

VIII SEMESTER  
**WIRELESS COMMUNICATION**

Subject Code	: <b>10EC81</b>	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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**UNIT - 1**

Introduction to wireless telecommunication systems and Networks, History and Evolution Different generations of wireless cellular networks 1G, 2G, 3G and 4G networks.

**6 Hrs**

**UNIT - 2**

Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components, Cellular component identification Call establishment.

**7 Hrs**

**UNIT - 3**

Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security.

**7 Hrs**

**UNIT - 4**

GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers

**6 Hrs**

**UNIT - 5**

GSM system operation, Traffic cases, Call handoff, Roaming, GSM protocol architecture. TDMA systems.

**6 Hrs**

**UNIT - 6**

CDMA technology, CDMA overview, CDMA channel concept CDMA operations.

**6 Hrs**

#### **UNIT - 7**

Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, wireless coding techniques, Digital modulation techniques, OFDM, UWB radio techniques, Diversity techniques, Typical GSM Hardware. **7 Hrs**

#### **UNIT - 8**

Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.15X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies. **7 Hrs**

#### **TEXT BOOK:**

1. **Wireless Telecom Systems and networks**, Mullet: Thomson Learning 2006.

#### **REFERENCE BOOKS:**

1. **Mobile Cellular Telecommunication**, Lee W.C.Y, MGH, 2<sup>nd</sup>, 2009.
2. **Wireless communication** - D P Agrawal: 2<sup>nd</sup> Edition Thomson learning 2007.
3. **Fundamentals of Wireless Communication**, David Tse, Pramod Viswanath, Cambridge 2005.
4. S. S. Manvi, M. S. Kakkasageri, **“Wireles and Mobile Network concepts and protocols”**, John Wiley India Pvt. Ltd, 1<sup>st</sup> edition, 2010.
5. **“Wireless Communication – Principles & Practice”**, T.S. Rappaport, PHI 2001.

## DIGITAL SWITCHING SYSTEMS

Subject Code	: 10EC82	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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### UNIT - 1

Developments of telecommunications, Network structure, Network services, terminology, Regulation, Standards. Introduction to telecommunications transmission, Power levels, Four wire circuits, Digital transmission, FDM, TDM, PDH and SDH, Transmission performance.

**7 Hrs**

### UNIT - 2

**EVOLUTION OF SWITCHING SYSTEMS:** Introduction, Message switching, Circuit switching, Functions of switching systems, Distribution systems, Basics of crossbar systems, Electronic switching, Digital switching systems.

**6 Hrs**

**DIGITAL SWITCHING SYSTEMS:** Fundamentals : Purpose of analysis, Basic central office linkages, Outside plant versus inside plant, Switching system hierarchy, Evolution of digital switching systems, Stored program control switching systems, Digital switching system fundamentals, Building blocks of a digital switching system, Basic call processing.

**7 Hrs**

### UNIT - 3

**TELECOMMUNICATIONS TRAFFIC:** Introduction, Unit of traffic, Congestion, Traffic measurement, Mathematical model, lost call systems, Queuing systems.

**6 Hrs**

### UNIT - 4

**SWITCHING SYSTEMS:** Introduction, Single stage networks, Gradings, Link Systems, GOS of Linked systems.

**6 Hrs**

### UNIT - 5

**TIME DIVISION SWITCHING:** Introduction, space and time switching, Time switching networks, Synchronisation.

**6 Hrs**

#### **UNIT - 6**

**SWITCHING SYSTEM SOFTWARE:** Introduction, Scope, Basic software architecture, Operating systems, Database Management, Concept of generic program, Software architecture for level 1 control, Software architecture for level 2 control, Software architecture for level 3 control, Digital switching system software classification, Call models, Connect sequence, Software linkages during call, Call features, Feature flow diagram, Feature interaction. **7 hrs**

#### **UNIT - 7**

**MAINTENANCE OF DIGITAL SWITCHING SYSTEM:** Introduction, Scope, Software maintenance, Interface of a typical digital switching system central office, System outage and its impact on digital switching system reliability, Impact of software patches on digital switching system maintainability, Embedded patcher concept, Growth of digital switching system central office, Generic program upgrade, A methodology for proper maintenance of digital switching system, Effect of firmware deployment on digital switching system, Firmware-software coupling, Switching system maintainability metrics, Upgrade process success rate, Number of patches applied per year, Diagnostic resolution rate, Reported critical and major faults corrected, A strategy improving software quality, Program for software process improvement, Software processes improvement, Software processes, Metrics, Defect analysis, Defect analysis. **7 Hrs**

#### **UNIT - 8**

**A GENERIC DIGITAL SWITCHING SYSTEM MODEL:** Introduction, Scope, Hardware architecture, Software architecture, Recovery strategy, Simple call through a digital system, Common characteristics of digital switching systems. Analysis report. Reliability analysis. **6 Hrs**

#### **TEXT BOOKS:**

1. **Telecommunication and Switching, Traffic and Networks** - J E Flood: Pearson Education, 2002.
2. **Digital Switching Systems**, Syed R. Ali, TMH Ed 2002.

#### **REFERENCE BOOK:**

1. **Digital Telephony** - John C Bellamy: Wiley India India Pvt. Ltd, 3<sup>rd</sup> Ed, 2008.

**ELECTIVE –4 (GROUP D)**  
**DISTRIBUTED SYSTEM**

Subject Code	: 10EC831	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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**UNIT - 1**

**CHARACTERIZATION OF DISTRIBUTED SYSTEMS:** Introduction, Examples of distributed systems, Resource sharing and the web, Challenges.

**7 Hrs**

**UNIT - 2**

**SYSTEM MODELS:** Introduction, Architectural models, Fundamental mode.

**6 Hrs**

**UNIT - 3**

**INTERPROCESS COMMUNICATION:** Introduction, The API for the internet protocols, External data representation and marshalling, Client-server communication, Group communication.

**7 Hrs**

**UNIT - 4**

**DISTRIBUTED OBJECTS AND REMOTE INVOCATION:** Introduction, Communication between distributed objects, Remote procedure call, Events and notifications.

**6 Hrs**

**UNIT - 5**

**SECURITY:** Introduction, Overview of security technique cryptographic algorithms, Digital signature, Cryptography pragmatics.

**7 Hrs**

**UNIT - 6**

**TIME & GLOBAL STATES:** Introduction, Clocks, Events, Process states, Synchronizing physical clocks, Global states, Distributed debugging.

**7 Hrs**

**UNIT - 7**

**COORDINATION AND AGREEMENT:** Distributed mutual exclusion, Elections, Multicast communication.

**6 Hrs**

**UNIT - 8**

**CORBA CASE STUDY:** Introduction, CORBA RMI, CORBA Services.

**6 Hrs**

**TEXT BOOK:**

5. **“Distributed Systems, Concepts & Design”**, George Coulouris, Jeam Dollimore, Tim Kindberg, fourth edition, 2006. Pearson education.

**REFERENCE BOOK:**

7. **“Distributed System Architecture, a Middleware Approach”** Arno puder, Kay Romer, Frank Pilhofer, Morgan Kaufmann publishers.

**NETWORK SECURITY**

Subject Code	: <b>10EC832</b>	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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**UNIT - 1**

Services, mechanisms and attacks, The OSI security architecture, A model for network security.

**6 Hrs**

**UNIT - 2**

**SYMMETRIC CIPHERS:** Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Simplified DES, Data encryption standard (DES), The strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of Operation, Evaluation Criteria for Advanced Encryption Standard, The AES Cipher.

**7 Hrs**

**UNIT - 3**

Principles of Public-Key Cryptasystems, The RSA algorithm, Key Management, Diffie - Hellman Key Exchange, Elliptic Curve Arithmetic, Authentication functions, Hash Functions. **6 Hrs**

**UNIT - 4**

Digital signatures, Authentication Protocols, Digital Signature Standard. **7 Hrs**

**UNIT - 5**

Web Security Consideration, Security socket layer (SSL) and Transport layer security, Secure Electronic Transaction. **6 Hrs**

**UNIT - 6**

Intruders, Intrusion Detection, Password Management. **6 Hrs**

**UNIT - 7**

**MALICIOUS SOFTWARE:** Viruses and Related Threats, Virus Countermeasures. **7 Hrs**

**UNIT - 8**

Firewalls Design Principles, Trusted Systems. **6 Hrs**

**TEXT BOOK:**

1. **Cryptography and Network Security**, William Stalling, Pearson Education, 2003.

**REFERENCE BOOKS:**

1. **Cryptography and Network Security**, Behrouz A. Forouzan, TMH, 2007.
2. **Cryptography and Network Security**, Atul Kahate, TMH, 2003.

## **OPTICAL NETWORKS**

Subject Code	: <b>10EC833</b>	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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### **UNIT - 1**

**INTRODUCTION TO OPTICAL NETWORKS:** Telecommunication networks, First generation optical networks, Multiplexing techniques, Second generation optical networks, System and network evolution. Non linear effects SPM, CPM, four wave mixing, Solitons. **7 Hrs**

### **UNIT - 2**

**COMPONENTS:** Couplers, isolators and Circulators, Multiplexes and filters Optical amplifiers. **6 Hrs**

### **UNIT - 3**

Transmitters, detectors, Switches, Wavelength converters. **6 Hrs**

### **UNIT - 4**

**TRANSMISSION SYSTEM ENGINEERING:** System model, Power penalty, Transmitter, receiver, optical amplifiers, Crosstalk, Dispersion, Overall design Consideration. **7 Hrs**

### **UNIT - 5**

**FIRST GENERATION NETWORKS:** SONET/SDH, Computer interconnects, Mans, Layered architecture for SONET and second generation networks. **6 Hrs**

### **UNIT - 6**

**WAVELENGTH ROUTING NETWORKS:** Optical layer, Node design, Network design and operation, routing and wavelength assignment architectural variations. **6 Hrs**



#### **UNIT - 7**

**VIRTUAL TOPOLOGY DESIGN:** Virtual topology design problem, Combines SONET/WDM network design, an ILP formulation, Regular virtual topologies, Control and management, Network management configuration management, Performance management, fault management.

**7 Hrs**

#### **UNIT - 8**

**ACCESS NETWORKS:** Network architecture overview, present and future access networks, HFC, FTTC, Optical access networks Deployment considerations, Photonic packet switching, OTDM, Multiplexing and demultiplexing Synchronisation.

**7 Hrs**

#### **TEXT BOOK:**

3. **Optical networks: A practical perspective** Kumar Sivarajan and Rajiv Ramaswamy: Morgan Kauffman 1998.

#### **REFERENCE BOOKS:**

14. **Optical Communication Networks:** Biswajit Mukherjee: TMG 1998.
15. **Optical Networks,** Ulysees Black: Pearson education 2007.

### **HIGH PERFORMANCE COMPUTER NETWORKS**

Subject Code	: 10EC834	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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#### **UNIT - 1**

History of Communication Networks, Networking principles, Future networks Internet, Pure TAM Network, Cable Network, Wireless.

**6 Hrs**

#### **UNIT - 2**

**NETWORK SERVICES AND LAYERED ARCHITECTURE:** Applications, Traffic characterization and quality of services, Network

services, High performance networks, Network Elements., Layered applications, Open data network model, Network architectures, Network bottlenecks.

**7 Hrs**

### **UNIT - 3**

**INTERNET AND TCP/IP NETWORKS:** Multicast IP, Mobile IP, TCP and UDP, Applications, FTP, SMTP. Internet success and limitations, Performance of TCP/IP Networks, Performance of circuit switched networks.

**7 Hrs**

### **UNIT - 4**

SONET, DWDM, FTH, DSL, Intelligent networks CATV.

**6 Hrs**

### **UNIT - 5**

**ATM:** Main features of ATM, Addressing, signaling and Routing, ATM header structure, ATM AAL, Internetworking with ATM.

**6 Hrs**

### **UNIT - 6**

**WIRELESS NETWORKS:** Link level design, Channel Access, Network design, Wireless networks today, Future networks, ad hoc networks, High speed Digital cellular, Home RF and Bluetooth.

**7 Hrs**

### **UNIT - 7**

Control of networks, Objectives and methods of control, Circuit switched networks, Datagram Networks Network economics, Derived demand for network services, ISPs, subscriber demand model, Empirical model.

**7 Hrs**

### **UNIT - 8**

**OPTICAL NETWORKS:** WDM systems, Optical cross connects, Optical LANs, Optical paths and networks.

**6 Hrs**

### **TEXT BOOK:**

5. **High Performance Communication Networks**, Warland and Varaiya: Morgan Kauffman/ Elsivier 2<sup>nd</sup> Edition 2000.

**REFERENCE BOOKS:**

1. **High-Speed Networks and Internet: Performance and Quality of service**, William Stallings, Pearson Edu., 2001.
2. **Building High-Speed Networks**, Tere Parnell, TMGH, 2000.

**INTERNET ENGINEERING**

Subject Code	: 10EC835	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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**UNIT - 1**

**INTRODUCTION:** Communication model, Communication software, and communication protocol: Representation, Development methods, Protocol engineering process. **NETWORK REFERENCE MODEL:** Layered architecture, Network services and interfaces, protocol functions, OSI model, TCP/IP protocol suite, Application protocols. **7 Hrs**

**UNIT - 2**

**PROTOCOL SPECIFICATION:** Communication service specification, Protocol entity specification, Interface specifications, Interactions, Multimedia protocol specifications, Internet protocol specifications. **6 Hrs**

**UNIT - 3**

**SPECIFICATION AND DESCRIPTION LANGUAGE (SDL):** A protocol specification language: SDL. **6 Hrs**

**UNIT - 4**

Examples of SDL based protocol specifications, Other protocol specification languages. Protocol Verification And Validation, Protocol verification, Verification of a protocol using finite state machines. **7 Hrs**

**UNIT - 5**

Protocol validation, Protocol design errors, and protocol validation approaches, SDL based protocol verification, SDL based protocol validation. **6 Hrs**

**UNIT - 6**

**PROTOCOL CONFORMANCE TESTING:** Conformance testing methodology and framework, Conformance test architectures, Test sequence generation methods, Distribute architecture by local methods, Conformance testing with TTCN, Conformance testing of RIP, Multimedia applications testing, SDL based tools for conformance testing. **7 Hrs**

**UNIT - 7**

**PROTOCOL PERFORMANCE TESTING:** SDL based performance testing of TCP, OSPF, Interoperability testing, SDL based interoperability testing of CSMA/CD and CSMA/CA protocol using bridge, Scalability testing. **7 Hrs**

**UNIT - 8**

**PROTOCOL SYNTHESIS:** Synthesis methods, interactive synthesis algorithms, automatic synthesis algorithm, automatic synthesis of SDL from MSC protocol re synthesis. **6 Hrs**

**TEXT BOOK:**

3. **Communication Protocol Engineering**, P. Venkatarm and S. S. Manvi, PHI, 2004.

**REFERENCES BOOKS:**

1. **The Internet and its Protocols**, Adrian Farrel, Elsevier, 2006.
2. **TCP/IP Protocol Stack**, B A Forouzan, TMH, 2006.

**ELECTIVE –5 (GROUP E)****MULTIMEDIA COMMUNICATIONS**

Subject Code	: <b>10EC841</b>	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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**UNIT - 1**

**MULTIMEDIA COMMUNICATIONS:** Introduction, multimedia information representation, multimedia networks, multimedia applications,

media types, communication modes, network types, multipoint conferencing, network QoS application QoS.

**6 Hrs**

## **UNIT - 2**

**MULTIMEDIA INFORMATION REPRESENTATION:** Introduction, digital principles, text, images, audio, video.

**7 Hrs**

## **UNIT - 3**

**TEXT AND IMAGE COMPRESSION:** Introduction, compression principles, text compression, image compression.

**6 Hrs**

## **UNIT - 4**

**AUDIO AND VIDEO COMPRESSION:** Introduction, audio compression, DPCM, ADPCM, APC, LPC, video compression, video compression principles, H.261, H.263, MPEG, MPEG-1, MPEG-2, and MPEG-4.

**7 Hrs**

## **UNIT - 5**

**MULTIMEDIA INFORMATION NETWORKS:** Introduction, LANs, Ethernet, Token ring, Bridges, FDDI High-speed LANs, LAN protocol.

**6 Hrs**

## **UNIT - 6**

**THE INTERNET:** Introduction, IP Datagrams, Fragmentation, IP Address, ARP and RARP, QoS Support, IPv8.

**7 Hrs**

## **UNIT - 7**

**BROADBAND ATM NETWORKS:** Introduction, Cell format, Switch and Protocol Architecture ATM LANs.

**6 Hrs**

## **UNIT - 8**

**TRANSPORT PROTOCOL:** Introduction, TCP/IP, TCP, UDP, RTP and RTCP.

**7 Hrs**

## **TEXT BOOK:**

1. **Multimedia Communications: Applications, Networks, Protocols and Standards**, Fred Halsall, Pearson Education, Asia, Second Indian reprint 2002.

**REFERENCE BOOKS:**

1. **Multimedia Information Networking**, Nalin K. Sharda, PHI, 2003.
2. **“Multimedia Fundamentals: Vol 1 - Media Coding and Content Processing”**, Ralf Steinmetz, Klara Narstedt, Pearson Education, 2004.
3. **“Multimedia Systems Design”**, Prabhat K. Andleigh, Kiran Thakrar, PHI, 2004.

## REAL TIME OPERATING SYSTEMS

Subject Code	: 10EC842	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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### UNIT 1

**Introduction to Real-Time Embedded Systems:** Brief history of Real Time Systems, A brief history of Embedded Systems. **6 Hrs**

### UNIT 2

**System Resources:** Resource Analysis, Real-Time Service Utility, Scheduling Classes, The Cyclic Executive, Scheduler Concepts, Preemptive Fixed Priority Scheduling Policies, Real-Time OS, Thread Safe Reentrant Functions. **7 Hrs**

### UNIT 3

**Processing:** Preemptive Fixed-Priority Policy, Feasibility, Rate Monotonic least upper bound, Necessary and Sufficient feasibility, Deadline – Monotonic Policy, Dynamic priority policies. **6 Hrs**

### UNIT 4

**I/O Resources:**

Worst-case Execution time, Intermediate I/O, Execution efficiency, I/O Architecture.

**Memory:**

Physical hierarchy, Capacity and allocation, Shared Memory, ECC Memory, Flash filesystems. **7 Hrs**

### UNIT 5

**Multiresource Services:**

Blocking, Deadlock and livelock, Critical sections to protect shared resources, priority inversion.

**Soft Real-Time Services:**

Missed Deadlines, QoS, Alternatives to rate monotonic policy, Mixed hard and soft real-time services. **7 Hrs**

### UNIT 6

**Embedded System Components:**

Firmware components, RTOS system software mechanisms, Software application components.

**Debugging Components:**

Exceptions assert, Checking return codes, Single-step debugging, kernel scheduler traces, Test access ports, Trace ports, Power-On self test and diagnostics, External test equipment, Application-level debugging.

**7 Hrs**

**UNIT 7**

**Performance Tuning:**

Basic concepts of drill-down tuning, hardware – supported profiling and tracing, Building performance monitoring into software, Path length, Efficiency, and Call frequency, Fundamental optimizations.

**6 Hrs**

**UNIT 8**

**High availability and Reliability Design:**

Reliability and Availability, Similarities and differences, Reliability, Reliable software, Available software, Design trade offs, Hierarchical applications for Fail-safe design.

**Design of RTOS – PIC microcontroller. (Chap 13 of book Myke Predko)**

**7 Hrs**

**References:**

1. **“Real-Time Embedded Systems and Components”**, Sam Siewert, Cengage Learning India Edition, 2007.
2. **“Programming and Customizing the PIC microcontroller”**, Myke Predko, 3<sup>rd</sup> Ed, TMH, 2008



## GSM

Subject Code	: <b>10EC843</b>	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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### UNIT - 1

**GSM ARCHITECTURE AND INTERFACES:** Introduction, GSM frequency bands, GSM PLMN, Objectives of a GSM PLMN, GSM PLMN Services, GSM Subsystems, GSM Subsystems entities, GSM interfaces, The radio interface (MS to BSC), A<sub>bits</sub> interface (BTS to BSC), A interface (BSC to MSC), Interfaces between other GSM entities, Mapping of GSM layers onto OSI layers.

**6 Hrs**

### UNIT - 2

**RADIO LINK FEATURES IN GSM SYSTEMS:** Introduction, Radio link measurements, Radio link features of GSM, Dynamic power control, Discontinuous transmission (DTX), SFH, Future techniques to reduce interface in GSM, Channel borrowing, Smart antenna.

**7 Hrs**

### UNIT - 3

**GSM LOGICAL CHANNELS AND FRAME STRUCTURE:** Introduction, GSM logical channels, Allowed logical channel combinations, TCH multi frame for TCH/H, CCH multi frame, GSM frame structure, GSM bursts, Normal burst, Synchronization burst, Frequency correction channel burst, Access burst, Data encryption in GSM, Mobility management, Location registration, Mobile identification.

**7 Hrs**

### UNIT - 4

**SPEECH CODING IN GSM:** Introduction, Speech coding methods, Speech code attributes, Transmission bit rate, Delay, Complexity, Quality, LPAS, ITU-T standards, Bit rate, Waveform coding, Time domain waveform coding, Frequency domain waveform coding, Vocoders, Full-rate vocoder, Half-rate vocoder. **MESSAGES, SERVICES, AND CALL FLOWS IN GSM:** Introduction, GSM PLMN services.

**7 Hrs**

#### **UNIT - 5**

GSM messages, MS-BS interface, BS to MSC messages on the A interface, MSC to VLR and HLR, GSM call setup by an MS, Mobile-Terminated call, Call release, Handover. Data services, Introduction, Data interworking, GSM data services, Interconnection for switched data, Group 3 fax, Packet data on the signaling channel, User-to-user signaling, SMS, GSM GPRS.

**6 Hrs**

#### **UNIT - 6**

**PRIVACY AND SECURITY IN GSM:** Introduction, Wireless security requirements, Privacy of communications, Authentication requirements, System lifetime requirements, Physical requirements, SIM cards, Security algorithms for GSM, Token-based authentication, Token-based registration, Token-based challenge.

**6 Hrs**

#### **UNIT - 7**

**PLANNING AND DESIGN OF A GSM WIRELESS NETWORK:** Introduction, Tele traffic models, Call model, Topology model, Mobility in cellular / PCS networks, Application of a fluid flow model, Planning of a wireless network, Radio design for a cellular / PCS network, Radio link design, Coverage planning, Design of a wireless system, Service requirements, Constraints for hardware implementation, Propagation path loss, System requirements, Spectral efficiency of a wireless system, Receiver sensitivity and link budget, Selection of modulation scheme, Design of TDMA frame, Relationship between delay spread and symbol rate, Design example for a GSM system.

**7 Hrs**

#### **UNIT - 8**

**MANAGEMENT OF GSM NETWORKS:** Introduction, Traditional approaches to NM, TMN, TMN layers, TMN nodes, TMN interface, TMN management services, Management requirements for wireless networks, Management of radio resources, Personal mobility management, Terminal mobility, Service mobility management, Platform-centered management, SNMP, OSI systems management, NM interface and functionality, NMS functionality, OMC functionality, Management of GSM network, TMN applications, GSM information model, GSM containment tree, Future work items.

**7 Hrs**

**TEXT BOOK:**

1. **“Principles of Applications of GSM”**, Vijay K. Garg & Joseph E. Wilkes, Pearson education/ PHI, 1999.

**REFERENCE BOOKS:**

1. **GSM: Evolution towards 3<sup>rd</sup> Generation Systems**, (Editor), Z. Zvonar Peter Jung, Karl Kammerlander Springer; 1<sup>st</sup> edition 1998
2. **GSM & UMTS: The Creation of Global Mobile Communication**, [Friedhelm Hillebrand](#), John Wiley & Sons; 2001.

**ADHOC WIRELESS NETWORKS**

Subject Code	: 10EC844	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

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**UNIT - 1**

**AD HOC NETWORKS:** Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet. **6 Hrs**

**UNIT - 2**

**MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS:** Introduction, Issues in designing a MAC protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad hoc wireless Networks, Classification of MAC protocols. **7 Hrs**

**UNIT - 3**

Contention - based MAC protocols with scheduling mechanism, MAC protocols that use directional antennas, Other MAC protocols. **6 Hrs**

**UNIT - 4**

**ROUTING PROTOCOLS FOR AD HOC WIRELESS NETWORKS:** Introduction, Issues in designing a routing protocol for Ad hoc wireless Networks, Classification of routing protocols, Table drive routing protocol, On-demand routing protocol. **7 Hrs**

**UNIT - 5**

Hybrid routing protocol, Routing protocols with effective flooding mechanisms, Hierarchical routing protocols, Power aware routing protocols.

**6 Hrs**

**UNIT - 6****TRANSPORT LAYER PROTOCOLS FOR AD HOC WIRELESS**

**NETWORKS:** Introduction, Issues in designing a transport layer protocol for Ad hoc wireless Networks, Design goals of a transport layer protocol for Ad hoc wireless Networks.

**7 Hrs**

**UNIT - 7**

**SECURITY:** Security in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning.

**6 Hrs**

**UNIT - 8****QUALITY OF SERVICE IN AD HOC WIRELESS NETWORKS:**

Introduction, Issues and challenges in providing QoS in Ad hoc wireless Networks, Classification of QoS solutions.

**7 Hrs**

**TEXT BOOK:**

3. **“Ad hoc wireless Networks”**, C. Siva Ram Murthy & B. S. Manoj, Pearson Education, 2<sup>nd</sup> Edition, reprint 2005.

**REFERENCE BOOKS:**

1. **“Ad hoc wireless Networks”**, Ozan K. Tonguz and Gianguigi Ferrari, Wiley
2. **“Ad hoc wireless Networking”**, Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du, Kluwer Academic publishers.

## OPTICAL COMPUTING

Subject Code	: 10EC845	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
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### UNIT - 1

#### **MATHEMATICAL AND DIGITAL IMAGE FUNDAMENTALS:**

Introduction, Fourier Transform, discrete Fourier transform, basic diffraction theory, Fourier transform property of lens, sampling and quantization, image enhancement, image restoration.

**7 Hrs**

### UNIT - 2

**LINER OPTICAL PROCESSING:** Introduction, photographic film, spatial filtering using binary filters, holography, inverse filtering, Deblurring.

**6 Hrs**

### UNIT - 3

**ANALOG OPTICAL ARITHMETIC:** Introduction, Halftone processing, nonlinear optical processing, Arithmetic operations.

**6 Hrs**

### UNIT - 4

**RECOGNITION USING ANALOG OPTICAL SYSTEMS:** Introduction, Matched filter, Joint transform correlation, Phase-only filter, Amplitude modulated recognition filters, Generalized correlation filter, Mellin transform based correlation.

**7 Hrs**

### UNIT - 5

**DIGITAL OPTICAL COMPUTING DEVICES:** Introduction, Nonlinear devices, Integrated optics, Threshold devices, Spatial high modulators, Theta modulation devices.

**6 Hrs**

### UNIT - 6

**SHADOW-CASTING AND SYMBOLIC SUBSTITUTION:** Introduction, Shadow casting system and design algorithm, POSC logic operations, POSC multiprocessor, Parallel ALU using POSC, Sequential ALU using POSC, POSC image processing, Symbolic substitutions, Optical implementation of symbolic substitution, Limitations and challenges.

**7 Hrs**

**UNIT - 7**

**OPTICAL MATRIX PROCESSING:** Introduction, Multiplication, Multiplication using convolution, Matrix operations, Cellular logic architecture, Programmable logic array. **6 Hrs**

**UNIT - 8**

**ARTIFICIAL INTELLIGENT COMPUTATIONS:** Introduction, Neural networks, Associative memory, Optical implementations, Interconnections, Artificial Intelligence. **7 Hrs**

**TEXT BOOK:**

2. **“Optical Computing An Introduction”**, Mohammed A. Karim, John Wiley & Sons, 1992.

**REFERENCE BOOKS:**

1. **Optical Signal Processing** by Vanderlugt John willy & sons NY 1992.
2. **Signal Processing in Optics** - Bradly G Boore Oxford University Press 1998.