UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025

REGULATIONS - 2009

CURRICULUM I TO IV SEMESTERS (FULL TIME)

M.E. BIOMEDICAL ENGINEERING

SEMESTER I

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	MA9109	Applied Mathematics for Electronics Engineers	3	1	0	4
2.	BM9111	Diagnostic & Therapeutic Equipments	3	0	0	3
3.	BM9112	Biomedical Sensors & Instrumentation	3	0	0	3
4.	MX9111	Anatomy and Physiology	3	0	0	3
5.	BM9113	Medical Imaging Systems	3	0	0	3
6.	E1	Elective I	3	0	0	3
PRACTICAL						
7.	BM9115	Clinical Instrumentation Lab	0	0	4	2
		TOTAL	**18**	**0**	**4**	**21**

SEMESTER II

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	MX9166	Bio Mechanics	3	0	0	3
2.	MX9157	Rehabilitation Engineering	3	0	0	3
3.	E2	Elective II	3	0	0	3
4.	E3	Elective III	3	0	0	3
5.	E4	Elective IV	3	0	0	3
6.	E5	Elective V	3	0	0	3
PRACTICAL						
7.	BM9125	Hospital Information System Lab	0	0	4	2
		TOTAL	**18**	**0**	**4**	**20**

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	E6	Elective VI	3	0	0	3
2.	E7	Elective VII	3	0	0	3
3.	E8	Elective VIII	3	0	0	3
PRACTICAL						
4.	BM9134	Project Work (phase I) Summer Training Prerequisite	0	0	12	6
		TOTAL	**9**	**0**	**12**	**15**

SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1.	BM9141	Project Work (Phase II)	0	0	24	12
		TOTAL	**0**	**0**	**24**	**12**

UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025

REGULATIONS - 2009

CURRICULUM I TO VI SEMESTERS (PART TIME)

M.E. BIOMEDICAL ENGINEERING

SEMESTER I

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	MA9109	Applied Mathematics for Electronics Engineers	3	1	0	4
2.	BM9112	Biomedical Sensors & Instrumentation	3	0	0	3
3.	MX9111	Anatomy and Physiology	3	0	0	3
		TOTAL	**9**	**1**	**0**	**10**

SEMESTER II

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	MX9166	Bio Mechanics	3	0	0	3
2.	MX9157	Rehabilitation Engineering	3	0	0	3
3.	E1	Elective I	3	0	0	3
		TOTAL	**9**	**0**	**0**	**9**

SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	BM9111	Diagnostic & Therapeutic Equipments	3	0	0	3
2.	BM9113	Medical Imaging Systems	3	0	0	3
3.	E2	Elective II	3	0	0	3
PRACTICAL						
4.	BM9115	Clinical Instrumentation Lab	0	0	4	2
		TOTAL	**9**	**0**	**4**	**11**

SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	E3	Elective III	3	0	0	3
2.	E4	Elective IV	3	0	0	3
3.	E5	Elective V	3	0	0	3
PRACTICAL						
4.	BM9125	Hospital Information System Lab	0	0	4	2
		TOTAL	**9**	**0**	**4**	**11**

SEMESTER V

3

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	E6	Elective VI	3	0	0	3
2.	E7	Elective VII	3	0	0	3
3.	E8	Elective VIII	3	0	0	3
PRACTICAL						
4.	BM9134	Project Work (phase I)	0	0	12	6
		TOTAL	9	0	12	15

SEMESTER VI

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1.	BM9141	Project Work (Phase II)	0	0	24	12
		TOTAL	0	0	24	12

ELECTIVES LIST

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
1	BM9151	Health Informatics	3	0	0	3
2	BM9152	Physics in Medicine	3	0	0	3
3	BM9153	Bio materials	3	0	0	3
4	MX9158	Physiological Modeling	3	0	0	3
5	BM9154	Bio Statistics	3	0	0	3
6	BM9155	Quality assurance & safety in Hospitals	3	0	0	3
7	BM9156	Hospital Planning, Organization & Management	3	0	0	3
8	BM9157	Human Resource Management in Hospital	3	0	0	3
9	BM9158	Finance Management in Hospital	3	0	0	3
10	BM9159	Hospital Waste Management	3	0	0	3
11	MX9161	Bio MEMS	3	0	0	3
12	MX9160	Tissue Engineering	3	0	0	3
13	BM9160	Health Policy and Equipment Management	3	0	0	3
14	MX9164	Tele Health technology	3	0	0	3

15	MX9155	Advanced Neural computing.	3	0	0	3
16	MX9162	Principles of Genetic Analysis	3	0	0	3
17	MX9154	Computer based medical Instrumentation	3	0	0	3
19	BM9162	Signal processing & Image processing techniques applied to biological systems	3	0	0	3
21		Special Elective	3	0	0	3

MA9109   **APPLIED MATHEMATICS FOR ELECTRONICS ENGINEERS**

                                                                    L T P C
                                                                    3 1 0 4
UNIT I   FUZZY LOGIC   9
Classical logic – Multivalued logics – Fuzzy propositions – Fuzzy quantifiers.

UNIT II   MATRIX THEORY   9
Some important matrix factorizations – The Cholesky decomposition – QR factorization – Least squares method – Singular value decomposition - Toeplitz matrices and some applications.

UNIT III   ONE DIMENSIONAL RANDOM VARIABLES   9
Random variables - Probability function – moments – moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a Random Variable.

UNIT IV   DYNAMIC PROGRAMMING   9
Dynamic programming – Principle of optimality – Forward and backward recursion – Applications of dynamic programming – Problem of dimensionality.

UNIT V   QUEUEING MODELS   9
Poisson Process – Markovian queues – Single and Multi-server Models – Little's formula - Machine Interference Model – Steady State analysis – Self Service queue.

                              L = 45: T=15; TOTAL: 45 PERIODS

REFERENCES

1. George J. Klir and Yuan, B., Fuzzy sets and fuzzy logic, Theory and applications, Prentice Hall of India Pvt. Ltd., 1997.
2. Moon, T.K., Sterling, W.C., Mathematical methods and algorithms for signal processing, Pearson Education, 2000.
3. Richard Johnson, Miller & Freund's Probability and Statistics for Engineers, 7th Edition, Prentice – Hall of India, Private Ltd., New Delhi (2007).
4. Taha, H.A., Operations Research, An introduction, 7th edition, Pearson education editions, Asia, New Delhi, 2002.
5. Donald Gross and Carl M. Harris, Fundamentals of Queuing theory, 2nd edition, John Wiley and Sons, New York (1985).

BM9111   DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS

L T P C

3 0 0 3

UNIT I   BIO POTENTIAL RECORDING   9
ECG, EEG, EMG, PCG, EOG, lead system and recording methods, typical waveform, frequency spectrum, abnormal waveforms. Evoked response.

UNIT II   CARDIAC CARE UNITS   9
Pace makers - different types, batteries for pace makers. DC defibrillators, asynchronous and synchronous types, patient monitoring system, principles of bio telemetry.

UNIT III   DIATHERMY AND STIMULATOR   9
Physiological effects of HF radiation, Depth of Penetration, short wave, Ultrasonic and microwave diathermy, Surgical diathermy, Galvanic, Faradic Stimulators, Interferential therapy, Leakage current, Micro and macro electric shock, GFI units, Earthing Scheme

UNIT IV   ASSIST DEVICES   9
Heart lung machine-Condition to be satisfied by the H/L System. Different types of Oxygenators, Pumps, Pulsatile and Continuous Types, Monitoring Process. Hemodialyser-Indication and Principle of Hemodialysis, Membrane, Dialyasate, Different types of heamodialisers, Monitoring Systems, Wearable Artificial Kidney, Implanting Type. Respiratory aids- Intermittent positive pressure, Breathing Apparatus Operating Sequence, Electronic IPPB unit with monitoring for all respiratory parameters.

UNIT V   RECENT TRENDS   9
Principles and application of thermography, Detection circuits, Principles of cryogenic Technique and application, principles of Fiber optics cables, Endoscopy, Laparoscopy, principles of Lithotripsy.

L = 45: T=15; Total: 45 PERIODS

REFERENCES:

1. Albert M Cook and Webster J G – Theraputic medical devices Prentice Hall Nee York 1982
2. Heinz Kresse – Handbook of Electro medicine. John Wiely & Sons – Chrchester – 1985
3. Webster J.G Medical Instrumentation application and design – John Wiley and sons New York 3rd edition 1999
4. Jacobson B and Webster J G Medical and Clinical Engineering – Prentice Hall of India New Delhi 1999
5. Leslie Cromwell , Fred J.Weibell and Erich A.Pfeiffer - Biomedical Instrumentation Prentice Hall New Delhi 2000
6. Joseph J Carr and John M Brown – Introduction to Biomedical equipment Technology - Pearson Education 4th edition New Delhi 2001.

7. Khandpur R.S Hand Book of Biomedical Instrumentation – Tata McGraw Hill publication , New Delhi 2nd edition 2003
8. John Denis Enderle, Joseph D. Bronzino, Susan M. Blanchard, 'Introduction to Biomedical Engineering:'Academic Press, 2005 , 2nd Edition ISBN 0122386620, 9780122386626

BM9112   BIOMEDICAL SENSORS AND INSTRUMENTATION
                                                                    L T P C
                                                                    3 0 0 3
UNIT I   TRANSDUCERS   9
Characteristics- Static, Dynamic, Error in the measurements, Classification of transducers - Resistive, Capacitive, Inductive, Photoelectric, piezoelectric and mechanoelectronics.

UNIT II   ELECTRODES & AMPLIFIERS   9
Half cell potential, Reference electrodes, polarization effects, Polarisable and nonpolarisable electrodes, Micro electrodes, Equivalent Circuits, Signal Conditioning circuits- Characteristics of Amplifiers , Differential Amplifiers, Filters, Bridge circuits, A/D Converters.

UNIT III   CHEMICAL AND OPTICAL TRANSDUCERS   9
PH, PO2, PCO2, HCO3 electrodes, Ion sensor, Anion and Cation sensor, Liquid and solid ion exchange membrane electrode, Enzyme electrode, Principle of fiber optic cable, fiber optic sensors, Photo acoustic sensors, PPG sensors.

UNIT IV   NON ELECTRICAL PARAMETERS MEASUREMENTS   9
Measurements of Respiration Rate, Temperature, Pulse rate, Blood pressure Measurements- Direct, Indirect, Blood flow Measurements – Invitro, Invivo, Gas flow measurements.

UNIT V   RECORDERS AND DISPLAY   9
Type of recorders, Ink jet, heated stylus, Photographic recorder, Multicolor dot scanners, CRO, storage type, long persistence, digital scope, magnetic tape recorders.

                                                        TOTAL: 45 PERIODS

REFERENCES:

  1. Rangan C.S., Sarma G.R., and Mani V.S.V., Instrumentation devices and system, Tata Mc Graw hill Publishing Company limited, New Delhi, 1983.

  2. John G.Webster, Medical Instrumentation, Application and Design, Third Edition, John willey and sons,1999

  3. Jacob Kline., Handbook of Bio Medical Engineering, Academic press Inc., Sandiego, 1988.

  4. J.B.Gupta, A course in electronic and electrical measurement and instrumentation, S.K.Kataria & Sons, 1999.

  5. Tatsuo Togawa, Toshiyo Tamura, P.Ake Oberg, Biomedical Transducers and Instruments, CRC Press, New York, 1997.

MX9111   ANATOMY AND PHYSIOLOGY

L T P C
3 0 0 3

UNIT I   CELL PHYSIOLOGY   9
Cell structure, Cell membrane Transport, Resting membrane potential and ionic basis of potentials, Recording of Action potentials, patch clamp, Action potential in nerve, Muscle and Heart.

UNIT II   GASTROINTESTINAL AND RESPIRATORY SYSTEM   9
Structure of gastrointestinal system, layers in Gastro-intestinal System (deglutition, Peristalsis) movement in stomach, small intestine and movements in GI tract and factors regulating the movement. Respiratory pathway, volumes capacities and measurement, respiratory centers and its regulation of respiration, Artificial Respiration.

UNIT III   ENDOCRINE AND NEURAL REFLEXES   9
Mention of Endocrine glands general hormonal action, Second messengers, anterior and posterior pituitary hormones. Components in a Simple reflex. Structure of kidney and micturition reflex, Cystometerogram.

UNIT IV   CARDIOVASCULAR AND SPECIAL SENSES   9

Structure of Heart, conducting pathway and ECG, What is BP and its measurements. Structure of Eye and Ear, errors of refraction, photochemistry of vision and visual pathway, Middle Ear mechanics, organ of Corti and Auditory pathway, Audiometers.

UNIT V   NERVOUS SYSTEM   9
Neuron, properties of Synapse, Cross section of spinal cord, ascending and descending tracts, EEG, Automatic nervous system, body temperature regulation. Cortical functions.

L = 45 TOTAL: 45 PERIODS

REFERENCES

1. Guyton 'Text book of Medical Physiology – WB jaunder company Philadelphia - 10 edition 2002
2. Cyrul A Keele and Eric Neil – Samsons Wrights Applied physiology – Oxford University press New Delhi – 1991
3. Ranganathan T S,Text Book of human Anatomy S. Chand and company New Delhi – 1994
4. Best and Taylor, The livery Body – BC publication New Delhi 1980

BM9113   MEDICAL IMAGING SYSTEMS

L T P C
3 0 0 3

UNIT I   PRINCIPLES OF RADIOGRAPHIC EQUIPMENTS   8

X-Ray tubes, cooling systems, removal of scatters, construction of image Intensifier tubes, angiographic setup, digital radiology.

UNIT II   COMPUTER AIDED TOMOGRAPHY   10

Need for sectional images, Principles of sectional scanning, Method of convolution and Back-Propagation, Methods of reconstruction, Artifacts, Principle of 3D imaging

UNIT III   RADIO ISOTOPIC IMAGING   9

Radiation detectors, Radio isotopic imaging equipments, scanners, Principle of semiconductor detectors, Gamma ray camera, Positron Emission tomography. SPECT.

UNIT IV   ULTRASONIC SYSTEMS   9

Wave propagation and interaction in Biological tissues, Acoustic radiation, continuous and pulsed excitation, Transducers and imaging systems, Scanning methods, Principle of image generation.

UNIT V   MAGNETIC RESONANCE IMAGING   9

Principles of MRI, Relaxation processes and their measurements, Pulse sequencing and MR image acquisition.

TOTAL:45 PERIODS

REFERENCES

1. D.N.Chesney and M.O.Chesney Radio graphic imaging, CBS Publications, New Delhi, 1987.
2. Peggy, W., Roger D.Ferimarch, MRI for Technologists, Mc Graw Hill, New York, 1995.
3. Steve Webb, The Physics of Medical Imaging, Taylor & Francis, New York.1988.

BM 9115   CLINICAL INSTRUMENTATION LABORATORY

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L T P C
0 0 4 2

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LIST OF EXPERIMENTS

1. Operational Amplifier-various amplifier configurations
2. Study of Timer circuit
3. Study of FSK modulation and demodulation
4. Design and testing of Bio-Amplifiers
5. Recording of Electromyogram.
6. Study of ECG machine.
7. Study of EEG machine
8. Study of Patient monitoring system and biotelemetry
9. Bio-chemical measurements

MX 9166   BIO-MECHANICS

L T P C
3 0 0 3

UNIT I   INTRODUCTION   9
Introduction to bio-mechanics, relation between mechanics and Medicine, Newton's laws, biofluid mechanics, soft tissue mechanics, stress, strain, shear rate, viscosity, visco elasticity, non Newtonian viscosity, mechanical properties of soft biological tissues.

UNIT II   MECHANICS OF CIRCULATION   9
Flow properties of blood, effect of shear rate, hematocrit, temperature and protein Content of blood, rheology of blood and micro vessels, dynamics of circulatory system, turbulence flow around prosthetic heart valves.

UNIT III   MECHANICS APPLIED TO ORTHOPAEDICS   9
Orthopedic biomechanics, mechanical properties of bones, stress induced bone growth, kinematics and kinetics of joints, lubrication of joints, and analysis of force in orthopedic implants.

UNIT IV   MECHANISM OF BIOLOGICAL SYSTEMS   9
Skeletal muscles servo mechanism, Cardio vascular control mechanism, respiratory control mechanism

UNIT V   BIO MECHANICAL ASPECT OF ACCIDENT INVESTIGATION   9
Experimental and Analytical method of analysis, Clinical evaluation, Head Injury tolerance, rotational injury, spine injury – Accident reconstruction, Analysis of impact, skid analysis – Damage analysis.

TOTAL:45 PERIODS

REFERENCES
1. Y.C.Fung, Biomechanics: Mechanical properties in living tissues, Springer Verlag, New York 1981.
2. D.Dawson and Right, Introduction to Bio-mechanics of joints and joint replacement, Mechanical Engineering publications Ltd. 1989.
3. Jacob clime, Head book of Bio Medical Engineering, Academic Press in, Sandiego, 1988.
4. Susan J.Hall, Basics Bio Mechanics 4th Edition, McGraw-Hill Publishing Co, 2002.

MX 9157   **REHABILITATION ENGINEERING**

L T P C
3 0 0 3

UNIT I   PROSTHETIC AND ORTHOTIC DEVICES   9

Hand and arm replacement, different types of models for externally powered limb prosthetics, feedback in orthotic system, material for prosthetic and orthotic devices, mobility aids.

UNIT II   AUDITORY AND SPEECH ASSIST DEVICES   9

Types of deafness, hearing aids, application of DSP in hearing aids, vestibular implants, Voice synthesizer, speech trainer.

UNIT III   VISUAL AIDS   9

Ultra sonic and laser canes, Intra ocular lens, Braille Reader, Tactile devices for visually challenged, Text voice converter, screen readers.

UNIT IV   MEDICAL STIMULATOR   9

Muscle and nerve stimulator, Location for Stimulation, Functional Electrical Stimulation, Sensory Assist Devices

UNIT V   REHABILITATION MEDICINE AND ADVOCACY   9

Physiological aspects of Function recovery, Psychological aspects of Rehabilitation therapy, Legal aspect available in choosing the device and provision available in education, job and in day-to-day life.

TOTAL:45 PERIODS

REFERENCES

1. Levine.S.N.Editor, Advances in Bio Medical Engineering and Medical Physics, Inter University Publication, New York 1968.
2. Albert M.Cook and Webster J.G, Therapeutic Medical devices, Prentice Hall Inc., NewJersy, 1982.
3. Reswick.J, What is Rehabilitation Engineering, Annual review of Rehabilitation-volume2, Springer-Verlag, New York 1982.

BM 9125   **HOSPITAL INFORMATION SYSTEM LABORATORY**

L T P C
0 0 4 2

LIST OF EXPERIMENTS

1.   Java Script programming
2.   HTML, XHTML, XML programming
3.   Macromedia / Web design
4.   SQL based design of tables, databases and queries
5.   Java programming
6.   Applets and Servelets
7.   Design of Hospital Information System
8.   Study of Image processing technique using MatLab
   a. Histogram
   b. Segmentation
   c. Edge Detection
   d. Classification
   e. Enhancement
   f. Restoration

BM 9151   **HEALTH INFORMATICS**

L T P C
3 0 0 3

UNIT I   HEALTH INFORMATICS   9
Historical highlights and Evolution, Hospital Information System – its characteristics and functional online and offline modules, e – health services, Medical Standards – HL7 – DICOM – PACS, Medical data formats – Bioethics.

UNIT II   MEDICAL INFORMATICS   9
Definitions and its six levels of interfacing, Electronic Patient Records - Biometrics, Telemedicine – Technologies and applications, Evidence Based Medicine, Virtual Reality and Multimedia applications in Medicine – Virtual Hospital

UNIT III   BIOMETRICS   9
Definitions and the need, Characteristic scattering of Biometrics, Databases, Bio-information technologies, Semantic web and Bioinformatics, Genome projects, Clinical informatics, Nursing informatics, Public health informatics,   Education and Training

UNIT IV   JAVA PROGRAMMING   9
Genesis of JAVA, Data types, Operators, Control statements, Classes – Inheritance – packages and interfaces – I/O applets, String handling Applet Classes – AWT and Swing classes - Java applets, Java servelets, Java script programming, Creating events, interactive forms, frames, documents, spread sheets and windows- Client – Server programmming

UNIT V   INTERNET AND WEB   9
Web Design and programming, HTTP protocol, Web browsers Netscape, Internet explorer, Web site and web   page design, HTML,XHTML, XML, CSS, Dynamic HTML, CGI. Data base design and programming, SQL introduction – Queries – Tables – RDBMS, Macromedia Dream Weaver, Web Servers, Databases – SQL, MYSQL, DBI and ADO.NET, Web based Medical Information Systems.

TOTAL: 45 PERIODS

REFERENCES
1. Ramachandra Lele, Computers in Medicine Progress in Medical Informatics, Tata McGraw Hill Publishing Company, New Delhi, 2005
2. Herbert Schildt, The Complete Reference – JAVA, Tata McGraw Hill Publishing Company, New Delhi, 2005
3. Mohan Bansal M S, Medical Informatics, Tata McGraw Hill Publishing Company, New Delhi, 2005
4. Yi-Ping Phoebe, Bioinformatics Technologies, Springer International, New Delhi, 2007.
5. Orpita Bosu, Bioinformatics – Databases, Tools and Algorithms, Oxford University Press, 2007.

6. John P Woodward, Biometrics – The Ultimate Reference, Dreamtech Publishers, New Delhi, 2003
7. Ranjan Parekh, Principles of Multimedia, Tata McGraw Hill Publishing Company, New Delhi, 2006
8. H M Dietel, Internet and World Wide Web, AB Goldberg publishers, New Delhi, 2007

9. Atul Khate, Cryptography and network security, Tata McGraw Hill Publishing Company, New Delhi, 2008
10. Lukas K Baehler, Bioinformatics – Basics, Applications in Biological Sciences and Medicine, Taylor & Francis, London, 2005.
11. Deitel, "Java How to Program", Pearson Education / PHI, 2006.

BM 9152   **PHYSICS IN MEDICINE**

L T P C
3 0 0 3

UNIT I   PRINCIPLES OF NUCLEAR PHYSICS   **9**
Traditional definition of atom, periodic system of elements, mechanical properties of atom, emission of light and its frequencies. Electromagnetic spectra, Natural radioactivity, Decay series, type of radiation and their applications, artificially produced isotopes and its application, accelerator principles; Radio nuclides used in Medicine and technology.

UNIT II   INTERACTION WITH LIVING CELLS   **9**
Target theory, single hit and multi target theory, cellular effects of radiation, DNA damage, depression of Macro molecular synthesis, Chromosomal damage.

UNIT III   SOMATIC EFFECT OF RADIATION   **9**
Radio sensitivity protocol of different tissues in human, LD 50/30 effect of radiation on skin, blood forming organs, lenses of eye, embryo and Endocrinal glands.

UNIT IV   GENETIC EFFECT OF RADIATION   **9**
Threshold of linear dose effect, relationship, factors affecting frequency of radiation induced mutation, Gene controlled hereditary diseases, biological effect of microwave, RF wave and UV radiation. Variation in dielectric constant and specific conductivity of tissues. Penetration and propagation of signals, effects in various vital organs, Protection standards.

UNIT V   LASER PHYSICS AND PHOTOMEDICINE   **9**
Characteristics of laser radiation, Laser speckle, biological effects, laser safety management Synthesis of vitamin D in early and late cutaneous effects, Phototherapy, photo hemotherapy, exposure level, hazards and maximum permissible exposures.

TOTAL ; 45 PERIODS

REFERENCES

1.   Moselly, `Non ionising Radiation' Adam Hilgar Brustol 1988
2.   Branski.s and Cherski.P `Biological effects of microwave' Hutchinson & ROSS Inc. Strondsburg 1980.
3.   Glasser.O.Medical Physics Vol.1,2,3 year Book Publisher Inc Chicago, 1980.

BM 9153   BIO MATERIALS

L T P C
3 0 0 3

UNIT I   INTRODUCTION   7
Surface Chemistry of materials, Tissue Reaction, Wound Kinetics, Bio Comparability.

UNIT II   MATERIALS   12
Metals, Ceramics, treated natural materials.

UNIT III   TESTING OF MATERIALS   8
Testing with Tissue Culture, Testing with Soft Tissues and Testing At non Thrombogenic surface.

UNIT IV   IMPLANTS   12
Cardiac Implants, Orthopedic Implants, Neural and Neuro Muscular Implants, Transcutaneous Implants, Intraocular lenses

UNIT V   STEIRLIZATION OF BIO MATERIALS   6
Various Techniques used for sterilization.

TOTAL: 45 PERIODS

REFERENCES

1. J.H.U.Brown (Ed), Advances in Bio Medical Engineering, Academic Press 1975.

2. Andrew F.Von Racum, Hand Book of Bio Medical Evaluation, Mc-Millan Publishers, 1980.

3. Jacob Cline, Hand Book of Bio Medical Engineering, Academic Press in Sandiego, 1988.

4. Jonathan Black, Biological Performance of Materials- Fundamentals of bio compatibility, 4th Edition, CRC Press 2005.

5. Larry L. Hench and Julian R.Jones, Biomaterials, Artificial organs and Tissue Engineering, 2005.

6. Buddy D.Ratner,Allan S .Hoffman, Frederick J. Schoen, Jack E. Lemons, Biomaterial Science; An Introduction to Materials in Medicine,2nd Edition, Elsevier Academic Press,San Diego,2004.

MX 9158   **PHYSIOLOGICAL MODELING**

L T P C
3 0 0 3

UNIT I   INTRODUCTION   9
System Concept, System Properties, Piece-Wise Linear Approximation, Electrical
Analog for Compliance, Thermal Storage, Mechanical Systems, Step response of a
Resistance/Compliant Systems, Pulse Response of First Order System.

UNIT II   TRANSFER FUNCTION   9
System as an Operator use of Transfer Function, Bio Engineering of a Coupled
System, Example of Transformed Signals and Circuits for the Transfer Function with
Impedance Concept, Prediction of Performance.

UNIT III   PERIODIC SIGNALS   9
Sinusoidal Functions, Sinusoidal Analysis of Instrumentation System, Evaluation of
Transfer Function s from Frequency Response, Relationship between Phase Lag
and Time Delay Transient Response of an Undamped Second Order system,
General Description of Natural Frequency Damping, Physical Significance of Under
Damped Responses.

UNIT IV   FEEDBACK   9
Characterization of Physiological Feedback. Systems, Uses and Testing of System
Stability.

UNIT V   SIMULATION OF BIOLOGICAL SYSTEMS   9
Simulation of Skeletal muscle servomechanism, thermo Regulation, cardiovascular
control System, Respiration controls, Oculo Motor System, Endocrine control system
and Modelling of receptors.

TOTAL : 45 PERIODS

REFERENCES

1. William B. Blesser, A System Approach to Biomedicine, McGraw Hill Book
   Co, New York, 1969.
2. Manfreo Clynes and John H. Milsum, Biomedical Engineering System,
   McGraw Hill and Co, New York, 1970.
3. Douglas S. Rigg, Control Theory and Physiological Feedback Mechanism,
   The William and Wilkins Co, Baltimore, 1970   .
4. Richard Skalak and Shu Chien, Hand Book of Biomedical Engineering,
   McGraw Hill and Co, New York, 1987.
5. Michael C.K. Khoo, "Physiological Control System" - Analysis, Simulation
   and Estimation"- Prentice Hall of India, New Delhi, 2001

BM 9154   BIO-STATISTICS

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L T P C
3 0 0 3

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UNIT I   INTRODUCTION   9
Introduction to probability, likelihood & odds, distribution variability.

UNIT II   STATISTICAL PARAMETERS   6
Statistical parameters p-values, computation and level chi square test and   distribution.

UNIT III   REGRESSION ANALYSIS   6
Regression, correction use of regression, multiple regression.

UNIT IV   INTERPRETING DATA   12
Interpreting life tables clinical trails, epidemical reading and interpreting of epidemical studies, application in community health.

UNIT V   META ANALYSIS   12
META analysis for research activities, purpose and reading of META analysis, kind of data used for META analysis

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TOTAL: 45 PERIODS

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REFERENCE

1.   Joseph A. Ingelfinger, Frederick Mosteller, Lawrence A. Thibodeau, James H. Ware Biostatistics in Clinical Medicine (third edition), Singapore, 1994.

BM 9155   QUALITY ASSURANCE & SAFETY IN HOSPITALS

L T P C
3 0 0 3

UNIT I   STANDARDIZATION OF QUALITY MEDICAL CARE IN HOSPITALS   9
Define Quality- TQM in Health care organization-QA in (Medical Imaging & Nuclear medicine) Diagnostic services – Classification of equipments

UNIT II   REGULATORY REQUIREMENT FOR HEALTH CARE   9
FDA regulations, Accreditation for hospitals - JCI, NABH and other regulatory Codes.

UNIT III   HOSPITAL SAFETY   9
Radiation safety, Safety precautions, hazardous effects of radiation, allowed levels of radiation, ICRP regulations for radiation safety.

UNIT IV   ELECTRICAL & FIRE SAFETY   9
Sources of shocks, macro & micro shocks, monitoring and interrupting the Operation from leakage current- Elements of fire, causes of fire & fire protection.

UNIT V   ASSESSING QUALITY HEALTH CARE   9
Organisation for quality assessment –Measuring Quality care – Evaluation of hospital services – six sigma way. **Q**uality assurance methods - Quality Assurance in Hospitals Sop's – Patient Orientation for Total Patient Satisfaction. 5S techniques

TOTAL :45 PERIODS

REFERENCES

1.   Cesar A. Cacere & Albert Zana, The Practice of Clinical Engg. Academic press, New Yark, 1977.
2.   Webster J.G and Albert M.Cook, Clinical Engg, Principles & Practices, Prentic Hall Inc., Engle wood Cliffs, New Jersy, 1979.
3.   B.M.Sakharkar, Principles of Hospital administration and Planning, JAYPEE Brothers, Medical Publishers (P) Ltd.
4.   K.Shridhara Bhat, Quality Management, Himalaya Publishing House.

BM 9156   HOSPITAL PLANNING, ORGANIZATION & MANAGEMENT

L T P C
3 0 0 3

UNIT I   FORMS OF ORGANISATION   8
Sole proprietorship, Partnership, Company-public and private sector enterprises, Principles of management, Evolution of management.

UNIT II   PRINCIPLE OF HOSPITAL MANAGEMENT: 10
Importance of management and Hospital, Management control systems. Forecasting techniques decision-making process

UNIT III   STAFFING   6
Staffing pattern in hospitals, Selection, Recruiting process, Training of staff, Organizational structures, Career development

UNIT IV   MARKETING AND MANAGEMENT   10
Basic concepts marketing, Principles of social marketing, Social marketing in health sector, Consumer behavior and research health, Advertising in Health Sector, Relevance of e-marketing of Health care services

UNIT V   COMPUTER AND HOSPITAL   11
System Development life cycle, Reasons to use computers in hospital, main categories of information systems in hospitals

TOTAL :45 PERIODS

REFERENCES

1. Goyal R.C., Human Resource Management in Hospital, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.

2. Nauhria R.N. and Rajnish Prakash, Management & systems, New Delhi Wheeler publishing, 1995.

3. Koontz, Essentials of Management, McGraw Hill, 1995.

BM 9157   HUMAN RESOURCES MANAGEMENT IN HOSPITAL

L T P C
3 0 0 3

UNIT I   PERSPECTIVES OF HUMAN RESOURCE MANAGEMENT   9
Evolution of Human Resource Management - Importance of Human factor, Objectives of Human resource Management - Human Resource Policies - Need for HRD/HRM in Healthcare Organisation - Computer Applications In Human Resource Management.

UNIT II   THE CONCEPT OF BEST FIT EMPLOYEE   9
Organisational Job Design - job description - job analysis - job rotation-job evaluation-Man-power planning- Importance of Human Resource Planning, Forecasting of Human Resource Requirements -Selection procedures - test, Validation, Interviews, Recruitment, Medical Examination.

UNIT III   TRAINING & EXECUTIVE DEVELOPMENT   9
Types of Training methods and their benefits - Executive development Programme - common practices - Benefits, self-development - knowledge Management.

UNIT IV   SUSTAINING EMPLOYEE INTEREST   9
Wage and Salary Administration – concept of incentives and its operational implications – Participative decision making – Concept of Collective Bargaining – Compensation plans – Rewards – Motivation – Theories of motivation - Grievances and redressal methods.

UNIT V   PERFORMANCE APPRAISAL   9
Importance of Performance Appraisal - Methods of Performance Evaluation, - Traditional methods – Modern methods – Feedback – Promotion – Demotion – transfer. Implications of jobs change. The control process, Methods and Requirements of Effective control system.

TOTAL ;45 PERIODS

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REFERENCES
1. R.C.Goyal, Human Resource Management in Hospitals, Prentice Hall of India,2000.
2. Mamoria C.B. and Mamoria S.Personnel Management, Himalaya Publishing Company,1997.
3. Decenzo and Robbins, Human Resource Management, Wiley & Sons, Singapore, 1999.

BM 9158   **FINANCE MANAGEMENT IN HOSPITALS**

                                                                        L T P C
                                                                        3 0 0 3

UNIT I   INTRODUCTION   4
Finance Function – Meaning – Definition - scope of finance function- Executive functions & Incidental functions - Scope and goal of Financial Management in Hospitals – Profit maximization & Wealth maximization.

UNIT II   ACCOUNTING TECHNIQUES   10
Types of Accounting, Hospital accounting - Financial book Keeping, Book keeping obligations. Accounting Concepts & Conventions – Final Accounts :Trading – Profit & Loss Accounts - Balance Sheet.

UNIT III   COSTING AND HOSPITALS   10
Nature & Scope of Cost Accounting – Cost analysis & Classification - Cost Calculation, significance of internal billing in Hospital -Necessary for internal & external controlling cost, cost unit calculation.

UNIT IV   MANAGEMENT ACCOUNTING   11
Budgeting & Budgetary control – Cost – Volume – Profit analysis.

UNIT V   FINANCING DECISIONS   10
Cost of capital & Capital Structure – Sources of Short term finance: Management of Working Capital –Sources of Long term finance: share capital, debentures - corporate debit capacity.

                                                    TOTAL ; 45 PERIODS

REFERENCES

1. James C. Vanhorne, Fundamentals of Financial Management, Prentice Hall of India Pvt. Ltd., New Delhi, 8th Edition, 1993.
2. James C.Vanhorne, Financial Management and Policy, Prentice Hall of India Pvt. Ltd., New Delhi, 9th Edition, 1995.
3. Prasannachandra, Financial Management, Tata McGraw Hill Publishing Co. Ltd., New Delhi, First Revised edition
4. Financial Management IM Pandey Vikas Publishing Co. 1999.

BM 9159   **HOSPITAL WASTE MANAGEMENT**

LT P C
3 0 0 3

UNIT I   INTRODUCTION   9
The Medical Waste Stream, Types of waste - Waste management elements – Categories of Bio-medical waste- Regulatory Requirements.

UNIT II   PRINCIPLES OF STERILIZATION   9
Disease Transmission - Disinfection methods – Sterilization - steam sterilizing (Auto claving) - Microwave (Non-burn treatment technology).

UNIT III   DISPOSAL OF WASTE   9
Disposal methods - Incinerator - Hazardous waste, radioactive waste, liquid waste destruction - landfill.

UNIT IV   CONTROLS APPLIED TO WASTE MANAGEMENT   9
Air pollution and Emission control, Instrumentation and monitoring, Crematories

UNIT IV   ENVIRONMENTAL SAFETY, RISKS & PUBLIC ISSUES.   9
Risk management in hospitals - Environment issues in hospitals - Risk analysis

TOTAL ; 45 PERIODS

REFERENCES

1.   C.R.BRUNNER, Medical Waste Disposable Handbook, Incentrated, Consultant in Corporated, Virginia, 2000.
2.   C.R.BRUNNER, Incentrated Consultant in Corporated Incentration System Hand Book, Virginia.

MX 9161   **BIO MEMS**

L T P C
3 0 0 3

UNIT I   MEMS AND MICROSYSTEMS   9
Working principle of Microsystems, materials for MEMS and Microsystems, micromachining, System modeling and properties of materials

UNIT II   MICROSENSORS AND ACUATORS   9
Mechanical sensors and actuators – beam and cantilever, piezoelectric materials, thermal sensors and actuators- micromachined thermocouple probe, Peltier effect heat pumps, thermal flow sensors, Magnetic sensors and actuators- Magnetic Materials for MEMS, Devices

UNIT III   MICRO OPTO ELECTRO MECHANICAL SYSTEMS   9
Fundamental principle of MOEMS technology, light modulators, beam splitter, microlens, digital micromirror devices, light detectors, optical switch

UNIT IV   MICROFLUIDIC SYSTEMS   9
Microscale fluid, expression for liquid flow in a channel, fluid actuation methods, dielectrophoresis, microfluid dispenser, microneedle, micropumps-continuous flow system

UNIT V   BIO MEMS   9
Drug delivery, micro total analysis systems (MicroTAS) detection and measurement methods, microsystem approaches to polymerase chain reaction (PCR), DNA hybridization, Electronic nose, Bio chip.

TOTAL: 45 PERIODS

REFERENCES

1. Tai Ran Hsu , " MEMS and Microsystems design and manufacture", Tata McGraw Hill Publishing Company, New Delhi, 2002
2. Nitaigour Premchand Mahalik, " MEMS", Tata McGraw Hill Publishing Company, New Delhi, 2007
3. Wanjun Wang, Steven A.Soper " BioMEMS- Technologies and applications", CRC Press,Boca Raton,2007

MX 9160   **TISSUE ENGINEERING**

L T P C
3 0 0 3

UNIT I   FUNDAMENTAL OF TISSUE ENGINEERING   9
Tissue Exchange and Tissue Development, objectives of Tissue engineering,
Element of Tissue development.

UNIT II   CELLULAR STUDIES   9
Cell growth and differentiation, Cell and tissue mechanism, cell adhesion, cell
migration, cell aggregation and tissue equivalent.

UNIT III   TISSUE BARRIERS TO MOLECULAR AND CELLULAR
                TRANSPORT   9
Cell delivery and recirculation, Delivery molecular agents in tissue engineering,
control releaser agents in time and space.

UNIT IV   INTRODUCTION TO POLYMERS   9
Non degrade polymer, Bio degradable polymer, cell interaction with polymer cell, cell
interaction with polymer in suspension, cell interaction with gels.

UNIT V   APPLICATION OF TISSUE ENGINEERING   9
Artificial organs, synthetic components, Replacement in Tissue structure or
Functional Tissue engineering cartilage, Skin, and nerve regeneration.

TOTAL =45 PERIODS

REFERENCES

1. W. Mark Saltzman Tissue Engineering – Engineering principles for design
   of replacement organs and tissue –- Oxford University Press inc New York
   2004
2. Gray E Wnek, Gray L Browlin – Encyclopaedia of Biomaterials and
   Biomedical Engineering – Marcel Dekker Inc New York 2004.

BM 9160   HEALTH POLICY AND EQUIPMENT MANAGEMENT

L T P C
3 0 0 3

UNIT I   HEALTH SYSTEM   6
Health organization of the country, the state and cities, health financial system, teaching cum research hospitals, General Hospital, PHC reference system.

UNIT II   HOSPITAL PLANNING   9
Technical consideration, size & kind of hospitals, principles of planning, selection, site of orientation, equipment plan, communication and information system, Power supply, Air-conditioning, Water supply, elevators.

UNIT III   NATIONAL HEALTH POLICY   9
Need for evaluating a health policy, need for providing primary health care, Health education, health insurance, health legislation, inter sectoral cooperation.

UNIT IV   EQUIPMENT MAINTENANCE MANAGEMENT   9
Organizing the maintenance operation, biomedical equipment procurement procedure, proper selection, compatibility, testing and installation, purchase and contract procedure, trained medical staff, on proper use of equipment and operating instructions. Maintenance job planning, preventive maintenance, maintenance budgeting, contract maintenance.

UNIT V   LOGISTIC SUPPORT & RELIABILITY   6
Maintenance equipment and Tools, failure analysis, spare parts and maintenance materials. Reliability fundamentals.

UNIT VI   EMI TO HOSPITAL EQUIPMENTS   6
Principles of EMI, computation of EMI, Method of suppressing and isolating the unit from interference.

TOTAL: 45 PERIODS

REFERENCES
1. Antony Kelly, `Maintenance Planning & control' Butterworth, London 1984.

2. Hans Pleiff veradammann (ed) `Hospital Engineering in developing countries, GTZ report Eschborn, 1986.

3. R.C.Goyal `Human Resource Management in Hospitals' Prentice Hall of India, New Delhi, 2000.

MX 9164   TELEHEALTH TECHNOLOGY

L T P C
3 0 0 3

UNIT I   TELEMEDICINE AND HEALTH   9
History and Evolution of telemedicine, Functional diagram of telemedicine system, Telemedicine, Tele health, Tele care, Organs of telemedicine, Global and Indian scenario, Ethical and legal aspects of Telemedicine - Confidentiality, Social and legal issues, Safety and regulatory issues, Advances in Telemedicine.

UNIT II   TELEMEDICAL TECHNOLOGY   9
Principles of Multimedia - Text, Audio, Video, data, Data communications and networks, PSTN, POTS, ANT, ISDN, Internet, Air/ wireless communications: GSM satellite, and Micro wave, Modulation techniques, Types of Antenna, Integration and operational issues, Communication infrastructure for telemedicine – LAN and WAN technology. Satellite communication. Mobile hand held devices and mobile communication. Internet technology and telemedicine using world wide web (www). Video and audio conferencing. Clinical data –local and centralized.

UNIT III   TELEMEDICAL STANDARDS   9
Data Security and Standards: Encryption, Cryptography, Mechanisms of encryption, phases of Encryption. Protocols: TCP/IP, ISO-OSI, Standards to followed DICOM, HL7, H. 320 series (Video phone based ISBN) T. 120, H.324 (Video phone based PSTN), Video Conferencing, Real-time   Telemedicine   integrating   doctors   / Hospitals, Clinical laboratory data, Radiological data, and other clinically significant biomedical data,   Administration of centralized medical data, security and confidentially of medical records and access control, Cyber laws related to telemedicine.

UNIT IV   MOBILE TELEMEDICINE   9
Tele radiology: Definition, Basic parts of teleradiology system: Image Acquisition system Display system, Tele pathology, multimedia databases, color images of sufficient resolution, Dynamic range, spatial resolution, compression methods, Interactive control of color, Medical information storage and management for telemedicine- patient information medical history, test reports, medical images diagnosis and treatment. Hospital information system - Doctors, paramedics, facilities available. Pharmaceutical information system.

UNIT V   TELEMEDICAL APPLICATIONS   9
Telemedicine access to health care services – health education and self care. · Introduction to robotics surgery, telesurgery. Telecardiology,   Teleoncology, Telemedicine in neurosciences, Electronic Documentation, e-health services security and interoperability., Telemedicine access to health care services – health education and self care, Business aspects - Project planning and costing, Usage of telemedicine.

REFERENCES

1. Norris, A.C. Essentials of Telemedicine and Telecare. Wiley (ISBN 0-471-53151-0), 2002

2. Wootton R. Craig, J., Patterson, V. (Eds.), Introduction to Telemedicine. Royal Society of Medicine Press Ltd (ISBN 1853156779), 2006

3. O'Carroll, P.W, Yasnoff W.A., Ward E.Ripp, L.H., Martin, E.L. (Eds), Public Health Informatics and Information Systems. Springer (ISBN 0-387-95474-0), 2003

4. Ferrer-Roca, O., Sosa-Iudicissa, M. (editors), Handbook of Telemedicine. IOS Press (Studies in Health Technology and Informatics, Volume 54). (ISBN 90-5199-413-3), 2002.

5. Simpson, W. 2006. Video over IP. A practical guide to technology and applications. Focal Press (Elsevier). ISBN-10: 0-240-80557-7

6. Bemmel, J.H. van, Musen, M.A. (Eds.) (1997). Handbook of Medical Informatics. Heidelberg, Germany: Springer. (ISBN 3-540-63351-0)

MX9155   ADVANCED NEURAL COMPUTING

L T P C
3 0 0 3

UNIT I   FUNDAMENTAL CONCEPTS AND MODELS OF ARTIFICIAL NEURAL SYSTEMS   9

Biological Neurons and their Artificial models, Models of artificial Neural Networks, Learning and Adaptation, Neural Network Learning Rules, Single Layer Perceptron Classifiers.

UNIT II   BPN AND BAM   9

Back Propagation Network, Generalised Delta Rule, BPN Application, Associative Memory definition, BAM, Hopfield Memory, Simulated Annealing – Boltzmann Machine.

UNIT III   OTHER NETWORKS   9

Counter Propagation Network, Feature Mapping, Self Organising Feature Maps, Adaptive Resonance Theory(ART) Network Descriptions.

UNIT IV   GENETIC ALGORITHMS & IMPLEMENTATION TECHNIQUES   10

The Appeal of Evolution, Search Spaces and Fitness Landscapes, Elements of Genetic Algorithms, Data Structures, Adaptive Encoding. Selective Methods, Genetic Operators, Fitness Scaling.

UNIT V   ADVANCES AND APPLICATIONS   8

Support Vector Machines, R B F Network, Neocognitron Evolving neural networks using GA, Applications of ANN in biomedical signal analysis and Medical image analysis.

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REFERENCES:

1. Philip D.Wasermann, Advanced Methods in neural Computing, Van Nostrand Reinhold, Newyork 1993.
2. David Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Addison – Wesley USA, 1997.
3. Melanie Mitchell, An Introduction to Genetic Algorithms: Prentice Hall of India, New Delhi 1998.
4. Simon Haykins, Neural Networks, Prentice HallinternationalInc, 1999.
5. James A Freeman and David M.Skapra, Neural Networks, Addison – Wesley, India 1999.

MX 9162   PRINCIPLES OF GENETIC ANALYSIS

L T P C
3 0 0 3

UNIT I   INHERITANCE - GENETIC ANALYSIS   9
Pattern of inheritance, Chromosomal basis of inheritance, Chromosome mapping by recombination, Genetics of Bacteria and   viruses.

UNIT II   DNA AND PHENOTYPE   9
From Gene to Phenotype, DNA structure and replication- DNA sequencing, DNA Amplification, DNA Hybridisation and DNA Polymorphism, RNA transcription and processing, Protein synthesis and regulation of gene expression.

UNIT III   GENOME STRUCTURE AND GENETIC ENGINEERING   9
Gene isolation and manipulation, Genomics, mutations, repair and recombination, site directed mutagenesis, large-scale chromosomal changes and genetic polymorphism.

UNIT IV   GENETIC PROCESSES   9
Gene function, Genetic organization, Genetic regulation, normal and cancer cells, Genetic basis of development

UNIT V   IMPACT OF GENETIC VARIATION   9
Population Genetics, Quantitative Genetics, Evolution Genetics.

TOTAL: 45 PERIODS

REFERENCES

1. Watson. J. etal, " Molecular Biology of the Gene ", 5th Edition, Pearson Publication, 2004.
2. Griffiths, Wesslers, Lewontin, Bart Gel, Suzuki, Miller "Introduction to Genetics Analysis", – W.H Freeman & company, New York 8th Edition - 2005.
3. Glick, B.R and J.J Pasternak "Molecular Biotechnology", Principles and application of Recombinant DNA" 3rd Edition ASM Press, 2003
4. Karp, Gerald." Cell and Molecular Biology". Concepts and Experiments, 4th Edition, John Wiley Sons, 2005.
5. Weaver. R.F. " Molecular Biology " 3rd Edition, McGraw – Hill, 2005.
6. Tom Strachan, Andrew P Read "Human molecular Genetics" 3rd Edition, Garland Publishing – 2004.

MX 9154   COMPUTER BASED MEDICAL INSTRUMENTATION

L T P C
3 0 0 3

UNIT I   PC HARDWARE AND OVERVIEW   9
Hardware – BIOS – DOS interaction, POST, Functional and Architecture Block diagram of a PC, Mother Board – I / O slots – Mother Board logics- Memory and I/O map, Peripheral interfacing and controllers- Serial and Parallel interface – CRT Display Adapter – FDC – HDC – PC buses

UNIT II   80186, 80286, 80386 AND 80486 MICROPROCESSORS   9
80186 Architecture, Enhancements of 80186 – 80286 Architecture – Real and Virtual Addressing Modes – 80386 Architecture – Special Registers – Memory Management – Memory Paging Mechanism – 80486 Architecture – Enhancements – Cache Memory Techniques – Exception Handling – Comparison of Microprocessors (8086 – 80186 – 80286 – 80386 – 80486).

UNIT III   PENTIUM MICROPROCESSORS   9
Pentium Microprocessor Architecture – Special Pentium Registers – Pentium Memory Management – New Pentium Instructions – Pentium Pro Microprocessor Architecture – Special features – Pentium II Microprocessor Architecture – Pentium III Microprocessor Architecture – Pentium III Architecture – Pentium IV Architecture – Comparison of Pentium Processors.

UNIT IV   COMPUTERISED DATA ACQUISITION AND PROGRAMMING   9
Plug-in-data acquisition and Control Boards, Data acquisition using GPIB and Serial Interfaces and Programming in C, Virtual reality – Multimedia - Telemedicine – Computers in Critically Care Units and radiological centers.

UNIT V   BIOMETRICS FOR NETWORK SECURITY   9
Introduction to Biometrics and its characteristics, Finger print technology, feature extraction and classification, Face recognition and hand geometry - feature extraction and classification, Biometric authentication system

TOTAL: 45 PERIODS

REFERENCES

1. Ramachandra Lele, Computers in Medicine Progress in Medical Informatics, Tata McGraw Hill Publishing Company, New Delhi, 2005
2. N.Mathivanan, PC Based Instrumentation: Concepts and Practice, Prentice Hall of India, New Delhi 2007.
3. B.Govindarajalu, IBM PC and Clones: Hardware, Trouble shooting and Maintenance, Tata McGraw Hill Publishing Company, New Delhi, 2005
4. Herbert Schildt, The Complete Reference – JAVA, Tata McGraw Hill Publishing Company, New Delhi, 2005
5. John P Woodward, Biometrics – The Ultimate Reference, Dreamtech Publishers, New Delhi, 2003
6. Ranjan Parekh, Principles of Multimedia, Tata McGraw Hill Publishing Company, New Delhi, 2006
7. Stephen J Bigelow, Trouble shooting, Maintaining and Repairing of PCs, Tata McGraw Hill Publishing Company, New Delhi, 2005
8. H M Dietel, Internet and World Wide Web, AB Goldberg publishers, New Delhi, 2007

9. Atul Khate, Cryptography and network security, Tata McGraw Hill Publishing Company, New Delhi, 2008

BM 9162   SIGNAL PROCESSING & IMAGE PROCESSING TECHNIQUES APPLIED TO BIOLOGICAL SYSTEMS

L T P C
3 0 0 3

UNIT I   SIGNALS AND SYSTEMS   9
Classification of signals and systems, analysis of continuous and discrete time signals, laplace transform, Z-transform, Fourier transform, LTI system.

UNIT II   DISCRETE – TIME SIGNALS AND SYSTEMS   9
Review of discrete – time signals and systems – Overlap-add and overlap-save methods, FFT algorithms and its applications to convolution, DFT and its properties, Impulse invariance, bilinear transform.

UNIT III   DESIGN OF INFINITE AND FINITE RESPONSE FILTERS   9
Analog filters – Butterworth and Chebyshev type 1. Analog transformation of prototype LPF to BPF / BSF / HPF .Transformation of analog filters into equivalent digital filters. Design of FIR filter using window method, Eigen structure –based frequency estimation, spectrum estimation, Weiner filter and its applications.

UNIT IV   IMAGE FUNDAMENTALS   9
Fundamental studies related to visual perception , sampling and quantization of visual data , Image restoration and enhancement ,Image compression ,watermarking ,authentication . Image preprocessing –Image enhancement ,Image restoration , Image compression .

UNIT V   IMAGE ANALYSIS AND OTHER APPLICATIONS   9
Image segmentation, Image representation and analysis, Neural Network approaches. Image visualization, virtual reality based Interactive visualization. Applications – Tele radiology – Medial Image formats [DICOM] and PACS .

TOTAL: 45 PERIODS
REFERENCES

1. Steren M.Kay , Fundamentals of Statistical signal processing : Estimation theory upper saddle river , New Jersy , USA : Prentics Hall , 1993
2. Monson .H.Hayes , statistical digital signal processing and modeling , New York , USA , Wiley ,1996.
3. Oppenheim Schafer and Buck , Discrete – Time signal Processing.