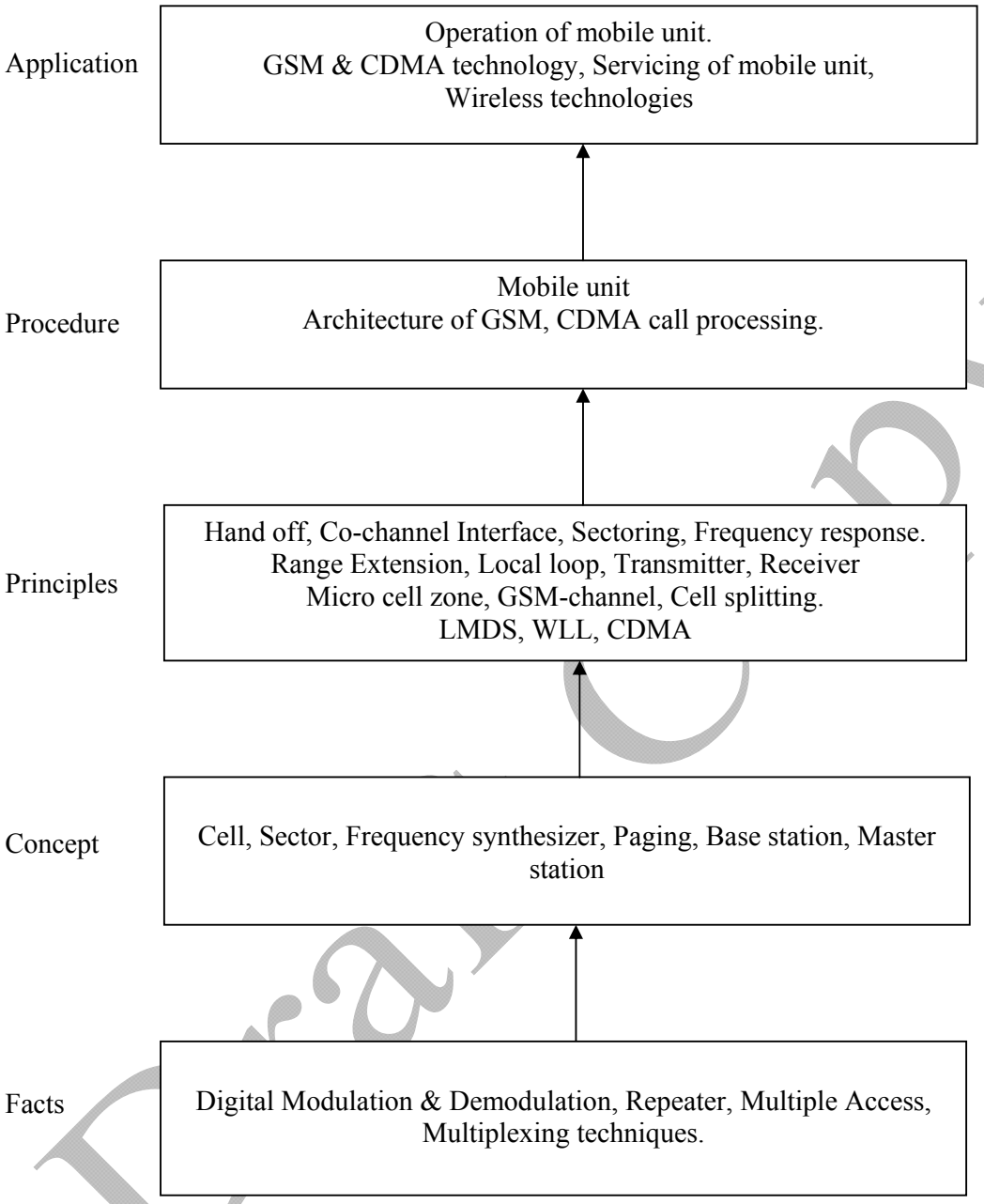
Students will know the fundamentals of mobile communication, basics of cellular system and different services provided by the cellular system. This subject gives the knowledge of cellular system architecture, components and its application along with its standards .It is the application of wireless digital communication.

General Objectives:

The student will be able to:

1. Describe cellular concept such as frequency reuse, hand off available in various mobile standards.
2. Understand GSM system, CDMA (IS-95), SS7 architecture and call processing in these system.
3. Understand 3G Mobile Communication system.

Learning Structure:



Theory:

Topic and Contents	Hours	Marks
Topic 1: Introduction to Wireless Communication System **Specific Objectives:** ➢ State a need and application of mobile communication. ➢ State technological evolution in radio communication ➢ State basic features of AMPS, N AMPS, IS 95, GSM standards along with Global geographical utility. ➢ Explain principle of Working of Paging system, cordless telephone system, cellular telephone system and call processing. ➢ Explain operation of mobile unit. Contents: 1.1 [10] • Evolution of mobile radio communications (2G,2.5G and 3G wireless system) • Mobile radio system around the world (AMPS, IS 95,GSM, N - AMPS) • Applications of wireless communication systems i. Paging System. ii. Cordless telephone system. iii. Cellular telephone system. Call processing in cellular telephone system. 1.2 Mobile Unit [10] • Block diagram and operation of mobile Unit. • Block Diagram and operation of frequency synthesizer, transmitter, Receiver, Logic Unit and Control unit. Essential features of hand set. • Definition of mobile base station, Mobile control station.	08	20
Topic 2: The Cellular Concept **Specific Objectives:** ➢ Explain Cell Structure and its importance. ➢ State need and process of Frequency reuse, Handoff and its types. ➢ State types of interference and methods of increasing channel capacity. ➢ State how to improve coverage and capacity in cellular system. Contents: 2.1 Introduction to cellular system. [10] • Frequency reuse concept. • Multiple Access Technologies for Cellular systems. • Cellular system operation and Planning Principles. • System Architecture • Location updating and call setup. • Hand off strategies and Power control. 2.2 Interference and system capacity. [10] • Co channel interference & system capacity. • Channel planning for wireless system. • Adjacent channel Interference. • Improving coverage and capacity in cellular system. • Cell splitting. • Sectoring. • Repeater for range extension.	10	20

• Micro cell zone concept.		
Topic 3: Digital Cellular Mobile Systems. **Specific Objective:** ➢ Explain GSM system architecture, features, services and channel types. ➢ Explain CDMA System architecture, radio aspects and features. ➢ Define and explain Signal Traffic, services and performance of Signal System in SS7. Contents: 3.1 G.S.M : Concept of GSM, the European TDMA Digital Cellular standard. [10] • GSM Standardization and service aspects • GSM Architecture. • GSM Radio Aspects. • Security Aspects. • GSM Protocol Model • Typical flow sequence in GSM 3.2 IS 95:Concept of IS 95, the North American CDMA Digital Cellular standard. [08] • Introduction • Service Aspects • Network reference Model and Security aspects. • Radio aspects • Key features of IS 95 CDMA systems 3.3 Signal system no.7 (SS7) : Concept of SS7 [06] • NSP of SS7 • Signaling Traffic in SS7 • SS7 services and performance.	16	24
Topic 4: Modern Wireless Communication System **Specific Objective:** ➢ List out features of 2.5 G GSM Standards HSCSD, GPRS and IS-136, EDGE and IS 95B. ➢ State features of IMT 2000 Radio spectrum, vision and Evolution. Contents: 4.1 Evolution for 2.5 G TDMA standards [12] • HSCSD for 2.5 G GSM • GPRS for 2.5 G GSM and IS-136 • EDGE for 2.5vg GSM and IS-136 • IS-95B for 2.5 G CDMA. 4.2 IMT 2000 [04] • IMT 2000 Vision and Evolution Aspects. • Radio Spectrum for IMT -2000	06	16
Topic 5: Modern wireless Networks **Specific Objective:** ➢ State features of 3G wireless networks- UMTS, 3G CDMA 2000, G-TD-SCDMA ➢ Explain WLL and LMDS technology ➢ State features of Bluetooth and Personal Area networks ➢ State Conceptual features of 4G and 4.5G. ➢ Explain 4G architecture and its capability	08	20

➢ Define and state importance of Blockage, voice channel blockage, Voice quality and word error rate. Contents: 5.1 Third Generation (3G) Wireless Networks. [10] • 3G W-CDMA (UMTS) (Universal mobile Telecommunication system.) • 3G CDMA 2000 • 3G- TD-SCDMA (synchronous) • Wireless local loop and LMDS (local multipoint distribution) 5.2 Wireless Local Area Networks [10] • Features of Bluetooth and Personal Area Networks(PANS) • Concept of Ad voc mobile communication for 4G and 4.5G. • 4G wireless architecture and capabilities, characteristics, • MANET applications. • Concept of Blockage, voice-channel Blockage, call drops, voice quality, word error rate. (no need of detail mathematical calculation and/or derivation)		
Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:

1. Identification of different components and their use.
2. Interpret various generation technologies.

Motor Skills:

1. Follow standard testing procedure
2. Accurate measurement of waveforms and write results.
3. Report writing.

List of Practical:

1. Perform installation of mobile phone, registration, activation and authentication of mobile handset
2. Observe Input / Output signal of different sections of mobile phone unit.
3. Read the content of SIM card.
4. Perform testing procedure of different sections of mobile phone.
5. Find out different add- on accessories for cell phones (battery, charger, hands free data cable, memory card) and their interfacing with Handset.
6. Identify different sections and component of mobile unit such as (Ringer section, dialer section, receiver section etc.)
7. Troubleshooting and testing of mobile handset. Such as Speaker problem, Ringer problem, Mike problem, Vibrator problem, SIM card problem, charging problem, display problem ,Dialing/keypad problem , Dead handset , Network problem, water dipped handset
8. Check network availability manual and auto selection of network using AT commands in mobile.
9. Observe the process of Call connection and Call release of Mobile system.

List of Assignments: (Any Three)

1. Industrial visit to mobile company BTS BSC MSC – GSM (Airtel, idea, Vodafone) to know duties and responsibilities of O & M engineer, Microwave and GSM antenna tower maintenance.
2. Industrial visit to CDMA mobile station BTS BSC MSC (TATA Indicom, Reliance)
3. Prepare report on features, services and technology provided by different companies.
4. Find out the electrical specifications of different handsets provided by different companies. Prepare report on GSM technology, its network, GSM capability & data Services, handoff, frequency reuse, cell splitting.
5. Study and prepare report on cell site, distance coverage, antennas used. Role of RF engineer.
6. Listing out message center number and their use.

Learning Resources:

1. Reference Books:

Sr. No.	Author	Title	Publisher
1	T.S. Rappaport	Wireless Communication Principles & Practice	Pearson Education
2	William Lee	Mobile Cellular Tele communication	Tata McGraw Hill
3	C K Toh	Ad Voc Mobile wireless Networks	Pearson Education
4	Raj Pandya	Mobile and Personal communication system and services	IEEE Press, PHI
5	Steffano Basagni Marco, Silvia, Ivan	Mobile AD HOC Network	Wiley India Pvt. Ltd.

2. CDs, PPTs Etc.:

http://nifrash.weebly.com/uploads/3/5/0/9/3509162/gsm_introduction.ppt
http://www.gadgetcage.com/4g-mobile-communications-presentation-powerpoint-download/4305/

3. IS, BIS and International Codes:

IS 15040:2010 CISPR 25:2008	Radio Disturbance Characteristics for Protection of receivers Used on Board Vehicles, Boats and Internal Combustion Engines – Limits and Methods of Measurement

4. Websites:

- http://en.wikipedia.org/wiki/W-CDMA_%28UMTS%29 for WCDMA
- http://www.itu.int/ITU- R/index.asp?category=information&rlink=imt-advanced&lang=en for IMTS
- http://www.mobiledia.com/glossary/33.html
- http://www.youtube.com/watch?v=whYljse4Abc