

Mobile Communication

DETAILED SYLLABUS

Credit Hours (Th-Pr) 3-0	Mobile Communication	Contact Lecture/Week (Th-Pr) 3-0	Total Allocated Weeks (Th-Pr) 16-0
--	-----------------------------	--	--

Course Outline:

Queuing Theory, GSM Channels, Frame Hierarchy & Burst Structures, Source Coding & Speech Processing, Channel Coding & Interleaving, Error Detection & Correction, Authentication & Ciphering, GSM Interfaces & Protocols, Radio Propagation, GPRS, EDGE, Introduction to W-CDMA.

Prerequisites: Data Communication, Computer Networking, Telecommunication.

Recommended Text Books:

S.No	Title	Authors	Assigned Code
1	Wireless Communications	Theodore S.Rappaport	TSR
2	The complete wireless communications Professionals	William Webb	WWB
3	Digital Communication	Bernard Sklar	BSK
4	GSM Switching, Services and Protocols 2nd Ed (2001)	Jorg Ebeospacher, Hans-Jorg Vogel, Christial Bettstetter.	JHC

Student Note:

All the students will be provided with the lecture notes and other related handouts for study. However they are required to read the related chapters of the recommended books to get a greater knowledge of the subject.

2	<p>Frame Hierarchy & Burst Structures</p> <ul style="list-style-type: none"> - Overview of Logical Channels - Channels combinations offered by BS - Channels combinations used by BS - BCCH Configuration - Timing Advancement - Frame hierarchy and Timings - Multi-Frame Structures - Traffic Multi-frame - Control Multi-frame - Super frames & Hyper frames - Mobile Activity. - TYPES of BURST - Normal Burst - FREQUENCY CORRECTION BURST - SYNCHRONIZATION BURST - DUMMY BURST - ACCESS BURST - Maximum Cell Size Estimation - Frequency Synchronization - Time Synchronization 	<p>3rd</p> <p>4th</p>
3	<p>Source Coding & Speech Processing</p> <ul style="list-style-type: none"> - GSM Transmission Chain - Source Coding -Speech Processing - Speech Functions at Receiver - Discontinuous Transmission - Silence Descriptor - Bad Frame indication - GSM Speech Coder - RPE-LTP - Speech Data Pre-processor - Short term Analysis Filter - Long term prediction Analysis - GSM Speech Decoder 	<p>5th</p> <p>6th</p>

	<ul style="list-style-type: none"> - Cyclic Codes - Polynomials - Prime Polynomial - Method for Generating Cyclic Codes - Generator Polynomial - Encoding with Generator Polynomial - Matrix Description of Cyclic Codes - Parity Check Polynomial - Error Correction through Syndrome Detection - Single bit Error Correction - Valid/Invalid Cyclic Codes for Single Bit Error Correction - Important Characteristics of Burst Errors - Consecutive Burst Errors - Example of 2-bits Consecutive Error Correction. - Non-Consecutive Burst Errors - Example of two single bit Isolated Errors Correction - Convolutional Codes 	
6	<p>Authentication & Ciphering</p> <ul style="list-style-type: none"> - Security Related Network Function - Protection of Subscriber Identity - TMSI Assignment by VLR - Data Base Failure - Re-transmission of IMSI - Subscriber Identity Authentication - Authentication Process - Signaling Information Element Authentication - Generating Security Data - Advantage of Pre-calculation of Security Data - Calculation & Transmission of Security data 	11 th

7	<p>GSM Interfaces & Protocols</p> <ul style="list-style-type: none"> - Introduction to interfaces - 2Mbps trunks - X.25 Interfaces - Signaling System 7 - A-bis (LAP-D) interfaces - A Interface - BSS Connections - GSM Network Protocol Architecture - Layer 3 Functions - LAPD Frame structure 	12 th
8	<p>Radio Propagation</p> <ul style="list-style-type: none"> - Introduction to Radio Propagation - Distance Related Attenuation - Coping with Large numbers in Mobile Radio - Slow Fading - Fast Fading - Free Space Propagation - terrestrial Propagation Mechanism - Multipath Propagation - Doppler Shift - Large & Small Scale Fading - Empirical Model - Okumura Model - Hata Model & Cost-231 Extension - Walfisch- Ikegami Model - Link Budget - Antenna Basics - Antenna Beam width - Antenna gain - Down tilt - Electrical Down tilting - Mechanical Down tilting - Antenna Diversity 	13 th

9	<p>GPRS</p> <ul style="list-style-type: none"> - Definition - GPRS Architecture - SGSN - GGSN - PCU - GPRS Network Overview & Interfaces - Data Packet Routing - GPRS Mobility Management - GPRS Coding & Data Rates - GPRS Mobile Classes - GPRS Multi-slot Classes - GPRS Physical & Logical Channel - GPRS Channel Mapping - Source of delays - GPRS Applications 	14 th
10	<p>EDGE</p> <ul style="list-style-type: none"> - Definition - EDGE Implementation - Differences b/w EDGE & GPRS - Physical Layer Differences - EDGE Modulation Technique - EDGE Coding Schemes - Packet Handling - Addressing Window - Measurement Accuracy - EGPRS link-controlling function - Link adaptation - Incremental redundancy - Impact of EGPRS on existing GSM/GPRS networks - Future Evolution of GSM/EDGE towards WCDMA alignment - EGPRS Benefits 	15 th

11	Introduction to W-CDMA <ul style="list-style-type: none">- Multiple Access Schemes- Definition of CDMA- Different Concepts related to CDMA- Spread Spectrum Concept- DS-CDMA System- Capacity for CDMA System- Introduction to UMTS- UMTS Main requirements- UMTS Bearer Services- UMTS Access Network-UTRA Concept Groups- Frequency Allocation for UMTS- W-CDMA Specifications	16 th
-----------	---	------------------