

**SEMESTER
VI**

CODE NO	COURSE TITLE	L	T	P	C
THEORY					
EC9351	<u>Medical Electronics</u>	3	0	0	3
EC9352	<u>Wireless Communication</u>	3	0	0	3
EC9353	<u>Communication Networks</u>	3	0	0	3
EC9354	<u>Antenna and Wave Propagation</u>	3	0	0	3
EC9355	<u>Digital VLSI</u>	3	0	0	3
	Elective I	3	0	0	3
PRACTICAL					
EC9356	<u>Electronic System Design Lab</u>	0	0	3	2
EC9357	<u>Medical Electronics Lab</u>	0	0	3	2
EC9358	<u>Networking Lab</u>	0	0	3	2
	TOTAL	18	0	9	24

**ELECTIVE LIST FOR B.E. ELECTRONICS AND
COMMUNICATION ENGINEERING**

**SEMESTER
VI**

CODE NO	COURSE TITLE	L	T	P	C
EC9032	<u>Digital Switching and Transmission</u>	3	0	0	3
EC9033	<u>Telecommunication System modeling and simulation</u>	3	0	0	3
EC9034	<u>Multimedia Compression and Communication</u>	3	0	0	3
EC9039	<u>Digital Control Engineering</u>	3	0	0	3
EC9041	<u>Speech Processing</u>	3	0	0	3
EC9077	<u>Operating Systems</u>	3	0	0	3
EC9078	<u>Embedded and Real-time Systems</u>	3	0	0	3
EC9080	<u>Advanced Microprocessors</u>	3	0	0	3

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EC9351

MEDICAL ELECTRONICS

**L T P C
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UNIT I ELECTRO-PHYSIOLOGY AND BIOPOTENTIAL RECORDING 9

The origin of Biopotentials; biopotential electrodes; biological amplifiers; ECG, EEG, EMG, PCG, EOG – lead systems and recording methods, typical waveforms and signal characteristics.

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENTS 9

pH, pO₂, pCO₂, pHCO₃, Electrophoresis, colorimeter, photometer, Auto analyzer,

Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters, differential count.

UNIT III ASSIST DEVICES 9

Cardiac pacemakers, DC Debrillators, Dialyser, Heart-Lung machine, Hearing aids.

UNIT IV PHYSICAL MEDICINE AND BIO-TELEMETRY 9

Diathermies – Short-wave, ultrasonic and microwave type and their applications, medical stimulator, Telemetry principles, frequency selection, Bio-telemetry, radio-pill and tele-stimulation, electrical safety.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Thermograph, endoscopy unit, Laser in medicine, Surgical diathermy, cryogenic application, introduction to telemedicine.

TOTAL: 45 PERIODS

TEXT BOOKS

1. John G.Webster, "Medical Instrumentation Application and Design", John Wiley and Sons, (Asia) Pvt.Ltd., 2004.
2. Lesile Cromwell, "Biomedical instrumentation and measurement", Prentice Hall of India, New Delhi, 2007.

REFERENCES

1. Khandpur, R.S. "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, Second edition, 2003.
2. Joseph.J, Carr and John M.Brown, "Introduction to Biomedical equipment technology", Pearson Education Inc.2004.

EC9352

WIRELESS COMMUNICATION

L T P C
3 0 0 3

UNIT I WIRELESS CHANNELS 9

Large scale path loss – Path loss models -Link Budget design – small scale fading- Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading – Parameters of mobile multipath channels – Time dispersion parameters-coherence bandwidth – Doppler spread & Coherence time.

UNIT II CELLULAR ARCHITECTURE 9

Evolution of Mobile Communication- trends in Cellular radio and personal communications- Cellular concept-Frequency reuse - channel assignment- hand off-interference & system capacity- trunking & grade of service.

UNIT III DIGITAL SIGNALING FOR FADING CHANNELS 9

Structure of a wireless communication link, Modulation and demodulation – Quadrature Phase Shift Keying, $\pi/4$ -Differential Quadrature Phase Shift Keying, Offset-Quadrature Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Power spectrum and Error performance in fading channels, OFDM principle – Transceiver implementation, Cyclic prefix, PAPR, Intercarrier interference.

UNIT IV MULTIPATH MITIGATION TECHNIQUES 9

Diversity – Micro- and Macrodiversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver, MIMO systems – Spatial Multiplexing, System Model, Channel state information, Capacity in fading and non-fading channels.

UNIT V WIRELESS STANDARDS 9

Principles of Spread Spectrum Techniques, FDMA, TDMA & CDMA -Capacity Calculations – GSM & GPRS, CDMA in IS-95 / CDMA 2000, Wi-Fi, WiMax.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Andreas.F. Molisch, "Wireless Communications", John Wiley – India, 2006.
2. Rappaport,T.S., "Wireless communications", Pearson Education, 2003.

REFERENCES

1. David Tse and Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005.
2. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd., 2001.
3. Simon Haykins & Michael Moher, "Modern Wireless Communications", Pearson Education, 2007.
4. Vijay. K. Garg, "Wireless Communication and Networking", Morgan Kaufmann Publishers, 2007.
5. Blake,R., Wireless Communication Technology, Thomson Delmar, 2003.
6. Lee,W.C.Y., Mobile Communication Engineering, McGraw Hill, 1998.
7. Van Nee, R. and Ramji Prasad, OFDM for wireless multimedia communications, Artech House, 2000.

EC9353

COMMUNICATION NETWORKS

L T P C
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UNIT I NETWORK FUNDAMENTALS AND PHYSICAL LAYER 9
Introduction to Networks, definition of layers, services, interface and protocols. OSI reference model- layers and duties. TCP/IP reference model – layers and duties. Physical layer- general description, characteristics, signaling media types, topologies, examples physical layer (RS232C, ISDN, ATM,SONET)

UNIT II DATA LINK LAYER AND NETWORK INTERCONNECTION 9
Logical link control Functions:- Framming, Flow control , Error control: CRC, LLC protocols:- HDLC, P to P. Medium access layer:- Random access, Controlled access, Channelization, IEEE standards:- 802.3, 802.4 and 802.5. Internetworking, Interconnection issues, Interconnection devices:- Repeaters, Hubs, Routers/switches and Gateways.

UNIT III MESSAGE ROUTING TECHNOLOGIES 9
Circuit switching, packet switching, message switching. Internet protocols; IPV4, IPV6, ARP, RARP, ICMP, IGMP, VPN. Network Routing Algorithms: - Distance vector routing, OSPF, Dijkstra's , Bellman Ford, Congestion control algorithms.

UNIT IV END-END PROTOCOLS and SECURITY 9
Process-process delivery:- TCP, UDP and SCTP. Application protocols: WWW,HTTP,FTP and TELNET, Network management protocol: SNMP, Network security.

UNIT V DIGITAL SWITCHING 9
Switching functions, Space Division Switch, Time Division Switch, STS switching, TST switching, No 4 ESS Toll switch, digital cross connect systems.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Behrouz.A. Forouzan, Data Communication And Networking, 4th Edition, Tata McGraw Hill, 2007.
2. John C. Bellamy, Digital Telephony, 3rd Edition, John Wiley 2006.

REFERENCES

1. Stallings.W., Data And Computer Communication, 4th Edition, Prentice Hall of India, 1996
2. Tanenbourn, A.S, Computer Networks, 3rd Edition , Prentice Hall Of India, 1996
3. Keshav.S. An Engineering Approach To Computer Networking, Addison – Wesley,1999.
4. J.E.Flood, Telecommunication Switching, Traffic and networks, 1st edition, Pearson Education, 2006

EC9354

ANTENNAS AND WAVE PROPAGATION

L T P C

3 0 0 3

UNIT I FUNDAMENTALS OF RADIATION

9

Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature, Radiation from oscillating dipole, Half wave dipole. Folded dipole, Yagi array.

UNIT II RECTURE AND SLOT ANTENNAS

9

Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna , Reflector antenna , Aperture blockage , Feeding structures , Slot antennas ,Microstrip antennas – Radiation mechanism – Application ,Numerical tool for antenna analysis

UNIT III ANTENNA ARRAYS

9

N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis- Binomial array

UNIT IV SPECIAL ANTENNAS

9

Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic. Modern antennas- Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements- Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR

UNIT V PROPAGATION OF RADIO WAVES

9

Modes of propagation , Structure of atmosphere , Ground wave propagation, Tropospheric propagation , Duct propagation , Troposcatter propagation , Flat earth and Curved earth concept ,Sky wave propagation – Virtual height ,critical frequency , Maximum usable frequency – Skip distance , Fading , Multi hop propagation.

TOTAL: 45 PERIODS

TEXT BOOKS

1. John D Kraus, " Antennas for all applications", 3 Ed, McGraw Hill, 2005
2. Edward C.Jordan and Keith G.Balmain "Electromagnetic Waves and Radiating Systems" Prentice Hall of India, 2006

REFERENCES

1. Constantine.A.Balanis"Antenna Theory Analysis and Design" Wiley student edition,2006
2. Rajeswari Chatterjee,,"Antenna Theory and Practice"Revised Second edition"New Age international Publishers,2006
3. S.Drabowitch,"Modern Antennas" Second edition,Springer Publications,2007
4. Robert S.Elliott"Antenna theory and Design"Wiley student edition,2006
5. H.Sizun" Radio Wave Propagation for Telecommunication Applications"First Indian Reprint, Springer Publications,2007

EC9355

DIGITAL VLSI

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UNIT I	MOS TRANSISTOR PRINCIPLE	9
NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams		
UNIT II	COMBINATIONAL LOGIC CIRCUITS	9
Examples of Combinational Logic Design, Elmore's constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles		
UNIT III	SEQUENTIAL LOGIC CIRCUITS	9
Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design		
UNIT IV	DESIGNING ARITHMETIC BUILDING BLOCKS	9
Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff		
UNIT V	IMPLEMENTATION STRATEGIES	9
Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.		

TOTAL: 45 PERIODS

TEXT BOOKS

- 1 Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated circuits: A design perspective". Second Edition, Prentice Hall of India, 2003.
- 2 M.J. Smith, "Application specific integrated circuits", Addison Wesley, 1997

REFERENCES

- 1 N.Weste, K.Eshraghian, "Principles of CMOS VLSI DESIGN", second edition, Addison Wesley 1993
- 2 R.Jacob Baker, Harry W.Li., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", 2005 Prentice Hall of India
- 3 A.Pucknell, Kamran Eshraghian, "BASIC VLSI DESIGN", Third edition, Prentice Hall of India, 2007.

EC9356

ELECTRONIC SYSTEM DESIGN LAB

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1. Design of switched mode power supply
2. Design of AC/DC voltage regulator using SCR
3. Design of FM transceiver
4. Design of wireless data modem
5. Design of Audio power amplifier with speaker AGC load with AGC circuit.
6. Design of VCO
7. Design of voltage to frequency converter
8. Delta modulator and demodulator
9. 3.5 Digital Voltmeter
10. Design of PRBS generator clocked by CMOS crystal oscillator
11. Numerical controlled oscillator using VHDL.
12. Huffman encoder and decoder using VHDL.

TOTAL: 45 PERIODS

EC 9357

MEDICAL ELECTRONICS LAB

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1. Bio-Amplifiers
2. Recording of ECG signal and analysis.
3. Recording of audiogram.
4. Recording of EMG.
5. Study and analysis of safety aspects of surgical diathermy.
6. Monitoring of electrical safety of hospital equipments.
7. Measurement of PH, PO₂ and conductivity.
8. Recording of various physiological parameters using patient monitoring system and telemetry units.
9. Bio-signal processing using MATLAB
10. Medical Imaging using MATLAB
11. Study of spectra of bio signals using spectrum analyzer.
12. Study of Magnetic tape recorder

TOTAL: 45 PERIODS

1. Analysis of logical link control layer protocols – Stop & wait, Sliding window
2. Analysis of MAC protocols – ALOHA, SLOTTED ALOHA, CSMA, CSMA/CD, TOKEN BUS, TOKEN RING.
3. Client / Server communication using TCP / UDP Socket programming
4. Data packet scheduling, Congestion control, transmission flow control algorithms
5. Switches / Routers
6. Wi-Fi Physical Layer
7. Wi-Fi MAC Layer
8. Cryptography (Network Security)
9. NS2 based simulation

TOTAL: 45 PERIODS