

SEVENTH SEMESTER

THEORY

S.No	Subject Code	Subject Name	L	T	P	IA	EE	Total
1		Hospital Management	4	0	0	20	80	100
2		Computers in medicine	4	0	0	20	80	100
3		Medical Optics	4	0	0	20	80	100
4		Diagnostic and therapeutic equipments	4	0	0	20	80	100
5		Principles of Environmental Science and Engg.	4	0	0	20	80	100
6		Elective II	4	0	0	20	80	100

PRACTICAL

S.No	Subject Code	Subject Name	L	T	P	IA	EE	Total
7		Hospital Training	0	0	3	20	80	100
8		Diagnostic and therapeutic equipments lab	0	0	3	20	80	100
9		Comprehension						

SEMESTER VII

1 HOSPITAL MANAGEMENT

1. NEED AND SCOPES OF CLINICAL ENGINEERING 9
Clinical engineering program, educational responsibilities, role to be performed by them in hospital, staff structure in hospital
2. NATIONAL HEALTH POLICIES 9
Need for evolving health policy, health organization in state, health financing system, health education, health insurance, health legislation
3. TRAINING AND MANAGEMENT OF TECHNICAL STAFF IN HOSPITAL 9
Difference between hospital and industrial organization, levels of training, steps of training, developing training program, evaluation of training, wages and salary, employee appraisal method.
4. STANDARDS AND CODES IN HEALTH CARE 9
Necessity for standardization, FDA, Joint Commission of Accreditation of hospitals, ICRP and other standard organization, methods to monitor the standards.
5. COMPUTER IN MEDICINE 9
Computer application in ICU, X-Ray department, laboratory administration, patient data, medical records, communication, simulation.

Total Hours: 45

TEXT BOOKS

1. Webster J.C. and Albert M. Cook, "Clinical Engineering Principle and Practice", Prentice Hall Inc., Englewood Cliffs, New Jersey, 1979 (Unit I).
2. Goyal R.C., "Handbook of hospital personal management", Prentice Hall of India, 1996 (Unit II – V).

SEMESTER VII

2. COMPUTERS IN MEDICINE

1. OVERVIEW OF COMPUTER HARDWARE PC-AT 9
8086 architecture, system connections, Instruction set & programming, Microcontrollers, Motherboard and its logic, RS232-C and IEEE bus standards, CRT controllers, FDC, HDC and Post sequence, PC based video card, modems and networking.

2. SYSTEM DESIGN 9
Multichannel computerised ECG, EMG and EEG data acquisition, storage and retrieval, transmission of signal and images.

3. COMPUTERS IN PATIENT MONITORING 9
Physiological monitoring, automated ICU, computerised arrhythmia monitoring, information flow in a clinical lab, computerised concepts, interfacing to HIS.

4. COMPUTERS IN MEDICAL SYSTEMS MODELING 9
Radiotherapy, drug design, drug delivery system, physiological system modelling and simulation.

5. COMPUTERS IN MEDICAL RESEARCH 9
Role of expert systems, pattern recognition techniques in medical image classification, ANN concepts.

Total Hours: 45

TEXT BOOKS

1. R.D. Lele, "Computers in Medicine", Tata McGraw-Hill, New Delhi, 1999.
2. Douglas V. Hall, "Microprocessors and Interfacing : Programming and hardware", McGraw Hill, Singapore, 1999.

SEMESTER VII

3. MEDICAL OPTICS

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| 1. OPTICAL PROPERTIES OF THE TISSUES | 9 |
| Refraction, Scattering, absorption, light transport inside the tissue, tissue properties, Light interaction with tissues, optothermal interaction, fluorescence, speckles. | |
| 2. INSTRUMENTATION IN PHOTONICS | 9 |
| Instrumentation for absorption, scattering and emission measurements, excitation light sources – high pressure arc lamp, solid state LEDs, LASERs, optical filters, polarisers, solid state detectors, time resolved and phase resolved detectors. | |
| 3. APPLICATIONS OF LASERS | 9 |
| Laser in tissue welding, lasers in dermatology, lasers in ophthalmology, otolaryngology, urology. | |
| 4. OPTICAL HOLOGRAPHY | 9 |
| Wavefronts, Interference patterns, principle of hologram, optical hologram, applications. | |
| 5. SPECIAL TECHNIQUES | 9 |
| Near field imaging of biological structures, in vitro clinical diagnostic, fluorescent spectroscopy, photodynamic therapy. | |

Total Hours: 45

TEXT BOOKS

1. Tuan Vo Dirh, "Biomedical photonics – Handbook", CRC Press, Boca Raton, 2003 (Unit I – III, V).
2. Leon Goldman, M.D., & R. James Rockwell, Jr., "Lasers in Medicine", Gordon and Breach, Science Publishers Inc., New York, 1971 (Unit IV).

SEMESTER VII

1. DIAGNOSTIC AND THERAPETIC EQUIPMENTS – II

1. ULTRASONIC TECHNIQUES FOR DIAGNOSIS 9
Basic principles of Echo technique, display techniques A, B, M modes, Echo cardiograms, Echo encephalogram, Ultrasonic applied as diagnostic tool in ophthalmology, obstetrics and gynaecology.
2. PATIENT MONITORING AND BIOTELEMETRY 9
Patient monitoring system – ICU, post operative, ICCU, single channel telemetry, multichannel telemetry, frequency allotment, radiopill. Transmission of Biosignals over telephone lines.
3. DIATHERMY 9
Clinical applications of electrotherapy, short wave diathermy, ultrasonic diathermy, microwave diathermy, surgical diathermy unit, IR lamps, UV lamps.
4. SPECIAL DIAGNOSTIC TECHNIQUES 9
Principles of Cryogenic technique and application, Endoscopy, Laproscopy, Thermography.
5. PATIENT SAFETY 9
Sources of leakage current, Micro and Macro shock, monitoring circuits, earthing schemes.

Total Hours: 45

TEXT BOOKS

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 1997.

REFERENCES

1. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 1998.
2. Joseph J. Carr and John M. Brown, "Introduction to Biomedical equipment technology", John Wiley and sons, New York, 1997.

SEMESTER VII

5. PRINCIPLES OF ENVIRONMENTAL SCIENCE AND ENGINEERING

1. COMPONENTS OF ENVIRONMENT

9

Components – Water, air and land – Inter-relationship between components – Subcomponents; Ecosystem – Structure and functional components of ecosystem – Development and evolution of ecosystem – Energy flow and material cycling in ecosystem – Natural and man made impacts on water, air and land; Environment and development – Concept of sustainable development.

2. SCIENCE OF ENVIRONMENT

9

Chemistry, Physics and biology of water, air and land; Stress on the Chemistry, Physics and Biology of water, air and land owing to the impacts; Environmental quality objective and goals – Policies on development projects and their impacts, with emphasis on the branch of engineering of the student.

3. CURRENT ENVIRONMENTAL ISSUES

9

Current Environmental issues at Country level – management of municipal sewage, municipal solid waste, Hazardous waste and Bio-medical waste – Air pollution due to industries and vehicles; Global issues – Biodiversity, Climatic change, Ozone layer depletion.

4. ENGINEERING INTERVENTIONS TO REDUCE THE ENVIRONMENTAL STRESSES

9

Minimisation of Stress – Principles of Physics, chemistry and biology in engineering interventions such as waste treatment – Flow sheets of engineering interventions relevant to the Engineering discipline of the student – Waste minimisation techniques – Clean technology options – Standards of performance of the interventions.

5 (A) TOOLS FOR ENVIRONMENTAL MANAGEMENT

9

Environmental impact assessment; Precautionary Principle and Polluter Pays Principle; Constitutional provisions, Legal and economic instruments in Environmental Management; Role of Non-government organisations – Community participation environmental management works; International conventions and protocols; Pollution Control Boards and Pollution Control Acts.

(B) Field Study

In-depth study of environmental issues at least one environmentally sensitive site relevant to the discipline of the student and preparation of a report thereupon.

Total Hours: 45

TEXT BOOKS:

1. G.M.Masters, Introduction to Environmental Engineering & Science, Prentice Hall, New Delhi, 1997
2. J.G. Henry and G. W. Heike, Environmental Science & Engineering”, Prentice Hall International Inc., New Jersey, 1996.

REFERENCES:

1. S. K. Dhameja, Environmental Engineering and Management, S. K. Kataria and Sons, New Delhi, 1999.
2. State of India’s Environment – A Citizen’s Report, Centre for Science and Environment and Others, 1999
3. Shyam Divan and Armin Rosancranz, Environmental Law and Policy in India, Cases, Materials and Statutes, Oxford University Press, 2001.

SEMESTER VII - ELECTIVE

1. ARTIFICIAL INTELLIGENCE AND PATTERN RECOGNITION

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| 1. INTRODUCTION | 9 |
| Definition of AI, Intelligent agents, perception and language processing, problem solving, searching, heuristic searching, game playing, Logics, logical reasoning. | |
| 2. BASIC PROBLEM SOLVING METHODS | 9 |
| Forward Vs Background, knowledge representation, frame problems, heuristic functions, weak methods of matching. | |
| 3. PRINCIPLES OF PATTERN RECOGNITION | 9 |
| Patterns and features, training and learning in pattern recognition, pattern recognition approach, different types of pattern recognition. | |
| 4. DECISION MAKING | 9 |
| Baye’s theorem, multiple features, decision boundaries, estimation of error rates, histogram, kernels, window estimators, nearest neighbour classification, maximum distance pattern classifier, adaptive decision boundaries. | |
| 5. CLUSTER ANALYSIS AND FEATURE EXTRACTION | 9 |
| Unsupervised learning, hierarchical clustering, Graph theories approach to pattern clustering, fuzzy pattern classifier, application of pattern recognition in medicine. | |

Total Hours: 45

TEXT BOOKS

1. Elain Rich and Kevin Knight, “Artificial Intelligence”, 2 nd Edition, Tata McGraw-Hill, 1993.

2. Earl Gose, Richard Johnsonbaugh, Steve Jost, "Pattern Recognition and Image Analysis", Prentice Hall of India Pvt. Ltd., New Delhi, 1999.

SEMESTER VII - ELECTIVE

2. PHYSIOLOGICAL MODELLING

1. INTRODUCTION 9
System concept, system properties, piece-wise linear approximation, electrical analog for compliance, thermal storage, pulse response of first order systems, response of resistant and compliance system.
2. TRANSFER FUNCTIONS 9
Transfer functions and its use, engineering concept in coupled system, example of Transformed signals.
3. IMPEDANCE CONCEPT 9
Circuits for the Transfer function with impedance concept, prediction of performance, periodic signals.
4. FEEDBACK SYSTEMS 9
Characteristics of physiological feedback systems, uses and testing of system stability.
5. SIMULATION OF BIOLOGICAL SYSTEMS 9
Simulation of thermal regulation, pressure and flow control in circulation, oculo motor system, endocrinal system, functioning of receptors.

Total Hours: 45

TEXT BOOK

1. William B.Blessner, "A System approach to Bio-medicine", McGraw-Hill book co., New York, 1969.

REFERENCES

1. Manfredo clynes and john H.Milsum, "Bio-medical engineering system", McGraw -Hill book co., New York, 1970.
2. Douglas S.Regs, "Control theory and physiological feedback mechanism", The William & Williams co., Baltimore, 1970.

SEMESTER VII - ELECTIVE

3. REFRIGERATION AND AIR CONDITIONING

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| 1. REFRIGERATION CYCLES & REFRIGERANTS | 9 |
| Vapour Compression Refrigeration Cycle-Simple saturated vapour compression Refrigeration cycle. Thermodynamic analysis of the above. Refrigerant Classification, Designation, Alternate Refrigerants, Global Warming Potential & Ozone Depleting Potential aspects. | |
| 2. SYSTEM COMPONENTS | 9 |
| Refrigerant Compressors - Reciprocating Open & Hermetic type, Screw Compressors and Scroll Compressors -Construction and Operation characteristics. Evaporators – DX coil, Flooded type Chillers Expansion devices -Automatic Expansion Valves, Capillary Tuber & Thermostatic Expansion Valves. Condensing Units and Cooling Towers. | |
| 3. CYCLING CONTROLS AND SYSTEM BALANCING | 9 |
| Pressure and Temperature controls. Range and Differential settings. Selection and balancing of system components - Graphical method. | |
| 4. PSYCHROMETRY | 9 |
| Moist air behaviour, Psychrometric chart, Different Psychrometric process analysis. | |
| 5. AIR CONDITIONING | 9 |
| Summer and Winter Airconditioning, Cooling Load Calculations, Air Distribution Patterns, Dynamic and Frictional Losses in Air Ducts, Equal Friction Method, Fan Characteristics in Duct Systems. | |

Total Hours: 45

TEXT BOOK

1. W.F.Stocker and J.W.Jones, "Refrigeration & Air Conditioning", McGraw-Hill Book Company, 1985.

REFERENCES

1. R.J.Dossat, "Principles of Refrigeration", John Wiley and Sons Inc., 1989.
2. Manohar Prasad, "Refrigeration and Air Conditioning", Wiley Eastern Ltd

SEMESTER VII - ELECTIVE

4. MEDICAL INFORMATICS

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| 1. MEDICAL DATABASE IMPLEMENTATION | 9 |
| Medical data acquisition and database systems; PC based multichannel data acquisition system; storage, analysis and retrieval techniques. | |
| 2. VISUAL BASIC | 9 |
| Visual programming concepts; Visual Basic environment, tools and controls; Dynamic data exchange; VB based Medical information System. | |
| 3. COMPUTERS IN SYSTEM DESIGN | 9 |
| Hospital information System its design and functional characteristics; Principles and applications of Artificial Intelligence, Pattern Recognition, Neural Network and Fuzzy Logic in Medicine. | |
| 4. MULTIMEDIA AND VIRTUAL REALITY APPLIED TO MEDICINE | 9 |
| Basic concepts of Multimedia; Design of Multimedia information systems; Components of virtual reality; Virtual reality applications in medicine. | |
| 5. COMPUTERS IN MEDICAL RESEARCH | 9 |
| Medical Informatics and its levels; Design and development of educational packages on medical sciences; Integrated design concepts; Interactive multimedia, Virtual and digital libraries; Internet and its applications. | |

Total Hours: 45

TEXT BOOK

1. R.D.Lele, "Computers in Medicine", Tata McGraw-Hill, New Delhi, 1997.

REFERENCES

1. Tay Vaughan, "Multimedia making it work", Tata McGraw-Hill, New Delhi, 1997.
2. Davis Chapman, "Teach Yourself Visual Basic 6 in 21 days", New Delhi, 1997.
3. Harold Sackman, "Biomedical Information Technology", Academic press, New York, 1997.
4. Mary Brth Fecko, "Electronics resources: Access and Issues", Bowker and saur, London, 1997.

SEMESTER VII

7. HOSPITAL TRAINING

8. DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS LAB

- 1) Study of ultrasonic transducers and displays.
- 2) Study of pacemaker.
- 3) Multichannel biotelemetry.
- 4) Shortwave and ultrasonic diathermy.
- 5) Multichannel data acquisition system.
- 6) Simulation of biosignals.
- 7) Analysis of ECG signals.
- 8) Analysis of EEG signals.
- 9) Leakage current and electrical safety measurements.
- 10) Mini Project.

Total Hours: 45

9. COMPREHENSION

Total Hours: 45