GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. Wireless Communication Systems and Networks (EC)

Semester: I

Subject Name: **3G Mobile Communications**

Sr.No	Course content
1.	**Overview :** Overview of 3G, Proposals for 3G Standard, WCDMA, Advanced TDMA, Hybrid CDMA/TDMA, OFDM, IMT-2000, GPP, TDD, TD-SCDMA, GPP2, 3G Evolution Paths
2.	**Principles of CDMA :** Radio-Channel Access Schemes, Spread Spectrum, RAKE Receiver, Power Control, Handovers , Soft Handover, Relocation , Hard Handover , Intersystem Handovers, Multiuser Detection
3.	**WCDMA Air Interface: Physical Layer:** Forward Error Correction Encoding/Decoding, Radio Measurements and Indications to Higher Layer, Macro diversity Distribution/Combining and Soft Handover Execution, Error Detection on Transport Channels, Multiplexing of Transport Channels and Demultiplexing of CCTrCHs, Rate Matching, Mapping of CCTrCHs on Physical Channels, Modulation, Spreading/Demodulation, and Dispreading of Physical Channels , Frequency and Time Synchronization, Inner-Loop Power Control Power Weighting and Combining of Physical Channels, RF Processing Timing Advance on Uplink Channels, Support of Uplink Synchronization, Channels, Logical Channels, Transport Channels, Physical Channels, Shared Channels, Channel Mapping, Spreading and Scrambling Codes, Diversity, Time Diversity, Multipath Diversity, Macro diversity, Antenna Diversity, Transport Formats, Data Through Layer
4.	**Modulation Techniques and Spread Spectrum:** Spreading Techniques, DS-CDMA, Frequency-Hopping CDMA, Time-Hopping CDMA, Multicarrier CDMA, Data Modulation
5.	**Spreading Codes and Channel Coding:** Orthogonal Codes, PN Codes, Synchronization Codes, Autocorrelation and Cross-Correlation, Intercell Interference, Coding Processe, Coding Theory, Block Codes, Convolutional Codes, Turbo Codes, Channel Coding in UTRAN
6.	**Wideband CDMA Air Interface: Protocol Stack:** Control Plane, MAC, MAC Services, MAC Functions, TFC Selection, RLC, RLC Services, RLC Functions, RRC, RRC Services, RRC Functions, RRC Protocol States, Location Management in UTRAN, Core Network Protocols in the Air Interface, Circuit-Switched Core Network, Packet-Switched Core Network, Packet Data Convergence

	Protocol, Broadcast/Multicast Control, Data Protocols, Dual-System Protocol Stack in UE
7.	**UMTS Network:** Evolution from GSM, UMTS Network Structure, Core Network, Mobile Switching Center , Visitor Location Register, Home Location Register, Equipment Identity Register, Authentication Center, Gateway MSC, Serving GPRS Support Node, Gateway GPRS Support Node, UMTS Terrestrial Radio Access Network, Radio Network Controller, GSM Radio Access Network, Base Station Controller, Base Transceiver Station , Small Base Transceiver Stations, Interfaces , A Interface, Gb Interface, Iu Interface, Iub Interface, Iur Interface, MAP Interfaces, Network Protocols, Asynchronous Transfer Mode , AAL2 and AAL5, Iu User Plane Protocol Layer, GPRS Tunnelling Protocol-Use, SS7 MTP3-User Adaptation Layer , MAP (MAP-A Through MAP-M), Message Transfer Part, Node B Application Part, Physical Layer (Below ATM), Radio Access Network, Radio Network Subsystem Application Part, Signalling ATM Adaptation Layer , Service-Specific Coordination Function, Service-Specific Connection-Oriented Protocol, Signalling Connection Control Part, Stream Control Transmission Protocol, UDP/IP, UMTS Network Evolution
8.	**Network Planning:** Importance of Network Planning, Differences Between TDMA and CDMA, Network Planning Terminology, Network Planning Process, Preparation Phase, Network Dimensioning, Detailed Radio-Network Planning, Network Planning in WCDMA, Pilot Pollution, SHO Parameters , HO Problems, Hierarchical Cells, Microcell Deployment, Pico cell Deployment and Indoor Planning
9.	**Network Management:** Telecommunication-Management Architecture, Fault Management, Configuration Management, Performance Management, Roaming Management, Accounting Management, Subscription Management, QoS Management, User Equipment Management, Fraud Management , Security Management, Software Management , Charging, Charging of Circuit-Switched Services, Charging of Packet-Switched Services, Billing, Service Providers Versus Operators
10.	**New Concepts in the UMTS Network:** Location Services, Cell-Coverage-Based Method , Observed Time Difference of Arrival, Network-Assisted, Global Positioning System ,Comparison of Location Methods, Service Categories, High-Speed Downlink Packet Access, Multimedia Broadcast/Multicast Service, Broadcast Service , Multicast Service, Multimedia Messaging Service, The Service, MMS Elements, MMS Protocols, Supercharger, Prepaging, Gateway Location Register, Optimal Routing, Adaptive Multirate Codec , Support of Localized Service Area Smart Antennas 386
11.	**3G Services :** Service Categories, Teleservices, Bearer Services, Supplementary Services, Service Capabilities, QoS Classes, Conversational Real-Time Services, Interactive Services, Streaming Services, Background Services, QoS Service Classes and 3G Radio Interface
12.	**3G Applications:**

	Application Technologies, Wireless Application Protocol, Bluetooth, I-mode, Electronic Payment, IPv6, Multimedia, Application Types, Traffic Characteristics of 3G Applications, M-commerce, Examples of 3G Applications, Voice, Messaging, Internet Access, Location-Based Applications, Terminals, Voice Terminals, Multimedia Terminals, Navigation Devices, Game Devices, Machine-to-Machine Devices

Reference Books:

1. Introduction to 3G Mobile Communications By Juha Korhonen, Artech House Inc.
2. 3G Wireless Networks By Clint Smith and Denial Collins, Tata MacGraw Hill
3. W-CDMA and CDMA 2000 By M R Karim and Mohseen Saraf, McGraw Hill Telecom
4. W-CDMA By Kaije Tachikawa, Wiley and Maruzen