

St. PETER'S UNIVERSITY

St. Peter's Institute of Higher Education and Research

(Declared under section 3 of UGC Act 1956)

Avadi, Chennai – 600 054.



B.E. (BIO – MEDICAL ENGINEERING) PROGRAMME

(I TO VIII SEMESTERS)

REGULATIONS AND SYLLABI

(REGULATIONS – 2012)

(Effective from the Academic Year 2012-'13)

B.E. (BIO – MEDICAL ENGINEERING) PROGRAMME

Regulations and Syllabi

(Effective from the Academic Year 2012-'13)

1. Eligibility:

(1) Candidates who passed the following Examination or any other equivalent Examination there to and who appeared for the entrance test conducted by the University or approved institutions wherever prescribed are eligible for admission to Four Year B.E. (Bio - Medical Engineering) Programme.

Higher Secondary Examination with Mathematics, Physics and Chemistry conducted by the Government of Tamil Nadu or its equivalent in the relevant subjects.

(2) Candidates who passed Three Year Diploma in Technical Education in the concerned subject conducted by the Government of Tamil Nadu are eligible for admission to Second Year of Four Year B.E. (Bio - Medical Engineering) Programme.

2. Duration: Four Years comprising 8 Semesters. Each semester has a minimum 90 working days with a minimum of 5 hours a day.

3. Medium: English is the medium of instruction and examination.

4. Weightage for Continuous and End Assessment: The weightage for Continuous Assessment (CA) and End Assessment (EA) be 25:75 unless the ratio is specifically mentioned in the scheme of Examinations.

5. Credit System: Credit system be followed with 18 credits for each semester and each credit is equivalent to 25 hours of effective study provided in the Time Table.

6. Scheme of Examinations

I Semester

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
112EHT01	Technical English – I	1	25	75	100
112MAT02	Mathematics – I	3	25	75	100
112PHT03	Engineering Physics – I	3	25	75	100
112CYT04	Engineering Chemistry – I	3	25	75	100
112EGT05	Engineering Graphics – I	3	25	75	100
112FCT06	Fundamentals of Computing – I	3	25	75	100
112CLP01	Computer Practices Laboratory – I	1	25	75	100
112ELP02	Engineering Practices Laboratory – I	1	25	75	100
	Total	18	200	600	800

II Semester

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
212EHT01	Technical English – II	2	25	75	100
212MAT02	Mathematics – II	3	25	75	100
212PHT03	Engineering Physics – II	2	25	75	100
212CYT04	Engineering Chemistry – II	2	25	75	100
212EDT05	Electric Circuits and Electron Devices	3	25	75	100
212CMT06	Basic Civil & Mechanical Engineering	3	25	75	100
Practical					
212CLP01	Computer Practices Laboratory – II	1	25	75	100
212PCP02	Physics & Chemistry Laboratory – II	1	25	75	100
212CDP03	Circuits and Devices Laboratory	1	25	75	100
Total		18	225	675	900

III Semester

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
312MAT01	Transforms and Partial Differential Equations	3	25	75	100
312BMT02	Medical Physics	2	25	75	100
312BMT03	Signals and Systems	3	25	75	100
312BMT04	Sensors and Measurements	2	25	75	100
312BMT05	Electronic Circuits	2	25	75	100
312BMT06	Biochemistry	2	25	75	100
312BMT07	Anatomy and Human Physiology	2	25	75	100
Practical					
312BMP01	Biochemistry and Human Physiology Lab	1	25	75	100
312BMP02	Electronic Circuits Lab	1	25	75	100
Total		18	225	675	900

IV Semester

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
412BMT01	Probability and Random Processes	3	25	75	100
412BMT02	Biomedical Instrumentation	2	25	75	100
412BMT03	Basics of Electrical Engineering	2	25	75	100
412BMT04	Analog and Digital ICs	3	25	75	100
412BMT05	Pathology and Microbiology	2	25	75	100
412BMT06	Analog and Digital Communication	2	25	75	100
412BMT07	Environmental Science and Engineering	2	25	75	100
Practical					
412BMP01	Integrated Circuits Lab	1	25	75	100
412BMP02	Pathology and Microbiology Lab	1	25	75	100
Total		18	225	675	900

V SEMESTER

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
512BMT01	Digital Signal Processing	3	25	75	100
512BMT02	Bio control systems	3	25	75	100
512BMT03	Diagnostic and Therapeutic Equipment I	3	25	75	100
512BMT04	Bio materials and artificial organs	2	25	75	100
512BMT05	Microprocessor, Microcontroller and System Design	3	25	75	100
512BMT06	Hospital Management	2	25	75	100
Practical					
512BMP01	Microprocessor and Microcontroller Lab	1	25	75	100
512BMP02	Biomedical Instrumentation Lab	1	25	75	100
Total		18	200	600	800

VI SEMESTER

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
612BMT01	Radiological Equipment	3	25	75	100
612BMT02	Biomechanics	3	25	75	100
612BMT03	Diagnostic and Therapeutic Equipment II	2	25	75	100
612BMT04	Internet and Java	2	25	75	100
612BMT05	Elective – I : Bio Fluids and Dynamics	3	25	75	100
612BMT09	Electives– II : Intellectual Property Rights	2	25	75	100
Practical					
612BMP01	Digital Signal Processing Lab	1	25	75	100
612BMP02	Internet and Java programming Lab	1	25	75	100
612BMP03	Diagnostic and Therapeutic Equipment Lab	1	25	75	100
Total		18	225	675	900

VII SEMESTER

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
712BMT01	Pattern Recognition and Neural Networks	3	25	75	100
712BMT02	Medical Informatics	3	25	75	100
712BMT03	Medical Optics	2	25	75	100
712BMT04	Digital Image Processing	3	25	75	100
712BMT05	Cell biology and tissue engineering	2	25	75	100
712BMT10	Elective - IIII : Computer Networks	2	25	75	100
Practical					
712BMP01	Hospital Training	2	25	75	100
712BMP02	Digital Image Processing Lab	1	25	75	100
Total		18	200	600	800

VIII SEMESTER

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
812BMT02	Elective IV: Assist Devices	3	25	75	100
812BMT05	Electives – V : Medical Imaging Techniques	3	25	75	100
Practical					
812BMP01	Project	12	25	75	100
Total		18	75	225	300

LIST OF ELECTIVE COURSES

Code No.	Course Title	Credit
Elective – I		
612BMT05	Bio Fluids and Dynamics	3
612BMT06	Biometric Systems	3
612BMT07	Computer Architecture and Organization	3
Electives– II		
612BMT08	Data Structures and Object Oriented Programming	2
612BMT09	Intellectual Property Rights	2
612BMT10	Indian Constitution and Society	2
612BMT11	Fiber Optics and Laser Instruments	2
Electives – III		
712BMT05	Cell biology and tissue engineering	2
712BMT06	Physiological Modeling	2
712BMT07	Bio Informatics	2
712BMT08	Total Quality Management	2
712BMT09	Nano Electronics	2
Electives – IV		
712BMT10	Computer Networks	2
712BMT11	Computer Hardware, Interfacing and Instrumentation	2
712BMT12	Refrigeration and Air-Conditioning	2
712BMT13	Biotelemetry	2
712BMT14	Biosensors and Transducers	2
Electives – V		
808BMT01	Bio MEMS	3
808BMT02	Assist Devices	3
808BMT03	VLSI Design	3
808BMT04	Professional Ethics in Engineering	3
Electives – VI		
812BMT05	Medical Imaging Techniques	3
812BMT06	Soft Computing	3
812BMT07	Rapid Prototyping	3
812BMT08	Embedded System	3

- 7. Passing Requirements:** The minimum pass mark (raw score) be 50% in End Assessment (EA) and 50% in Continuous Assessment (CA) and End Assessment (EA) put together. No minimum mark (raw score) in Continuous Assessment (CA) be prescribed unless it is specifically mentioned in the scheme of Examination.
- 8. Grading System:** Grading System on a 10 Point Scale be followed with 1 mark = 0.1 Grade point to successful candidates as given below.

CONVERSION TABLE

(1 mark = 0.1 Grade Point on a 10 Point Scale)

Range of Marks	Grade Point	Letter Grade	Classification
90 to 100	9.0 to 10.0	O	First Class
80 to 89	8.0 to 8.9	A	First Class
70 to 79	7.0 to 7.9	B	First Class
60 to 69	6.0 to 6.9	C	First Class
50 to 59	5.0 to 5.9	D	Second Class
0 to 49	0 to 4.9	F	Reappearance

Procedure for Calculation

Cumulative Grade Point Average (CGPA) = $\frac{\text{Sum of Weighted Grade Points}}{\text{Total Credits}}$

$$= \frac{\sum (CA+EA) C}{\sum C}$$

Where Weighted Grade Points in each Course = Grade Points (CA+EA)
multiplied by Credits

$$= (CA+EA)C$$

Weighted Cumulative Percentage of Marks(WCPM) = CGPAx10

C- Credit,

CA-Continuous Assessment,

EA- End Assessment

9. Pattern of the Question Paper: The question paper for End Assessment will be set for three hours and for the maximum of 100 marks with following divisions and details.

Part A: 10 questions (with equal distribution to all units in the syllabus).
Each question carries 2 marks.

Part B: 5 question with either or type (with equal distribution to all units in the syllabus). Each question carries 16 marks.

The total marks scored by the candidates will be reduced to the maximum prescribed in the Regulations.

10. Effective Period of Operation for the Arrear Candidates :Two Year grace period is Provided for the candidates to complete the arrear examination, if any.

Registrar

11.Syllabus

112EHT01 - TECHNICAL ENGLISH – I

AIM:

To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

OBJECTIVES:

1. To help students develop listening skills for academic and professional purposes.
2. To help students acquire the ability to speak effectively in English in real-life situations.
3. To inculcate reading habit and to develop effective reading skills.
4. To help students improve their active and passive vocabulary.
5. To familiarize students with different rhetorical functions of scientific English.
6. To enable students write letters and reports effectively in formal and business situations.

UNIT I

General Vocabulary - changing words from one form to another - Adjectives, comparative adjectives – Adverbs - Active and passive voice – Tenses - simple present, present continuous - Adverb forms – Nouns – compound nouns - Skimming and scanning - Listening and transfer of information – bar chart, flowchart - Paragraph writing, description – Discussing as a group and making an oral report on the points discussed, conversation techniques - convincing others.

Suggested activities:

1. Matching words & meanings - Using words in context – Making sentences.
2. Changing sentences from active to passive voice & vice versa.
3. Skimming, cloze exercises, exercises transferring information from text to graphic form – bar charts, flow charts.
4. Writing descriptions using descriptive words & phrases, and technical vocabulary.
5. Role play, conversation exercises, discussions, oral reporting exercises
Any other related relevant classroom activity

UNIT II

Vocabulary – prefixes & suffixes – simple past tense - Spelling and punctuation – 'wh' Question forms - Scanning, inference - Listening & note-taking - Paragraph writing - comparison and contrast - Creative thinking and speaking.

Suggested Activities:

1. a. Vocabulary activities using prefixes and suffixes.
b. Exercises using questions – asking & answering questions.
2. Scanning the text for specific information
3. Listening guided note-taking - Writing paragraphs using notes, giving suitable headings and subheadings for paragraphs. Using expressions of comparison and contrast.
4. Discussion activities and exploring creative ideas.
Any other related relevant classroom activity

UNIT III

Tenses - simple past, simple future and past perfect - Reading in Context -Listening & note-taking – single line – Definitions – sequencing of sentences – instruction - Persuasive speaking.

Suggested activities:

1. Providing appropriate context for the use of tenses
2. Listening and note-taking
3. (a) Writing sentence definitions, instructions
(b) Identifying the discourse links and sequencing jumbled sentences / writing instructions.
4. Speaking exercises, discussions, role play exercises using explaining, convincing and persuasive strategies
Any other related relevant classroom activity

UNIT IV

Modal verbs and Probability – Concord subject verb agreement – Correction of errors - Cause and effect expressions – Extended Definition - Speaking about the future plans.

Suggested activities:

1. a) Making sentences using modal verbs to express probability
b) Gap filling using relevant grammatical form of words.
2. Writing extended definitions
3. 3. Speaking - role play activities, discussions, extempore speaking exercises speculating about the future.
Any other related relevant classroom activity

UNIT V

'If' conditionals – Gerunds - Intensive reading - Speaking – Presentation of problems & solutions - Itinerary – planning for an industrial visit - Formal Letter writing – Letter to the editor, invitation letter, accepting, declining letter and permission letter.

Suggested activities:

1. a) Sentence completion exercises using 'If' conditionals.
b) Gap filling exercises using gerunds and present participle forms
2. Reading comprehension exercises.
3. Role play, discussion, debating and speaking activities for stating, discussing
a. problems and suggesting solutions.
4. Planning a tour, Writing a travel itinerary. Writing letters to officials and to the
a. editor in formal/official contexts.
Any other related relevant classroom activity

TEXT BOOK:

1. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 1 – 4 (Resources, Energy, Computer, Transport)

REFERENCES:

1. Meenakshi Raman and Sangeeta Sharma, 'Technical Communication English skills for Engineers', Oxford University Press, 2008.
2. Andrea, J. Rutherford, 'Basic Communication Skills for Technology', Second Edition, Pearson Education, 2007.
- 3.

Extensive Reading:

A.P.J.Abdul Kalam with Arun Tiwari, 'Wings of Fire' An Autobiography, University Press (India) Pvt. Ltd., 1999, 30th Impression 2007.

NOTE:

The book given under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

112MAT02 - MATHEMATICS – I

UNIT I MATRICES

Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY

Equation of a sphere – Plane section of a sphere – Tangent Plane – Equation of a cone – Right circular cone – Equation of a cylinder – Right circular cylinder.

UNIT III DIFFERENTIAL CALCULUS

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes – Evolute as envelope of normals.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Differentiation of implicit functions – Jacobians – Taylor's expansion – Maxima and Minima – Method of Lagrangian multipliers.

UNIT V MULTIPLE INTEGRALS

Double integration – Cartesian and polar coordinates – Change of order of integration – Change of variables between Cartesian and polar coordinates – Triple integration in Cartesian co-ordinates – Area as double integral – Volume as triple integral

TEXT BOOK:

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", Third edition, Laxmi Publications(p) Ltd.,(2008).
2. Grewal. B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, Delhi, (2007).

REFERENCES:

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2007).
2. Glyn James, "Advanced Engineering Mathematics", 7th Edition, Pearson Education, (2007).
3. Jain R.K and Iyengar S.R.K," Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

112PHT03 – ENGINEERING PHYSICS I

UNIT-I: ACOUSTICS & ULTRASONICS

Classifications of sound – Characteristics of musical sound – Intensity – Loudness – Weber Fechner law – Decibel – reverberation – reverberation time, derivation of Sabine's formula for reverberation – (Jager's Method) - absorption coefficient and its determination – factors affecting acoustics of building (optimum reverberation time, loudness, focusing, echo, echelon, effect, resonance, and noise) and their remedies – Ultrasonic production –Magnetostriction and piezoelectric methods – Properties – applications of ultrasonic with particular reference to detection of flaws in metal (Non – Destructive testing NDT) – SONAR.

UNIT II LASER & ITS APPLICATIONS

Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einsteins A and B Coefficient – derivations. Types of lasers – He-Ne, CO₂, Nd-YAG, Semiconductor lasers (homojunction & heterojunction) Qualitative Industrial Applications – Lasers in welding, heat treatment, cutting – Medical applications – Holography (construction & reconstruction).

UNIT III CRYSTAL PHYSICS

Lattice –Unit cell –Bravais lattice –Lattice Planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – atomic radius – Coordination number –Packing factor for SC, BCC, FCC and HCP structure –Polymorphism and allotropy – Crystal defects – point, line and surface defects.

UNIT IV PROPERTIES OF MATTER

Elasticity – types of moduli of elasticity – stress strain diagram –Young's modulus of elasticity – rigidity modulus – bulk modulus – Factors affecting elasticity – twisting couple on a wire – Torsional pendulum – determination of rigidity modulus of a wire – depression of a cantilever – Young's modulus by cantilever – uniform and non uniform bending – viscosity – Coefficient of viscosity – Determination of viscosity - Poiseuille's Method –Ostwalds viscometer – comparison of viscosities.

Unit V OPTICS & FIBER OPTICS

Air Wedge theory and experiment – testing of flat surfaces –anti reflection coating – Michelson interferometer – types of fringes, determination of wave length of monochromatic source and thickness of a thin transparent sheet – Double refraction – Photoelasticity – Photoelastic effect – Photoelastic analysis –Photoelastic material – Block diagram of a photoelastic bench. Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle – Types – Types of optical fibres (material, refraction index, mode)- Double crucible technique of fibre drawing – Fibre drawing – Fibre optical communication system (Block diagram)

Text Book:

1. S.Stella Mary , m. Parasuraman and a. Mohammed Hidayathullah , 'Engineering Physics I R.K. Publishers, Coimbatore (2012)

REFERENCES:

1. R.K. Gaur and S.C.Gupta, "Engineering Physics" Dhanpat Rai Publications , New Delhi(2003)
2. M.N. Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics' S.Chand and company, Ltd. New Delhi, 2005.
3. Serway and Jewett, 'Physics for Scientists and Engineering with Modern Physics', 6th Edition, Thomson Brooks/Cole, Indian reprint (2007).
4. Rajendran, Vand Marikani A, 'Engineering Physics' Tata McGraw Hill Publications Ltd,III edition New Delhi,(2004).
5. Palaniswamy, P.K. 'Engineering Physics' Scitech publications,Chennai,(2007)
6. Jayakumar.s 'Engineering Physics' , R.K.publishers, Coimbatore. (2007)
7. Jayakumar. S 'Engineering Physics', Pearson Education,New Delhi, (2007).
8. Dr. P. Santhana Raghavan, Dr.P. Ramasamy, Crystal Growth- Process and Methods –KRU Publications-Kumbakonam.

112CYT04 ENGINEERING CHEMISTRY –I

Aim

To impart a sound knowledge on principles of Chemistry involving industrial application oriented topics required for all engineering branches.

Objectives

- * The student should be conversant with the principles, treatment of water for potable and industrial purposes
- Principles of polymer chemistry and its application in industries
- Industrial application of surface chemistry
- Conventional and Non- conventional energy sources and Principle and working of energy storage devices
- Chemistry of engineering materials and their industrial applications.

UNIT I WATER TECHNOLOGY

Characteristics –alkalinity-types of alkalinity and determination - Water - Hardness and problems -Estimation of Hardness by EDTA method - Problems in EDTA Titrations - Domestic water treatment-Disinfection methods (boiling, bleaching powder, chlorination UV treatment, ozonisation) Boiler feed water- Requirements -Disadvantages of using hard water in boilers-Scale and sludge formation, Carry over trouble, Caustic embrittlement and Boiler corrosion –Internal conditioning- colloidal,carbonate,phosphate and calgon conditioning methods. External conditioning -Zeolite Process and Demineralization process- Desalination - Reverse osmosis and Electro dialysis

UNIT II POLYMERS AND COMPOSITES

Polymers - Definition –Nomenclature -Functionality- Polymerization –Types -addition condensation, copolymerization and co-ordination polymerization –Mechanism of free radical and Co-ordination polymerization -Plastics-Classification -Preparation ,properties and uses of PVC, Teflon – Polycarbonates, Polyurethanes,Nylon 6,6, PET- Rubber-Vulcanisation of rubber ,synthetic rubber,Butyl rubber ,SBR. Composites- Definition – Types of Composites - Polymer matrix composites –Metal matrix composites – Ceramic matrix composites ,properties and their application

UNIT III SURFACE CHEMISTRY

Adsorption – Terminology –Types- physical adsorption and chemical adsorption -Differences - Adsorption of gases on solids -Adsorption isotherms -Freundlich adsorption isotherm -Langmuir adsorption isotherm – Limitation. Adsorption of solutes from solutions - Ion exchange adsorption- Pollution abatement -Chromatography
Catalysis –Types-- Role of adsorbent in catalysis.

UNIT IV NON –CONVENTIONAL ENERGY SOURCES AND ENERGY STORAGE DEVICES

Nuclear energy – Difference between chemical and nuclear reactions -fusion and fission reactions – Binding energy – Mass defect-problems- Nuclear reactor- components -Light water nuclear power plant -Breeder reactor –Atom bomb.
Solar energy conversion-Solar cells, wind energy --Fuel cells– Hydrogen-oxygen fuel cell – Batteries – Dry cell- alkaline battery -Lead - acid battery –Nickel –Cadmium battery - Lithium battery- Lithium – Sulphur battery.

UNIT V ENGINEERING MATERIALS

Refractories –classification –acidic, basic and neutral refractories-properties of refractories –refractoriness- refractoriness under load –dimensional stability-porosity-thermal spalling-chemical inertness-Manufacture of alumina, magnesite and zirconia bricks - Abrasives- natural and synthetic abrasives- Quartz, corundum, emery, garnet, diamond, silicon carbide ,alundum and boron carbide- Lubricants- Mechanism of lubrication – Classification – Solid lubricants-graphite and molybdenum disulphide.- Semi -Solid lubricants – Grease- Liquid lubricants -Synthetic lubricants - Blended oils -Properties- Viscosity ,Viscosity index, Flash and fire points, Cloud and pour points,Oiliness. and their significance –Adhesives -Classification and applications
Nano chemistry- Introduction –Properties –Carbon nanotubes –Classification – Synthesis – Applications

Text Books

1. P.C.Jain and Monica Jain , 'Engineering Chemistry'', Dhanpat Rai Pub Co Ltd New Delhi (2002)
2. S.S.Dara , ' A Text Book of Engineering Chemistry'', S.Chand & Co Ltd New Delhi (2006)
3. Dr.Sayeeda Sultana " Engineering chemistry " Vol-I Professional and Technical Publishers, Coimbatore (2011)

Reference Books

1. B.K.Sharma 'Engineering Chemistry',Krishna Prakasan Media (P) Ltd Meerut (2001)
2. B.Shiva Sankar 'Engineering Chemistry',Tata McGraw-Hill Pub Co Ltd New Delhi (2008)

112EGT05 - ENGINEERING GRAPHICS

AIM

To develop graphic skills in students.

OBJECTIVES

To develop in students graphic skill for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

Concepts and conventions (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING

Curves used in engineering practices:

Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Free hand sketching:

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III PROJECTION OF SOLIDS

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section.

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.

Perspective projection of prisms, pyramids and cylinders by visual ray method.

TEXT BOOKS:

1. N.D. Bhatt, "Engineering Drawing" Charotar Publishing House, 46th Edition, (2003).

REFERENCES:

1. K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2006).
2. M.S. Kumar, "Engineering Graphics", D.D. Publications, (2007).
3. K. Venugopal & V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited (2008).
4. M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education (2005).
5. K. R. Gopalakrishnana, "Engineering Drawing" (Vol.I&II), Subhas Publications (1998).
6. Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited (2008).
7. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, (2008).

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. Whenever the total number of candidates in a college exceeds 150, the University Examination in that college will be conducted in two sessions (FN and AN on the same day) for 50 percent of student (approx) at a time.

112FCT06 - FUNDAMENTALS OF COMPUTING AND PROGRAMMING

AIM :

To provide an awareness to Computing and Programming

OBJECTIVES :

- To enable the student to learn the major components of a computer system
- To know the correct and efficient ways of solving problems
- To learn to use office automation tools
- To learn to program in C

UNIT I INTRODUCTION TO COMPUTERS

Introduction – Characteristics of Computers – Evolution of Computers - Computer Generations – Classification of Computers – Basic Computer organization – Number Systems

UNIT II COMPUTER SOFTWARE

Computer Software –Types of Software – Software Development Steps – Internet Evolution - Basic Internet Terminology – Getting connected to Internet Applications.

UNIT III PROBLEM SOLVING AND OFFICE APPLICATION SOFTWARE

Planning the Computer Program – Purpose – Algorithm – Flow Charts – Pseudocode -Application Software Packages- Introduction to Office Packages (not detailed commands for examination).

UNIT IV INTRODUCTION TO C

Overview of C – Constants, Variables and Data Types – Operators and Expressions – Managing Input and Output operators – Decision Making - Branching and Looping.

UNIT V FUNCTIONS AND POINTERS

Handling of Character Strings – User-defined Functions – Definitions – Declarations - Call by reference – Call by value – Structures and Unions – Pointers – Arrays – The Preprocessor – Developing a C Program : Some Guidelines

TEXT BOOKS:

1. Ashok.N.Kamthane, " Computer Programming", Pearson Education (India) (2008).
2. Behrouz A.Forouzan and Richard.F.Gilberg, "A Structured Programming Approach Using C", II Edition, Brooks-Cole Thomson Learning Publications, (2007).

REFERENCES:

1. Pradip Dey, Manas Ghosh, "Programming in C", Oxford University Press. (2007).
2. Byron Gottfried, "Programming with C", 2nd Edition, (Indian Adapted Edition), TMH publications, (2006).
3. Stephen G.Kochan, "Programming in C", Third Edition, Pearson Education India, (2005).
4. Brian W.Kernighan and Dennis M.Ritchie, "The C Programming Language", Pearson Education Inc., (2005).
5. E.Balagurusamy, "Computing fundamentals and C Programming", Tata McGraw-Hill Publishing Company Limited, (2008).
6. S.Thamarai Selvi and R.Murugan, "C for All", Anuradha Publishers, (2008).

LIST OF EXERCISES

a) Word Processing

1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
3. Mail merge and Letter preparation.
4. Drawing - flow Chart

b) Spread Sheet

5. Chart - Line, XY, Bar and Pie.
6. Formula - formula editor.
7. Spread sheet - inclusion of object, Picture and graphics, protecting the document and sheet.
8. Sorting and Import / Export features.

Simple C Programming *

9. Data types, Expression Evaluation, Condition Statements.
10. Arrays
11. Structures and Unions
12. Functions

* For programming exercises Flow chart and pseudocode are essential

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS

Hardware

- LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.
- Printers – 3 Nos.

Software

- OS – Windows / UNIX Clone
- Application Package – Office suite
- Compiler – C

OBJECTIVES

To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE

Buildings:

- (a) Study of plumbing and carpentry components of residential and industrial buildings.
Safety aspects.

Plumbing Works:

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- (b) Study of pipe connections requirements for pumps and turbines.
- (c) Preparation of plumbing line sketches for water supply and sewage works.
- (d) Hands-on-exercise:
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- (e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

- (a) Study of the joints in roofs, doors, windows and furniture.
- (b) Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE

Welding:

- (a) Preparation of arc welding of butt joints, lap joints and tee joints.
- (b) Gas welding practice

Basic Machining:

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

Sheet Metal Work:

- (a) Forming & Bending:
- (b) Model making – Trays, funnels, etc.
- (c) Different type of joints.

Machine assembly practice:

- (a) Study of centrifugal pump
- (b) Study of air conditioner

Demonstration on:

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.
- (c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EOR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

REFERENCES:

1. K.Jeyachandran, S.Natarajan & S, Balasubramanian, "A Primer on Engineering Practices Laboratory", Anuradha Publications, (2007).
2. T.Jeyapoovan, M.Saravanapandian & S.Pranitha, "Engineering Practices Lab Manual", Vikas Puplicing House Pvt.Ltd, (2006)
3. H.S. Bawa, "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, (2007).
4. A. Rajendra Prasad & P.M.M.S. Sarma, "Workshop Practice", Sree Sai Publication, (2002).
5. P.Kannaiah & K.L.Narayana, "Manual on Workshop Practice", Scitech Publications, (1999).

SEMESTER EXAMINATION PATTERN

The Laboratory examination is to be conducted for Group A & Group B, allotting 90 minutes for each group, with a break of 15 minutes. Both the examinations are to be taken together in sequence, either in the FN session or in the AN session. The maximum marks for Group A and Group B lab examinations will be 50 each, totaling 100 for the Lab course. The candidates shall answer either I or II under Group A and either III or IV under Group B, based on lots.

Engineering Practices Laboratory List of equipment and components (For a Batch of 30 Students)

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets.
2. Carpentry vice (fitted to work bench) 15 Nos.
3. Standard woodworking tools 15 Sets.
4. Models of industrial trusses, door joints, furniture joints 5 each
5. Power Tools: (a) Rotary Hammer 2 Nos
(b) Demolition Hammer 2 Nos
(c) Circular Saw 2 Nos
(d) Planer 2 Nos
(e) Hand Drilling Machine 2 Nos
(f) Jigsaw 2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders 5 Nos.
2. Welding booth with exhaust facility 5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc. 5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. 2 Nos.
5. Centre lathe 2 Nos.
6. Hearth furnace, anvil and smithy tools 2 Sets.
7. Moulding table, foundry tools 2 Sets.
8. Power Tool: Angle Grinder 2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner One each.

ELECTRICAL

1. Assorted electrical components for house wiring 15 Sets
2. Electrical measuring instruments 10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp 1 each
4. Megger (250V/500V) 1 No.
5. Power Tools: (a) Range Finder 2 Nos
(b) Digital Live-wire detector 2 Nos

ELECTRONICS

1. Soldering guns 10 Nos.
2. Assorted electronic components for making circuits 50 Nos.
3. Small PCBs 10 Nos.
4. Multimeters 10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply

COMMON TO ALL BRANCHES

PHYSICS LABORATORY (Any Ten Experiments)

1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Young's modulus of the material – uniform bending .
3. Determination of viscosity of liquid – Poiseuille's method.
4. Torsional pendulum – Determination of rigidity modulus.
5. Determination of the thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of the thickness of a thin wire – Air Wedge method.
7. (a) Particle size determination using Diode Laser.
(b) Determination of Laser Parameters – Wave length, and angle of divergence.
(c) Determination of acceptance angle in an optical fiber.
8. Spectrometer dispersive power of a prism.
9. Determination of Wave length of mercury spectrum –Spectrometer grating.
10. Determination of Band Gap of a Semiconductor diode.
11. Determination of velocity of sound and compressibility of liquid- Ultrasonic interferometer.
12. Determination of Hysteresis loss in a ferromagnetic material

- **A minimum of FIVE experiments shall be offered in Each Semester.**
- **Laboratory classes on alternate weeks for physics and chemistry.**
- **The lab examinations will be held only in the second Semester.**

CHEMISTRY LABORATORY – I

LIST OF EXPERIMENTS

1. Estimation of hardness of Water by EDTA method
 2. Estimation of Copper in brass by EDTA method
 3. Determination of DO in water (Winkler's method)
 4. Estimation of Chloride in Water sample (Argentometric)
 5. Estimation of alkalinity of Water sample
 6. Determination of molecular weight and degree of polymerization of a polymer by viscometry.
 7. Determination of cloud and pour point of a Lubricating oil
- Any five experiments

212EHT01 - TECHNICAL ENGLISH II

AIM:

To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

OBJECTIVES:

1. To help students develop listening skills for academic and professional purposes.
2. To help students acquire the ability to speak effectively in English in real-life situations.
3. To inculcate reading habit and to develop effective reading skills.
4. To help students improve their active and passive vocabulary.
5. To familiarize students with different rhetorical functions of scientific English.
6. To enable students write letters and reports effectively in formal and business situations.

UNIT I

Technical Vocabulary - meanings in context, sequencing words, Articles- Prepositions, intensive reading& predicting content, Reading and interpretation, extended definitions, Process description

Suggested activities:

1. Exercises on word formation using the prefix 'self' - Gap filling with preposition.
2. Exercises - Using sequence words.
3. Reading comprehension exercise with questions based on inference – Reading headings
4. and predicting the content – Reading advertisements and interpretation.
5. Writing extended definitions – Writing descriptions of processes – Writing paragraphs based on discussions – Writing paragraphs describing the future.

UNIT II

Phrases / Structures indicating use / purpose – Adverbs-Skimming – Non-verbal communication - Listening – correlating verbal and non-verbal communication -Speaking in group discussions – Formal Letter writing – Writing analytical paragraphs.

Suggested activities:

1. Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) - Reading comprehension exercises with texts including graphic communication - Exercises in interpreting non-verbal communication.
2. Listening comprehension exercises to categorise data in tables.
3. Writing formal letters, quotations, clarification, complaint – Letter seeking permission for Industrial visits– Writing analytical paragraphs on different debatable issues.

UNIT III

Cause and effect expressions – Different grammatical forms of the same word - Speaking – stress and intonation, Group Discussions - Reading – Critical reading - Listening, - Writing – using connectives, report writing – types, structure, data collection, content, form, recommendations .

Suggested activities:

1. Exercises combining sentences using cause and effect expressions – Gap filling exercises using the appropriate tense forms – Making sentences using different grammatical forms of the same word. (Eg: object –verb / object – noun)
2. Speaking exercises involving the use of stress and intonation – Group discussions– analysis of problems and offering solutions.
3. Reading comprehension exercises with critical questions, Multiple choice question.
4. Sequencing of jumbled sentences using connectives – Writing different types of reports like industrial accident report and survey report – Writing recommendations.

UNIT IV

Numerical adjectives – Oral instructions – Descriptive writing – Argumentative paragraphs – Letter of application – content, format (CV / Bio-data) – Instructions, imperative forms – Checklists, Yes/No question form – E-mail communication.

Suggested Activities:

1. Rewriting exercises using numerical adjectives.
2. Reading comprehension exercises with analytical questions on content – Evaluation of content.
3. Listening comprehension – entering information in tabular form, intensive listening exercise and completing the steps of a process.
4. Speaking - Role play – group discussions – Activities giving oral instructions.
5. Writing descriptions, expanding hints – Writing argumentative paragraphs – Writing formal letters – Writing letter of application with CV/Bio-data – Writing general and safety instructions – Preparing checklists – Writing e-mail messages.

UNIT V

Speaking - Discussion of Problems and solutions - Creative and critical thinking – Writing an essay, Writing a proposal.

Suggested Activities:

1. 1. Case Studies on problems and solutions
2. 2. Brain storming and discussion
3. 3. Writing Critical essays
4. 4. Writing short proposals of 2 pages for starting a project, solving problems, etc.
5. Writing advertisements.

TEXT BOOK:

1. Chapters 5 – 8. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 5 – 8 (Technology, Communication, Environment, Industry)

REFERENCES:

1. P. K. Dutt, G. Rajeevan and C.L.N Prakash, 'A Course in Communication Skills', Cambridge University Press, India 2007.
2. Krishna Mohan and Meera Banerjee, 'Developing Communication Skills', Macmillan India Ltd., (Reprinted 1994 – 2007).
3. Edgar Thorpe, Showick Thorpe, 'Objective English', Second Edition, Pearson Education, 2007.

Extensive Reading:

1. Robin Sharma, 'The Monk Who Sold His Ferrari', Jaico Publishing House, 2007

Note:

The book listed under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

212MAT02 - MATHEMATICS – II

UNIT I ORDINARY DIFFERENTIAL EQUATIONS

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

UNIT III ANALYTIC FUNCTIONS

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : $w = z + c$, cz , $1/z$, and bilinear transformation.

UNIT IV COMPLEX INTEGRATION

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour (excluding poles on boundaries).

UNIT V LAPLACE TRANSFORM

Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions.

Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

TEXT BOOK:

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", 3rd Edition, Laxmi Publications (p) Ltd., (2008).
2. Grewal. B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, Delhi, (2007).

REFERENCES:

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2007).
2. Glyn James, "Advanced Engineering Mathematics", 3rd Edition, Pearson Education, (2007).
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 7th Edition, Wiley India, (2007).
4. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

212PHT03 – ENGINEERING PHYSICS II

UNIT I: CONDUCTING MATERIALS

Conductors – classical free electron theory of metals-Electrical and thermal conductivity – Derivation – Wiedemann – Franz law – Lorentz number – Draw backs of Classical free electron theory –Quantum theory – Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – Carrier concentration in metals.

UNIT II: SEMICONDUCTING MATERIALS

INTRINSIC SEMICONDUCTOR: Intrinsic semiconductor – Density of electrons in conduction band – Density of holes in valence band – Intrinsic carrier concentration – derivation – Fermi level – Variation – of Fermi with temperature – electrical conductivity – mobility – band gap determination.

EXTRINSIC SEMICONDUCTOR: Extrinsic semiconductors – carrier concentration derivation in n-type and p- type semiconductor variation of Fermi level with temperature and impurity concentration – compound semiconductors.

UNIT III: DIELECTRIC MATERIALS

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarization- internal field – Clausius – Mosotti relation (derivation) – dielectric loss - dielectric breakdown – uses of dielectric materials (capacitor and transformer) Ferro electricity and applications.

UNIT IV: QUANTUM AND SUPER CONDUCTING MATERIALS

Black body radiation – Planck's theory (derivation) – Deduction of Wien' displacement law and Rayleigh – jeans' Law from Planck's theory - Compton Effect – Theory and experimental verification – Matter waves – Schrodinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box – Superconductivity: Properties – Types of super conductors – BCS theory of superconductivity(Qualitative) – High Tc superconductors – Applications of super conductors - SQUID, cryotron, magnetic levitation.

UNIT V: NEW ENGINEERING & NANO MATERIALS

Metallic glasses: Preparation, properties and applications – Shape memory alloys (SMA): Characteristic, Properties of NiTi alloy, application, advantages and disadvantages of SMA-synthesis –Plasma arcing – Chemical vapour deposition – sol-gels – eletrodeposition – ball milling – properties of nanoparticles and applications Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition –Structure – properties and applications.

Text Books:

1. S. Stella Mary, M. Parasuraman and A. Mohammed Hidayathullah, 'Engineering Physics II' R.K Publishers, Coimbatore(2012).

REFERENCES:

1. Charles Kittel 'Introduction to solid state physics', John Wiley & Sons, 7th edition, Singapore (2007).
2. Charles P.Poole and Frank J. Ownen, 'Introduction to nanotechnology' Wiley India (2007)(for unit V)
3. Rajendran. v and Marikani.A. 'Materials Science' Tata McGraw hill publications, (2004) New Delhi.
4. Jayakumar. S, 'Materials Science' R.K. Publishers, Coimbatore, (2008).
5. Palanisamy P.K, 'Materials Science' , Scitech publications (India) Pvt. Ltd., Chennai, Second Edition(2007).
6. M. Arumugam, 'Materials Science' Anuradha Publications, Kumbakonam, (2006).

212CYT04 ENGINEERING CHEMISTRY –II

To impart a sound knowledge on principles of Chemistry involving industrial application oriented topics required for all engineering branches.

Objectives

- * The student should be conversant with the principles of Electrochemistry
Electrochemical cells and their applications.
- Principles of corrosion and its inhibition.
- * Chemistry of fuels and combustion.
- Importance of phase rule, alloys and their industrial application.
- Analytical techniques and their instrumentation.

UNIT I ELECTROCHEMISTRY

Electrochemical cells-Reversible and irreversible cells-Concentration cells -EMF Measurement of emf- Single electrode potential -Nernst equation(problem)-Reference electrodes-Standard hydrogen electrode-Calomel electrode-Ion selective electrode-Glass electrode-Measurement of pH-Electrochemical series-significance- Potentiometric titration (redox Fe^{2+} Vs Dichromate,) - Conductometric titrations (acid-base and precipitation titrations)

UNIT II CORROSION AND CORROSION CONTROL

Chemical corrosion -Pilling- Bedworth rule-electrochemical corrosion -mechanism Different types of corrosion-Galvanic corrosion-Differential aeration corrosion -pitting corrosion-waterline corrosion - stress corrosion -crevice corrosion-Factors influencing corrosion -corrosion control-sacrificial anode and impressed cathodic current methods-corrosion inhibitors -protective coatings-paints-constituents-functions- metallic coatings- anodic coating -cathodic coating- metal cladding - diffusion coating - electroplating of gold and electroless plating of nickel.

UNIT III FUELS AND COMBUSTION

Calorific value -Classification-coal -Proximate analysis and Ultimate analysis-Metallurgical Coke-Manufacture by Bee-hive oven and Otto-Hoffmann method-Petroleum processing and fractions-Cracking -Catalytic cracking and methods-Knocking -octane number -cetane number-Synthetic petrol-Fischer -Tropsch and Bergius process-Gaseous fuels-,Water gas-Producer gas., CNG and LPG-Flue gas analysis-Orsat apparatus-Theoretical air for combustion-Problems

UNIT IV PHASE RULE AND ALLOYS

Statement and Explanation of terms involved with examples- Phase diagram-One Component system-Water system- Condensed phase rule-Construction of phase diagram by Thermal analysis-Simple eutectic system(Lead-silver system only)- Limitations of phase rule-Alloys-importance of Ferrous alloys-Nichrome-Alnico -Stainless steel-Heat treatment of steel -Non-Ferrous alloys -Brass and Bronze

UNIT V ANALYTICAL TECHNIQUES

Spectroscopy -Atomic and molecular spectroscopy-Absorption spectrum -Emission spectrum - Absorbance-Beer-Lamberts law-Problems-UV Visible spectroscopy -IR spectroscopy-(principle,instrumentation (block diagram only)and applications colorimetry(principle ,instrumentation and applications)-Estimation of iron by colorimetry.Flame photometry-(principle , instrumentation and applications)-Estimation of Sodium by Flame photometry-Atomic absorption spectroscopy(principle , instrumentation and applications)-Estimation of Nickel by Atomic absorption spectroscopy.

Text Books

1. P.C.Jain and Monica Jain , 'Engineering Chemistry', Dhanpat Rai Pub Co Ltd ,New Delhi (2002)
2. S.S.Dara , ' A Text Book of Engineering Chemistry', S.Chand & Co Ltd New Delhi (2006)
3. Dr.Sayeeda Sultana " Engineering chemistry " Vol -II, Professional and Technical publishers ,Coimbatore (2011)

Reference Books

1. B.K.Sharma 'Engineering Chemistry',Krishna Prakasan Media (P) Ltd Meerut (2001)
2. B.Shiva Sankar 'Engineering Chemistry',Tata McGraw-Hill Pub Co Ltd New Delhi (2008)

212EDT05 - ELECTRIC CIRCUITS AND ELECTRON DEVICES
(For ECE, CSE, IT and Biomedical Engg. Branches)

UNIT I CIRCUIT ANALYSIS TECHNIQUES

Kirchoff's current and voltage laws – series and parallel connection of independent sources – R, L and C – Network Theorems – Thevenin, Superposition, Norton, Maximum power transfer and duality – Star-delta conversion.

UNIT II TRANSIENT RESONANCE IN RLC CIRCUITS

Basic RL, RC and RLC circuits and their responses to pulse and sinusoidal inputs – frequency response – Parallel and series resonances – Q factor – single tuned and double tuned circuits.

UNIT III SEMICONDUCTOR DIODES

Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode – Energy band structure – current equation – space charge and diffusion capacitances – effect of temperature and breakdown mechanism – Zener diode and its characteristics.

UNIT IV TRANSISTORS

Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT V SPECIAL SEMICONDUCTOR DEVICES
(Qualitative Treatment only)

Tunnel diodes – PIN diode, varactor diode – SCR characteristics and two transistor equivalent model – UJT – Diac and Triac – Laser, CCD, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.

TEXT BOOKS:

1. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series, Tata McGraw Hill, (2001)
2. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits", Tata McGraw Hill, 2nd Edition, (2008).
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, (2008).

REFERENCES:

1. Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Edition, (2006).
2. William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill, 6th Edition, 2002.
3. J. Millman & Halkins, Satyabranta Jit, "Electronic Devices & Circuits", Tata McGraw Hill, 2nd Edition, 2008.

212CMT06 BASIC CIVIL & MECHANICAL ENGINEERING
(Common to branches under ECE, CSE, IT and Biomedical Engg.)

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS

Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.

UNIT II BUILDING COMPONENTS AND STRUCTURES

Foundations: Types, Bearing capacity – Requirement of good foundations.

Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV I C ENGINES

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

REFERENCES:

1. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, (1996).
2. Ramamrutham. S, "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd. (1999).
3. Seetharaman S. "Basic Civil Engineering", Anuradha Agencies, (2005).
4. Venugopal K and Prahuraja V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, (2000).
5. Shantha Kumar S R J., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, (2000).

212CLP01 - COMPUTER PRACTICE LABORATORY – II

LIST OF EXPERIMENTS

1. UNIX COMMANDS

Study of Unix OS - Basic Shell Commands - Unix Editor

2. SHELL PROGRAMMING

Simple Shell program - Conditional Statements - Testing and Loops

3. C PROGRAMMING ON UNIX

Dynamic Storage Allocation-Pointers-Functions-File Handling

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Hardware

- 1 UNIX Clone Server
- 33 Nodes (thin client or PCs)
- Printer – 3 Nos.

Software

- OS – UNIX Clone (33 user license or License free Linux)
- Compiler - C

COMMON TO ALL BRANCHES

PHYSICS LABORATORY (Any Ten Experiments)

1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Young's modulus of the material – uniform bending .
3. Determination of viscosity of liquid – Poiseuille's method.
4. Torsional pendulum – Determination of rigidity modulus.
5. Determination of the thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of the thickness of a thin wire – Air Wedge method.
7. (a) Particle size determination using Diode Laser.
(b) Determination of Laser Parameters – Wave length, and angle of divergence.
(c) Determination of acceptance angle in an optical fiber.
8. Spectrometer dispersive power of a prism.
9. Determination of Wave length of mercury spectrum –Spectrometer grating.
10. Determination of Band Gap of a Semiconductor diode.
11. Determination of velocity of sound and compressibility of liquid- Ultrasonic interferometer.
12. Determination of Hysteresis loss in a ferromagnetic material

- **A minimum of FIVE experiments shall be offered in Each Semester.**
- **Laboratory classes on alternate weeks for physics and chemistry.**
- **The lab examinations will be held only in the second Semester.**

CHEMISTRY LABORATORY – II

LIST OF EXPERIMENTS

1. Conductometric titration (Simple acid base)
 2. Conductometric titration (Mixture of weak and strong acidsVs base)
 3. Conductometric titration using BaCl_2 Vs $\text{Na}_2 \text{SO}_4$
 4. Potentiometric Titration ($\text{Fe}^{2+}/\text{KMnO}_4$ or $\text{K}_2\text{Cr}_2\text{O}_7$)
 5. PH titration (acid & base)
 6. Determination of water of crystallization of a crystalline salt (Copper sulphate)
 7. Estimation of Ferric iron by spectrophotometry.
 8. Estimation of sodium and potassium by flame photometry.
- Any five experiments.

212CDP03 CIRCUITS AND DEVICES LABORATORY

1. Verification of KVL and KCL
2. Verification of Thevenin and Norton Theorems.
3. Verification of superposition Theorem.
4. Verification of Maximum power transfer and reciprocity theorems.
5. Frequency response of series and parallel resonance circuits.
6. Characteristics of PN and Zener diode
7. Characteristics of CE configuration
8. Characteristics of CB configuration
9. Characteristics of UJT and SCR
10. Characteristics of JFET and MOSFET
11. Characteristics of Diac and Triac.
12. Characteristics of Photodiode and Phototransistor.

312MAT01 - TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS (Common to all branches)

OBJECTIVES

The course objective is to develop the skills of the students in the areas of Transforms and Partial Differential Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT I FOURIER SERIES

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identify – Harmonic Analysis.

UNIT II FOURIER TRANSFORMS

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant coefficients.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in cartesian coordinates.

UNIT V Z -TRANSFORMS AND DIFFERENCE EQUATIONS

Z-transforms - Elementary properties – Inverse Z-transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z-transform.

TEXT BOOKS

1. Grewal, B.S, "*Higher Engineering Mathematic*", 40th Edition, Khanna publishers, Delhi, (2007)

REFERENCES

1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematic", 7th Edition, Laxmi Publications(P) Ltd. (2007)
2. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company limited, New Delhi (2007).
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education (2007).
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, Wiley India (2007).

312BMT02 - MEDICAL PHYSICS

AIM

To get the complete understanding of radioactivity and medical applications of various radio isotopes

OBJECTIVES

To Study the effects of sound and light in Human body

To study the effects of radiation in matter and how isotopes are clinically used.

UNIT I

Electromagnetic spectrum and its medical application

Light - Physics of light, Intensity of light, limits of Vision and color vision **Sound** - Physics of sound , Normal sound levels – Ultrasound fundamentals- Generation of ultrasound (Ultrasound Transducer) – Interaction of Ultrasound with Materials-Reflection and Refraction – Absorption and Scattering **Non- ionizing Electromagnetic Radiation** Tissue as a leaky dielectric – Relaxation Processes – Overview of non – ionizing radiation effects -Low Frequency Effect – Higher frequency effect.

UNIT II

Radioactive Decay – Spontaneous Emission – Isometric Transition - Gamma ray emission, alpha, beta, positron decay, electron capture **Principles of Nuclear Physics** – Natural radioactivity, Decay series, Half life period, type of radiation and their applications. **Production of radionuclides** – Cyclotron produced Radionuclide - Reactor produced Radionuclide – fission and electron Capture reaction, Radionuclide Generator – Milking Process - Linear accelerator , Radionuclide used in Medicine and technology.

UNIT III INTERACTION OF RADIATION WITH MATTER

Interaction of charged particles_with matter – Specific ionization , linear energy Transfer Range, Bremsstrahlung , Annihilation Interaction of Gamma radiations_with matter – Photoelectric effect, Compton Scattering , pair Production, Attenuation of Gamma Radiation, Interaction of neutron with matter

UNIT IV PHYSICS OF CARDIOPULMONARY SYSTEM

The Airways, - blood and lung interaction – measurement of lung volume – pressure air flow volume relation ships of lungs – physics of alveoli – the breathing mechanism – Major components of cardiovascular system – O₂ and CO₂ exchange in the capillary system – Physical activity of heart – transmural pressure – Bernolli's principles applied to cardiovascular system - Blood flow – laminar and turbulent

UNIT V RADIATION EFFECTS

Acute Radiation Effects - The concept of LD 50 – Radiation syndromes- Central nervous system syndrome - Gastro-intestinal syndrome –Bone Marrow syndrome **Delayed Effects of Radiation** - Stochastic and Deterministic effects – Late Deterministic effect in different organs and tissues.

TEXT BOOKS

13. B.H Brown , PV Law ford, R H Small wood , D R Hose , D C Barber , "Medical Physics and Biomedical Engineering", CRC Press, 1999.
14. Gopal B.Saha "Physics and Radiobiology of Nuclear Medicine" Springer, 3rd ed, 2006

REFERENCES

1. John R. Cameron and James G. Skofronick, "Medical Physics", John-Wiley & Sons, 1978.
2. RF Farr and PJ Allisy –Roberts, "Physics for Medical Imaging" Saunders, 1997.
3. P.Uma Devi, A. Nagarathnam, B S Satish Rao, "Introduction to Radiation Biology" B.I .Churchill Livingstone pvt ltd, 2000.
4. S.Webb, "The Physics of Medical Imaging", Taylor and Francis, 1988.

312BMT03 - SIGNALS AND SYSTEMS

AIM

To study and analyse characteristics of continuous, discrete signals and systems

OBJECTIVE

- To study the properties and representation of discrete and continuous signals
- To study the properties and representation of discrete and continuous systems
- To study the signals in time domain and frequency domain using Fourier
- To study the sampling process and analysis of signals and systems using Laplace and Z-transforms.
- To study the analysis and synthesis of systems.

1. Classification of Signals and Systems

Classification of signals – Continuous-time signal and discrete-time signals – periodic and aperiodic signals – even and odd signals – energy and power signals – deterministic and random signal. Basic operations on signals – arithmetic operations – reflections – time shifting – time scaling. Types of signals – exponential, sinusoidal, step, impulse and ramp. System - impulse response of the system. Classification of systems – stable – memory – invertible – time invariant – linear – causal. Convolution integrals and its properties. Sampling theorem.

2. Fourier Series and Fourier Transform

Continuous-time Fourier series (CTFS) – Exponential and trigonometric representation of CTFS. Dirichlet condition. Properties of CTFS – linearity, time-shifting, time-reversal, time-scaling, multiplication, Parseval's relation – differentiation – integration. Continuous-time Fourier transform (CTFT) – properties of CTFT – linearity, time shifting, time-reversal, time-scaling, multiplication, convolution, Parseval's relation – differentiation in time and frequency domains – integration. Application to systems - solution to differential equation using CTFT.

Discrete-time Fourier series (DTFS) and Discrete-time Fourier transform (DTFT) – properties – linearity, time-shifting, time-reversal, time-scaling, multiplication, Parseval's relation – difference – accumulation. Application to systems - solution to difference equation using DTFT.

3. Laplace Transform

Unilateral and bilateral Laplace transform (LT) – region of convergence (ROC) - properties of LT – linearity, time-shifting, time-reversal, time-scaling, multiplication, convolution, Parseval's relation – differentiation in time and frequency domain – integration – initial value and final value theorem – inversion of LT – solution to differential equation using LT – analysis of passive network using LT.

4. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT)

Discrete Fourier transform – properties of DFT – linearity, circular-shifting in time and frequency domains, time-reversal, time-scaling, circular correlation, multiplication, convolution, parseval's relation – circular convolution – circle method, matrix method – sectional convolution – overlap-add method and overlap-save method – radix-2 fast Fourier algorithm – decimation-in-time FFT – decimation-in-frequency FFT – inverse FFT.

5. Z-transform and state matrix

Z-transform (ZT) – region of convergence (ROC) - properties of ZT – linearity, time-shifting, time-reversal, time-scaling, multiplication, convolution, parseval's relation – differentiation in time and frequency domain – integration – initial value and final value theorem – inversion of ZT – power series method, partial-fraction method, residual method - solution to difference equation using ZT.

State variable description for LTI system – determination of transfer function from state model – discrete-time model.

TEXT BOOK

1. Allan V. Oppenheim et al, "Signals and Systems", Pearson Education, 2007

REFERENCE

1. Simon Haykin and Barry Van Veen, "Signals and Systems", John Willey, 1999
2. Roger E. Zeimer et al, "Signals and Systems", McMillan, 2nd Edition, 1999.
3. Douglas K. Linder, ""Signals and Systems", McGraw-Hill, 2nd Edition, 1999.

312BMT04 - SENSORS AND MEASUREMENTS

UNIT I SCIENCE OF MEASUREMENT

Measurement System – Instrumentation – Classification and Characteristics of Transducers – Static and Dynamic – Errors in Measurements – Calibration – Primary and secondary standards.

UNIT II DISPLACEMENT , PRESSURE,TEMPERATURE SENSORS

Strain Gauge: Gauge factor, sensing elements, configuration, unbounded strain gage, biomedical applications; strain gauge as displacement & pressure transducers: force summing devices, capacitive transducer, inductive transducer, LVDT, Passive types: RTD materials & range, relative resistance vs. temperature characteristics, thermistor characteristics, biomedical applications of Temperature sensors. Active type: Thermocouple – characteristics,

UNIT III PHOTOELECTRIC AND PIEZO ELECTRIC SENSORS

Phototube, Photo Multiplier Tube (PMT), photovoltaic, photoconductive cells, photo diodes, phototransistor, comparison of photoelectric transducers, spectro-photometric applications of photo electric transducers. Piezoelectric active transducer and biomedical applications as pressure & Ultrasound transducer.

UNIT IV SIGNAL CONDITIONING & SIGNAL ANALYSER

AC and DC Bridges –wheat stone bridge, Kelvin, Maxwell, Hay, Schering –Pre-amplifier – impedance matching circuits – isolation amplifier. Spectrum analyzer.

UNIT V DISPLAY AND RECORDING DEVICES

Digital voltmeter – Multi meter – CRO – block diagram, CRT – vertical & horizontal deflection system, DSO, LCD monitor, PMMC writing systems, servo recorders, photographic recorder, magnetic tape recorder, X–Y recorder, thermal recorder.

TEXT BOOK

1. Principles of Applied Biomedical Instrumentation L.A Geddas and L.E.Baker – John Wiley and sons.
2. Albert D.Helfrick and William D. Cooper. Modern Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India, 2007.

REFERENCES

1. Ernest o Doebelin and dhanesh N manik, Measuremet systems, Application and design ,5th edition ,McGraw-Hill, 2007.
2. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw-Hill, New Delhi, 2007.
3. Leslie Cromwell, “Biomedical Instrumentation and measurement”, Prentice hall of India, New Delhi, 2007.
4. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, New York, 2004

312BMT05 - ELECTRONIC CIRCUITS

AIM

The aim of this course is to familiarize the student with analysis and design of basic transistor amplifier circuits, signal generator circuits and power supplies

OBJECTIVES:

- On completion of this course, the student will understand
- The methods of biasing transistors,
- Design the simple amplifier circuits, and design of signal generation circuits,
- Advantages and analysis of feed back,
- Design of Power supplies.

UNIT I DIODE APPLICATIONS AND TRANSISTOR BIASING

Rectifiers – HWR, FWR, Bridge rectifier with and without capacitor and pie filter. Clipper-clampers – voltage multiplier circuits - Operating point of the bi-polar junction transistor – Fixed bias circuit – Transistor on saturation – Emitter stabilized Bias Circuit – Voltage divider bias – Transistors switching network – Trouble shooting the Transistor (In circuit testing)- practical applications. Biasing the FET transistors - CMOS devices – MOSFET handling.

UNIT II SMALL SIGNAL AMPLIFIERS

Two port network, h-parameter model – small signal analysis of BJT (CE and CC configurations only) -- high frequency model of BJT – (CE configuration only) - small signal analysis of JFET (CS configuration only) - Frequency response of BJT and FET.

UNIT III FEEDBACK AMPLIFIER AND OSCILLATORS

Basic of feedback system (block diagram approach) – Types of feedback amplifier – Basic principles of oscillator. Audio oscillators – RC phase shift and wein bridge oscillator. RF oscillators – Hartly and Collpit oscillator – Crystal oscillator, Multivibrators.

UNIT IV POWER AMPLIFIERS

Definition – Types of power amplifiers – Class A (series fed – transformer coupled)- Class B amplifier – Class-B push-pull amplifier – Complimentary symmetry type - Class-C amplifier – Heat sinking .

UNIT V VOLTAGE REGULATIONS

Shunt voltage regulator – Series voltage regulator – current limiting – feedback technique – SMPS (Block diagram approach) – DC to DC converter - Three terminal IC regulators (78XX and 79XX).

TEXT BOOKS:

1. Robert L. Boylestad, Louis Nashelsky , Electronic Devices and circuit Theory , Prentice Hall of India , 2004.

REFERENCES

1. David A. Bell , Electronic Devices And Circuits 4 th Edition Prentice Hall of India, 2003.
2. Millman Haykins, Electronic Devices And Circuits, 2nd Edition Tata MC Graw Hill, 2007.

312BMT06 - BIOCHEMISTRY

AIM

- To study the biochemical reactions and the various methods to analyze them.

Objective:

- To give a clear understanding of important biomolecules and their functions.
- To analyze the metabolic pathways in normal and diseased state.
- To help in devising analytical & diagnostic tools.

UNIT I

Introduction to biochemistry – Biomolecules, structure of water & its importance – Important noncovalent forces – Hydrogen bonds, electrostatic, hydrophobic & vanderwaals forces – Acid, base & buffers – pH, Henderson Hasselbalch equation. Biological buffers and their significance – Principle of viscosity – surface tension , adsorption, diffusion, osmosis & their applications in biological systems.

UNIT II

Classification, structure & properties of carbohydrates – mono, di , oligo & polysaccharides. Classification, structure & properties of amino acids & proteins. Classification, structure & properties of Lipids – Simple lipids , Phospholipids , glycolipids & steroids . Transport of lipids: Lipoproteins Structure & functions of nucleic acids – Nucleosides , nucleotides – Cyclic AMP , cyclic GMP , ATP , GTP – DNA & RNA

UNIT III

Classification of Enzymes, Chemical nature, Active Site, Specificity of Enzyme catalyzed reactions, Regulation : Feedback , Allosteric , Covalent modification , Hormonal regulation, co-enzymes. Assay of enzymes, enzymes in clinical diagnosis of diseases. Introduction to Metabolism: Carbohydrate metabolism, Glycolysis
Lipid metabolism : fatty acid, beta oxidation , ketogenesis and cholesterol metabolism. TCA cycle : Structure of biological membranes, electron transport & Oxidative phosphorylation.

UNIT IV

Liver function and liver function tests, Kidney function and kidney function tests , normal & abnormal constituents of urine and their clinical significance. General characteristics of hormones. Structure , functions & disorders of thyroid , parathyroid , pituitary ,adrenal and pancreatic hormones. Hormones as chemical messengers: General assay of hormones – Bio assay , chemical assay & immuno assays.

UNIT V

Analytical techniques: Principle and applications of electrophoresis – PAGE , SDS PAGE , Isoelectric focusing , Two Dimensional Electrophoresis. Chromatography: Principle of adsorption & partition chromatography, Size exclusion , Ion exchange & affinity chromatography. Spectro photometry, fluorimetry, flame photometry, manometry , microcalorimetry , electrochemical methods, biosensors , automation in clinical laboratory , use of radio isotopes in biochemistry.

TEXT BOOKS

1. Harper's review of biochemistry By David. W. Martin, Peter. A. Mayes , Victor. W. Rodwell . LANGE medical publications, 2003.
2. Practical Biochemistry – Principles & Techniques, Keith Wilson & John Walker. Oxford university press.

REFERENCE BOOKS

1. Understanding Enzymes By Trevor palmer. Published by Ellis Horwood LTD.
2. Biochemistry Lippincott's Illustrated Reviews By Pamela.C.Champe & Richard. A.Harvey. Lippincott-Raven publishers, 3rd edition, 2006.

312BMT07 - ANATOMY AND HUMAN PHYSIOLOGY

AIM

To provide the students the exposure to the fundamentals in human anatomy and physiology.

UNIT I STUDY OF CELLULAR SYSTEM

Cell: Structure and organelles - Functions of each component in the cell. Cell membrane - transport across membrane - origin of cell membrane potential (Nernst and Goldman and Katz equations) - Action potential.

UNIT II HEMATOLOGICAL SYSTEM

Blood composition - functions of blood - functions of RBC. WBC types and their functions. Blood groups -importance of blood groups -identification of blood groups. blood flow factors regulating blood flow such as viscosity, radius , density etc (Fahreus lindqvist effect, Poiseuille's Law)

UNIT III RENAL AND RESPIRATORY SYSTEM

Structure of Kidney and nephron. Mechanism of Urine formation and acid base regulation. Dialysis. Components in of respiratory system. Oxygen and carbon dioxide transport and acid base regulation.

UNIT IV CARDIAC SYSTEM

Structure of heart - Properties of Cardiac muscle - Cardiac muscle and pacemaker potential - Cardiac cycle - ECG - Heart sound - volume and pressure changes and regulation of heart rate.

UNIT V SENSORY SYSTEM

Structure of a Neuron. Synaptic conduction. Conduction of action potential in neuron Parts of brain cortical localization of functions.. EEG. Simple reflexes , withdrawal reflexes. Autonomic nervous system and its functions,Structure of eye ,ear and auditory and visual pathways.

TEXT BOOK

1. Essential of human Anatomy and Physiology, Elaine.N. Marieb Eight edition, Pearson Education New Delhi ,2007.

REFERENCE BOOKS

1. Review of Medical Physiology,22nd edition,William F.Ganong Mc Graw Hill New Delhi,
2. Text book of Physiology, Prof. A.K. Jain, Third edition volume I and II Avichal Publishing company, New Delhi

312BMP01 - BIOCHEMISTRY AND HUMAN PHYSIOLOGY LAB

1. General tests for carbohydrates, proteins and lipids.
2. Preparation of serum and plasma from blood.
3. Estimation of blood glucose.
4. Estimation of serum cholesterol.
5. Assay of SGOT/SGPT.
6. Estimation of creatinine in urine.
7. Electrophoresis of serum proteins.
8. Separation of amino acids using thin layer chromatography.
9. ESR , PCV , MCH, MCV, MCHC, total count of RBCs and Hemoglobin estimation
10. Differential count of different WBCs and Blood group identification
11. Ishihara chart for color blindness and Snellen's chart for myopia and hyperopia – by letters reading and ophthalmoscope to view retina.
12. Weber's and Rinnee's test for auditory conduction.

LAB EQUIPMENTS

1. Test tube, microscope (Binocular), colorimeter
2. Centrifuge, Test tubes, anticoagulant
3. Blood Glucose kit
4. Cholesterol kit
5. SGOT/SGPT kit
6. Creatinine kit
7. Electrophoresis apparatus
8. Glass tanks, thin layer chromatography
9. ESR glan tube wintrobe PCV tube(Haematocrit tube) , sahli's Haemo globinometer, Microscope, Haemocytometer(Mirror coated)
10. Differential count Leishman stain(readymade),Blood group antigen ,microscope slides.
11. Ishihara chart, Snellen's chart, Ophthalmoscope
12. Weber's and Rinnee's test.

312BMP02 - ELECTRONIC CIRCUITS LAB

1. Rectifiers – HWR and FWR (with & without capacitor filter)
2. Zener diode as regulator
3. Study of biasing circuits
 - a. i). Fixed bias, ii). Self bias, iii). collector to base bias
4. FET amplifier
5. Differential amp – CMRR and determination of Gain
6. Design of RC coupled amplifier
7. Design of Voltage series feedback amplifier
8. Design of Class A and Class B amplifier
9. Design of RC phase shift oscillator
10. Design of Hartely Oscillator
11. Design of Colpitt oscillator
12. Study of pulse shaping circuits
 - i. i). Astable Multivibrator
 - ii. ii). Monostable Multivibrator

(Common to Electronic and Communication Engineering & Bio Medical Engg.)

LIST OF EQUIPMENTS AND COMPONENTS FOR A BATCH OF 30 STUDENTS (3 per Batch)

S.No	Name of the Equipments / Components	Quantity Required	Remarks
1	Variable DC Power Supply	10	(0-30V)
2	Fixed Power Supply	5	+ / - 12V
3	CRO	10	30MHz
4	Multimeter	10	Digital
5	Function Generator	5	1 MHz
6	Digital LCR Meter	1	
Consumables (Minimum of 25 Nos. each)			
7	BC107, BF195, 2N2222, BC147, BFW10, SL100		
8	IC 555, LEDs		
9	Resistors 1/4 Watt Assorted		
10	Capacitors		
11	Inductors		
12	Bread Boards		
13	Transformer Diodes, Zener Diodes		

412BMT01 - PROBABILITY AND RANDOM PROCESSES (Common to ECE & Bio Medical Engineering)

AIM

This course aims at providing the necessary basic concepts in random processes. Knowledge of fundamentals and applications of random phenomena will greatly help in the understanding of topics such as signals & systems, pattern recognition, voice and image processing and filtering theory.

OBJECTIVES

At the end of the course, the students would

- Have a fundamental knowledge of the basic probability concepts.
- Have a well-founded knowledge of standard distributions which can describe real life phenomena.
- Acquire skills in handling situations involving more than one random variable and functions of random variables.
- Understand and characterize phenomena which evolve with respect to time in probabilistic manner.
- Be able to analyze the response of random inputs to linear time invariant systems.

UNIT I RANDOM VARIABLES

Discrete and continuous random variables – Moments - Moment generating functions and their properties. Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and normal distributions – Function of Random Variable.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem (for iid random variables)

UNIT III CLASSIFICATION OF RANDOM PROCESSES

Definition and examples - first order, second order, strictly stationary, wide-sense stationary and ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process – Random telegraph process.

UNIT IV CORRELATION AND SPECTRAL DENSITIES

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khinchine relation – Relationship between cross power spectrum and cross correlation function

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS

Linear time invariant system - System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output – white noise.

TEXT BOOKS

1. Oliver C. Ibe, "Fundamentals of Applied probability and Random processes", Elsevier, First Indian Reprint (2007) (For units 1 and 2)
2. Peebles Jr. P.Z., "Probability Random Variables and Random Signal Principles", Tata McGraw-Hill Publishers, Fourth Edition, New Delhi, 2002. (For units 3, 4 and 5).

REFERENCES

1. Miller, S.L and Childers, S.L, "Probability and Random Processes with applications to Signal Processing and Communications", Elsevier Inc., First Indian Reprint 2007.
2. H. Stark and J.W. Woods, "Probability and Random Processes with Applications to Signal Processing", Pearson Education (Asia), 3rd Edition, 2002.
3. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw-Hill edition, New Delhi, 2004.
4. Leon-Garcia, A, "Probability and Random Processes for Electrical Engineering", Pearson Education Asia, Second Edition, 2007.
5. Yates and D.J. Goodman, "Probability and Stochastic Processes", John Wiley and Sons, Second edition, 2005.

412BMT02 - BIO MEDICAL INSTRUMENTATION

1. BIO POTENTIAL ELECTRODES

Origin of bio potential and its propagation. Electrode-electrolyte interface, electrode-skin interface, half cell potential, impedance, polarization effects of electrode – nonpolarizable electrodes. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits. Recording problems - measurement with two electrodes.

2. ELECTRODE CONFIGURATIONS

Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven’s triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG, ERG and EOG – unipolar and bipolar mode.

3. BIO AMPLIFIER

Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. Band pass filtering, isolation amplifiers – transformer and optical isolation - isolated DC amplifier and AC carrier amplifier. Chopper amplifier. Power line interference.

4. MEASUREMENT OF NON-ELECTRICAL PARAMETER

Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - auscultatory method, oscillometric method, direct methods: electronic manometer, Pressure amplifiers - systolic, diastolic, mean detector circuit.

Blood flow and cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method, Electromagnetic and ultrasound blood flow measurement.

5. BIO-CHEMICAL MEASUREMENT

Biochemical sensors - pH, pO₂ and pCO₂, Ion selective Field effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors - Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

TEXT BOOKS:

1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2004.
2. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004

REFERENCE

1. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.
3. Standard Handbook of Biomedical Engineering & Design – Myer Kutz, McGraw-Hill Publisher, 2003.

412BMT03 - BASICS OF ELECTRICAL ENGINEERING

AIM

To make the students understand the basics of electricity generation and utilization.

OBJECTIVES

- To study the magnetic circuits
- To study the principle and application of transformers
- To study the principle of operation of DC motors
- To study the principle and operation of AC machines
- To study the principle of fractional-kW motors and their applications.

1. MAGNETIC CIRCUIT

Magnetic effects of electric current, Magnetic circuits, Magnetic materials and B-H relationship, Electromagnetic induction and force, Hysteresis and eddy current losses.

2. DC MOTORS

Parts of DC motors, types of motors, principle of operation of DC motors, Back EMF, circuit model, power balance, calculation of torque and speed, armature and field control, DC motor starting, calculation of efficiency.

3. TRANSFORMERS

Methods of generation of AC voltages, role of transformers in the distribution of electricity, Construction and principle of operation of single phase transformers, Ideal transformer, voltage and current relationships, impedance transformation, definition of voltage regulation, Losses in the transformer, calculation of efficiency of transformer, construction and voltage ratio aspects of single phase autotransformer, construction and voltage ratio aspects three phase transformer.

4. AC MACHINES

Synchronous machines, construction, principle of operation, phasor diagram, voltage equation, Open circuit and short circuit characteristics, voltage regulation, induction motor, construction, circuit model, torque slip characteristics, starting, speed control-slip control, frequency control

5. FRACTIONAL -KW MOTORS

Single phase induction motor, principle of operation, torque-speed characteristics, two-phase motors, split phase motor, universal motor, two value capacitance motor, stepper motors - variable reluctance stepper motor-single stack and multistack-permanent magnet stepper motor-drive concepts-unipolar drive circuit, bipolar drive circuit-calculation

TEXT BOOKS:

1. D P Kothari and I J Nagrath, "Basic Electrical Engineering", TMH, 2ed, 2007.
2. P. C Sen, "Principles of Electric machines and power electronics", John-Wiley & Sons, 2ed, 2007.

REFERENCE

1. Muhammad Rashid, "Power electronics circuit, devices and applications", Prentice-Hall of India, 3rd ed, 2004.

412BMT04 - ANALOG AND DIGITAL ICs

AIM

To understand the functions of various analog and digital IC and their applications

OBJECTIVES

- To acquire the knowledge about the characteristics and operation of various analog ICs
- To study the application of analog ICs in the designing circuit.
- To study the applications of these Digital ICs.
- To understand the basic of the Digital systems.
- To study the design of the various functional circuits using these ICs.

1. OPERATIONAL AMPLIFIERS

The characteristics of Ideal Operation – slew rate, offset voltage, bias current, CMRR, bandwidth - equivalent circuit of an op-Amp – virtual ground concept – Linear applications of op-amp – inverting and noninverting amplifier, summing, subtracting, averaging amplifier - voltage to current converter – current to voltage converter – Differential amplifiers – differentiator and integrator. Nonlinear applications – comparator - Schmitt Triggers – Precision Diode Half wave and full wave rectifiers – Average detectors – peak detector

2. ACTIVE FILTERS AND SIGNAL GENERATOR

Active filters (first and second order) – Low pass, high pass, band pass filters, band reject filters (notch filters). Oscillators - RC Phase shift and Wein-bridge. Waveform generators - Square, triangular and saw tooth.

3. TIMER, PLL, A/D AND D/A CONVERTERS

555 Timer (internal diagram) and its applications – monostable multivibrator, astable multivibrator. Phase locked Loop (565 - block diagram approach) and its applications - Frequency multiplication, Frequency translation, voltage to frequency and frequency to voltage converters. DAC – Binary weighted DAC and R-2R DAC. ADC – single slope and dual slope ADCs, successive approximation ADC

4. NUMBER SYSTEMS AND LOGIC GATES

Decimal, Binary, Octal and Hexadecimal Numbers.-Conversion between these number systems.- Complements r's and (r-1)'s complements.- subtraction using complements – Encoding numbers and characters using Binary digits. –Binary coded Decimal –Gray code - Binary to Gray code conversion –ASCII Code. Logic gates – Truth tables – NOT, AND, OR, NOR, NAND, XOR, XNOR - Boolean Laws and theorems – Solving Boolean expressions, Truth Tables and Logic circuits – The Karnaugh Map – half adder, full adder, Multiplexers and Demultiplexers - Decoders and encoders. Coding of Combination Circuits in verilog.

5. REGISTERS AND COUNTERS

Flip Flops – RS, D, T, JK Flip Flops – Characteristic equations, exciting tables – JK Master – Slave flip-flop – Universal shift register. Design of modulo-N counters – counter design using state diagram. sequential circuit design with verilog.

TEXT BOOKS

1. Ramakant A. Gayakwad , "Op-AMP and Linear Ics, Prince Hall, 1994
2. M. Morris Mano , "Digital Logic and Computer design " Prentice Hall 1994.

REFERENCE:

1. Robert B.Northrop, "Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation, CRC Press, 2004.
2. Sergio Franco, DESIGN with Operational Amplifiers and analog Integrated circuits, McGraw-Hills
3. Millman , J. Halkis.C.C "Integrated Electronics".McGraw Hill , 1972.
4. John. F. Wakerly, "Digital design principles and practices", Pearson Education,Fourth Edition, 2007 .
5. Charles H. Roth, Jr, "Fundamentals of Logic Design", Fourth edition, Jaico Books, 2002

412BMT05 - PATHOLOGY AND MICROBIOLOGY

UNIT I:

Cell Degeneration, repair and neoplasia-Cell injury and Necrosis, Apoptosis, Intracellular accumulations, Pathological calcification, cellular adaptations of growth and differentiation, Inflammation and Repair including fracture healing, Neoplasia, Classification, Benign and Malignant tumours, carcinogenesis, spread of tumours.

UNIT II:

Fluid and hemodynamic derangements, - edema, normal hemostasis, thrombosis, disseminated intravascular coagulation, embolism, infarction, shock.

Hematological disorders-Bleeding disorders, Leukaemias, Lymphomas.

UNIT III :

General Structural Organisation of bacterial and viral cell- growth and identification of bacteria, observation of culture.

Microscopy: Light microscopy, dark field microscopy, phase contrast microscopy, fluorescence and electron microscopy.

UNIT IV:

Genetic disorders, Infection and Immunity-Mutations, Autosomal and X linked disorders, Mendelian disorders, types of immune response, hypersensitivity disorders, Immune deficiency syndrome, Viral disease, Chlamydial, Bacterial, Mycoplasma, Rickettsial, Fungal, protozoal and helminthic disease.

UNIT V:

Identification of disease producing organisms, simple stain, Gram stain, AFB stain, Fluorescent techniques, antigen-antibody techniques.

TEXT BOOKS:

1. Ramzi S Cotran, Vinay Kumar & Stanley L Robbins: Pathologic Basis of diseases. WB
2. Saunders Co. 7th edn-2005.
3. Harsh Mohan: Text book of Pathology. Jaypee publishers. 4th edn. 2000.

REFERENCE:

1. **Underwood JCE:** General and Systematic Pathology Churchill Livingstone 3edn.2000.

MICROBIOLOGY

TEXT BOOK

1. Ananthanarayanan R& Panicker CKJ:Textbook of Microbiology. Orient Longmans.7th ed.2006.
2. 2..Dubey RC and Maheswari DK.A textbook of Microbiology. S Chand,2007.

REFERENCES:

1. Prescott,Harley,Klein.Microbiology.Mc Graw Hill 5th ed. 2002.
2. Manual of Microbiology tools and techniques. Kanika Sharma. Ane's student edition.2007.

412BMT06 - ANALOG AND DIGITAL COMMUNICATION

1. ANALOG MODULATION

Amplitude Modulation – AM, DSBSC, SSBSC, VSB – PSD, modulators and demodulators – Angle modulation – PM and FM – PSD, modulators and demodulators – Superheterodyne receivers

2. PULSE MODULATION

Low pass sampling theorem – Quantisation - PAM – Line coding - PCM, DPCM, DM, ADPCM and ADM, Channel Vocoder,– Time Division Multiplexing, frequency Division Multiplexing

3. DIGITAL MODULATION AND TRANSMISSION

Phase shift keying – BPSK, DPSK, QPSK - Principles of M-ary signaling M-ary PSK & QAM – Comparison, ISI – Pulse shaping – Duo binary encoding - Cosine filters – Eye pattern, equalizers

4. INFORMATION THEORY AND CODING

Measure of information – Entropy – Source coding theorem - Shannon-Fano coding, Huffman Coding, LZ Coding– Channel capacity – Shannon-Hartley law – Shannon’s limit- Error control Codes – Cyclic codes, Syndrome calculation – Convolutional Coding, Sequential and Viterbi decoding

5. SPREAD SPECTRUM AND MULTIPLE ACCESS

PN sequences – properties – m-sequence –DSSS –Processing gain, Jamming – FHSS – Synchronisation and tracking - Multiple Access – FDMA, TDMA, CDMA

TEXT BOOK:

1. H Taub, D L Schilling, G Saha, "Principles of Communication Systems" 3/e, TMH, 2007
2. S. Haykin "Digital Communications" John Wiley, 2005

REFERENCES:

1. B.P.Lathi, "Modern Digital and Analog Communication Systems", 3/e, Oxford University Press,2007
2. H P Hsu, Schaum Outline Series - "Analog and Digital Communications" TMH 2006
3. B.Sklar, "Digital Communications Fundamentals and Applications" 2/e Pearson Education 2007

412BMT07 - ENVIRONMENTAL SCIENCE AND ENGINEERING (Credit=2) (Biomedical Engineering)

AIM

The aim of this course is to create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make them sensitive to the environment problems in every professional endeavour that they participates.

OBJECTIVE

At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity. The role of government and non-government organization in environment managements.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TEXT BOOKS

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd Edition, Pearson Education, 2004.
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

REFERENCE BOOKS

1. R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press (2005).

412BMP01 - INTEGRATED CIRCUIT LAB

1. Inverting, non-inverting amplifier and comparator
2. Integrator and Differentiator
3. Active filter – first order LPF and HPF
4. Schmitt trigger using IC741
5. Instrumentation amplifier using IC741
6. Wein bridge oscillator
7. Multivibrator using IC555 Timer
8. Study of logic gates, Half adder and Full adder
9. Encoder and BCD to 7 segment decoder
10. Multiplexer and demultiplexer using digital ICs
11. Universal shift register using flipflops
12. Design of mod-N counter

LIST OF EQUIPMENTS AND COMPONENTS FOR A BATCH OF 30 STUDENTS (3 per Batch)

S.No	Name of the equipments / Components	Quantity Required	Remarks
1	Dual (0-30V) variable Power Supply	10	-
2	CRO	9	30MHz
3	Digital Multimeter	10	Digital
4	Function Generator	8	1 MHz
5	IC Tester (Analog/Digital)	2	
6	Bread board	10	
Consumables (Minimum of 25 Nos. each)			
1	IC 741	25	
2	IC NE555	25	
3	LED	25	
4	Potentiometer		
5	Seven Segment Display	25	
6	Capacitor		
7	Resistors 1/4 Watt Assorted	25	
8	Single Strand Wire	25	
9	Encoder and Decoder ICs (IC7445, IC 74147)	25	
10	Multiplexer and Demultiplexer ICs. (IC74150, IC74154)	25	
11	Shift register ICs, Counter ICs	25	
12	IC7400	25	
13	IC7404	25	
14	IC7402		
15	IC7408	25	
16	IC7411	25	
17	IC7432	25	

412BMP02 - PATHOLOGY AND MICROBIOLOGY LAB.

1. Urine physical and chemical examination (protein, reducing substances, ketones, bilirubin and blood)
2. Hematoxylin and eosin staining.
3. Study of parts of compound microscope
4. Histopathological slides of benign and malignant tumours.
5. Manual tissue processing and section cutting (demonstration)
6. Simple stain.
7. Gram stain.
8. AFB stain.
9. Slides of malarial parasites, micro filaria and leishmania donovani.
10. Haematology slides of anemia and leukemia
11. Bleeding time and clotting time.
12. Study of bone marrow charts

(Lab Requirement for a both of Semester)

- 1) Test tubes, Test tube racks, Bunsen burner(gas),(Benedict's solution, Acetic acid,Sulphosalicylic acid), centrifuge, microscope.
- 2) Slides, cover slips,H & E stains
- 3) Microscope
- 4) Beakers,graded alcohols, acetone, moulds(or maling bodies), paradigm wax, water bath, microtome for section cutting,slides,cover slips,hotair oven,refrigerator to store chemical and ice.
- 5) Whatman filter paper for bleeding time Test tubes.
- 6) Simple Stain test
SIMPLE STAIN, Glass Slide
Reagents - Methylene blue, Crystal Violet, Carbal Iushin
- 7) Gram Stain test
SIMPLE GRAM STAIN
Reagents - Crystal Violet, Gram's Iodine, 95% ethyl alcohol Safranin
Urine bacterial count/ml exceeding 100,000(10⁵) denotes urinary tract infection.
Normal : 0-100 ml
Glass Slide
- 8) AFB Strain test
ACID FAST STAIN (ZIEHL - NEELSON METHOD)
Reagent - Carbal Iushin, Acid Alcohol, Methylene blue, Glass slide
- 9) Bone marrow charts

FIFTH SEMESTER

512BMT01 - DIGITAL SIGNAL PROCESSING

AIM

To study the signal processing methods and processors

OBJECTIVES

- To study the design techniques of IIR and FIR filters
- To study the structure realization method for IIR and FIR filters
- To study the finite word length effects in signal processing
- To study power spectrum estimation
- To study multirate signal processing

UNIT I FINITE IMPULSE RESPONSE (FIR) FILTER

Introduction to FIR filter - phase delay and group delay – linear phase transfer function. Design of FIR filter using Fourier method, Rectangular window, Hanning window, Hamming window, Kaiser window. Design using frequency sampling technique. Structure realization of FIR system – direct form, cascade form, linear phase FIR system.

UNIT II INFINITE IMPULSE RESPONSE (IIR) FILTERS

Introduction to IIR filter - Impulse-invariant transformation technique – Bilinear transformation technique – frequency transformation in digital domain - design of Butterworth filter and Chebyshev filter (type-1) (restricted to 3rd order). Structure realization of IIR system – lattice structure and lattice-ladder structure.

UNIT III FINITE WORD LENGTH EFFECT IN FIR AND IIR FILTER

Quantization of fixed-point and floating-point numbers – product quantization – variance estimation of quantization error – finite word length effect on IIR filter – Product quantization error in IIR filter – mathematical analysis of steady state output noise – dynamic scaling to prevent overflow – limit-cycle oscillation in recursive system – rounding-off error in DFT and FFT computation.

UNIT IV BASICS OF RANDOM SIGNAL PROCESSING (ONLY QUALITATIVE ANALYSIS)

Introduction to probability function, joint probability, conditional probability – estimation parameters – joint distribution function, probability density function, ensemble average – mean squared value, variance, standard deviation, moments, correlation, covariance, orthogonality, auto-covariance, auto-correlation, cross-covariance and cross-correlation – stationarity – ergodic – white noise – energy density spectrum – power density spectrum estimation – periodogram – direct method, indirect method, Barlett method – Welch method. Decimator (down sampling) – frequency-domain analysis of decimator – interpolation (up sampling) – frequency-domain analysis of interpolator.

UNIT V INTRODUCTION TO DIGITAL SIGNAL PROCESSORS

Programmable DSP – multiplier accumulator – over-flow and under-flow in MAC unit – Van-Neumann architecture – Harvard architecture – cache memory – pipelining – computer configuration – RISC – CISC – addressing modes – replication – TMS320 processor – first to fifth generation (only block diagram approach) – architecture and features.

TEXT BOOKS:

1. E. C. Ifeachor and B.W. Jervis, "Digital Signal processing – A Practical Approach", Pearson education, New Delhi, 4th Edition, 2004.
2. John G. Proakis and Dimitris G. Manolakis, "Digital Signal Processing, Algorithms and Applications", Pearson education, New Delhi, 4th Edition, 2007.

REFERENCES:

1. Sanjit K. Mitra, "Digital Signal Processing – A computer Based Approach", TMH, New Delhi, 1998.
2. Andreas Antoniou, Digital filter Analysis and Design", Prentice Hall India.
3. R. Rabiner and B. Gold, "Theory and Application of Digital Signal processing", PHI.

512BMT02 - BIOCONTROL SYSTEMS

AIM

By studying various control systems modeling technique, time response analysis and frequency response analysis, biological control systems can be analyzed and understood.

OBJECTIVES

- To study concept and different mathematical techniques applied in analyzing any given system
- To learn to do the analysis of given system in time domain and frequency domain
- To study the techniques of plotting the responses in both domain analysis
- To study techniques of modeling the physiological systems

UNIT I CONTROL SYSTEM MODELLING

Terminology and basic structure of control system, example of a closed loop system, transfer functions, modeling of electrical systems, translational and rotational mechanical systems, electromechanical systems, block diagram and signal flow graph representation of systems, conversion of block diagram to signal flow graph, reduction of block diagram and signal flow graph.

UNIT II TIME RESPONSE ANALYSIS

Step and Impulse responses of first order and second order systems, determination of time domain specifications of first and second order systems from its output responses. definition of steady state error constants and its computation, definition of stability, Routh-Hurwitz criteria of stability, root locus technique, construction of root locus and study of stability, definition of dominant poles and relative stability .

UNIT III FREQUENCY RESPONSE ANALYSIS

Frequency response, Nyquist stability criterion, Nyquist plot and determination of closed loop stability, definition of gain margin and phase margin, Bode plot, determination of gain margin and phase margin using Bode plot, use of Nichol's chart to compute resonance frequency and band width.

UNIT IV PHYSIOLOGICAL CONTROL SYSTEMS

Block diagram representation of the muscle stretch reflex, difference between engineering and physiological control systems, generalized system properties , models with combination of system elements, introduction to simulation.

UNIT V PHYSIOLOGICAL SYSTEM MODELING

Linear model of respiratory mechanics, model of chemical regulation of ventilation, linear model of muscle mechanics, model of regulation of cardiac output, model of Neuromuscular reflex motion.

TEXT BOOKS:

1. M. Gopal "Control Systems Principles and design", Tata McGraw Hill ,2002
2. Benjamin C. Kuo, "Automatic control systems", Prentice Hall of India, 1995
3. Michael C K Khoo, "Physiological control systems", IEEE press, Prentice -Hall of India, 2001.

REFERENCES:

1. John Enderle, Susan Blanchard, Joseph Bronzino "Introduction to Biomedical Engineering" second edition, Academic Press, 2005.
2. Richard C. Dorf, Robert H. Bishop, " Modern control systems", Pearson, 2004

512BMT03 - DIAGNOSTIC AND THERAPEUTIC EQUIPMENT - I

UNIT I CARDIAC EQUIPMENTS

Electrocardiograph, Normal and Abnormal Waves, Heart rate monitor, Arrhythmia Simulator, Holter Monitor, Phonocardiography, Plethysmography. Cardiac Pacemaker- Internal and External Pacemaker-Batteries, AC and DC Defibrillator- Internal and External.

UNIT II NEUROLOGICAL EQUIPMENTS

Clinical significance of EEG, Multi channel EEG recording system, Epilepsy, Evoked Potential – Visual, Auditory and Somatosensory, MEG (Magneto Encephalon Graph). EEG Bio Feedback Instrumentation.

UNIT III SKELETAL MUSCULAR SYSTEM

Sliding theory of contraction, recording and analysis of EMG waveforms, fatigue characteristics , Muscle stimulators, nerve stimulators, Nerve conduction velocity measurement, EMG Bio Feedback Instrumentation.

UNIT IV RESPIRATORY MEASUREMENT STSTEM

Instrumentation for measuring the mechanics of breathing – Spirometer-Lung Volume and vital capacity, measurements of residual volume, pneumotachometer – Airway resistance measurement, Whole body plethysmography, Intra-Alveolar and Thoracic pressure measurements, Apnea Monitor. Types of Ventilators – Pressure, Volume, Time controlled. Flow, Patient Cycle Ventilators, Humidifiers, Nebulizers, Inhalators.

UNIT V SENSORY MEASUREMENT

Psycho Physiological Measurements-for testing and sensory Responses, Electro oculograph, Electro retinograph, Audiometer-Pure tone, Speech. EGG (Electrogastrograph), galvanic skin resistance(GSR).

TEXT BOOKS:

1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical equipment technology", Pearson education, 2003.
2. John G.Webster, Medical Instrumentation Application and Design, third edition, Wiley India Edition, 2007.

REFERENCES:

1. Myer Kutz, "Standard Handbook of Biomedical Engineering & Design", McGraw Hill, 2003.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, New Delhi, 2003.
3. L.A Geddes and L.E.Baker, "Principles of Applied Biomedical Instrumentation",
4. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Pearson Education, New Delhi, 2007.

512BMT04 - BIOMATERIALS AND ARTIFICIAL ORGANS

UNIT I STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY

Definition and classification of bio-materials, mechanical properties, visco elasticity, wound-healing process, body response to implants, blood compatibility.

UNIT II IMPLANT MATERIALS

Metallic implant materials, stainless steels, co-based alloys, Ti-based alloys, ceramic implant materials, aluminum oxides, hydroxyapatite glass ceramics carbons, medical applications.

UNIT III POLYMERIC IMPLANT MATERIALS

Polymerization, polyamides, Acrylic polymers, rubbers, high strength thermoplastics, medical applications. Bio polymers: Collagen and Elastin.

UNIT IV TISSUE REPLACEMENT IMPLANTS

Soft-tissue replacements, sutures, surgical tapes, adhesive, Percutaneous and skin implants, maxillofacial augmentation, blood interfacing implants, hard tissue replacement implants, internal fracture fixation devices, joint replacements.

UNIT V ARTIFICIAL ORGANS

Artificial Heart, Prosthetic Cardiac Valves, Artificial lung (oxygenator), Artificial Kidney (Dialyser membrane) , Dental Implants.

TEXT BOOKS:

1. Sujata V. Bhatt, Biomaterials Second Edition, Narosa Publishing House,2005.
2. Joon B.Park Joseph D. Bronzino, Biomaterials - Principles and Applications – CRC Press, 2003

REFERENCES:

1. Park J.B., "Biomaterials Science and Engineering", Plenum Press, 1984.
2. Standard Handbook of Biomedical Engineering & Design – Myer Kutz, McGraw-Hill, 2003.
3. Introduction to Biomedical Engineering – John Enderle, Joseph D. Bronzino, Susan M. Blanchard, Elsevier, 2005.

512BMT05 - MICROPROCESSOR, MICROCONTROLLER AND SYSTEM DESIGN

UNIT I ARCHITECTURE OF 8085 /8086

8085- Functional Block Diagram- Description - Addressing Modes, Timing diagrams. 8086- Architecture, Instruction set, Addressing Modes. Introduction to 8087 - Architecture.

UNIT II 8086 ASSEMBLY LANGUAGE PROGRAMMING

Simple Assembly Language Programming, Strings, Procedures, Macros, Assembler Directives- Interrupts and Interrupt Applications.

UNIT III PERIPHERAL INTERFACING & APPLICATION

Programmable Peripheral Interface (8255), keyboard display controller (8279), ADC, DAC Interface, Programmable Timer Controller (8254), Programmable interrupt controller (8259), Serial Communication Interface (8251).

UNIT IV MICROCONTROLLER

Architecture of 8051 Microcontroller- Instruction Set – Assembly Language Programming – Branching, I/O and ALU Instructions. Programming 8051 - Timers, Serial Port, Interrupts. C programming for 8051.

UNIT V 8086 AND 8051 BASED SYSTEM DESIGN

Design and interfacing - LED, LCD & Keyboard Interfacing, ADC, DAC, Sensor Interfacing, External Memory Interface Traffic light controller, Washing machine, RTC Interfacing using I2C Standard, Motor Control, Relay, PWM, DC, Stepper Motor Multichannel biomedical data acquisition system.

TEXTBOOKS:

1. Ramesh S. Gaonkar, Microprocessor Architecture Programming and Applications with 8085. Fourth edition, Penram International Publishing 2006.
2. Douglas V.Hall, Microprocessor and Interfacing, Programming and Hardware. Revised second Edition, Indian edition, Tata McGraw Hill, 2007.
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay The 8051 Microcontroller and Embedded Systems, Second Edition, Pearson Education 2008.

REFERENCES:

1. Kenneth J.Ayala., "The 8051 Microcontroller, 3rd Edition, Thompson Delmar Learning, New Delhi, 2007.
2. A.K. Ray , K.M .Bhurchandi "Advanced Microprocessor and Peripherals" ,Second edition, Tata McGraw-Hill, 2007.
3. Barry B.Brey, "The Intel Microprocessors Architecture, Programming and Interfacing" Pearson Education, New Delhi, 2007,
4. Zdravko Karakehayov, "Embedded System Design with 8051 Microcontroller hardware and software", Mercel Dekkar, 1999.
5. Krishna Kant, " Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051 and 8096, PHI, 2007.

512BMT06 - HOSPITAL MANAGEMENT

UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION

Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning – Equipment Planning – Functional Planning.

UNIT II HUMAN RESOURCE MANAGEMENT ON HOSPITAL

Principles of HRM – Functions of HRM – Profile of HRD Manager – Tools of HRD – Human Resource Inventory – Manpower Planning.

UNIT III RECRUITMENT AND TRAINING

Different Departments of Hospital, Recruitment, Selection, Training Guidelines – Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer.

UNIT IV PLANNING SUPPORTIVE SERVICES

Medical Records Department – Central Sterilization and Supply Department – Pharmacy – Food Services – Laundry Services.

UNIT V COMMUNICATION AND SAFETY ASPECTS IN HOSPITAL

Purposes – Planning of Communication, Modes of Communication – Telephone, ISDN, Public Address and Piped Music – CCTV. Security – Loss Prevention – Fire Safety – Alarm System – Safety Rules.

TEXT BOOKS:

1. R.C.Goyal, "Hospital Administration and Human Resource Management", PHI –
2. Fourth Edition, 2006.
3. G.D.Kunders, "Hospitals – Facilities Planning and Management – TMH, New Delhi –
4. Fifth Reprint 2007.

REFERENCE:

1. Cesar A.Caceres and Albert Zara, "The Practice of Clinical Engineering, Academic Press, New York, 1977.

512BMP01 - MICROPROCESSOR AND MICROCONTROLLER LAB

8085 based experiments

1. Assembly Language Programming of 8085

8086 based experiments

1. Programs for 16 bit Arithmetic, Sorting, Searching and String operations,
2. Programs for Digital clock, Interfacing ADC and DAC
3. Interfacing and Programming 8279, 8259, and 8253.
4. Serial Communication between two Microprocessor Kits using 8251.
5. Interfacing and Programming of Stepper Motor and DC Motor Speed control and Parallel Communication between two Microprocessor Kits using Mode 1 and Mode 2 of 8255.
6. Macroassembler Programming for 8086

8051 based experiments

1. Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.
2. Programming and verifying Timer, Interrupts and UART operations in 8051 microcontroller.
3. Interfacing – DAC and ADC and 8051 based temperature measurement
4. Interfacing – LED and LCD
5. Interfacing – stepper motor traffic light control
6. Communication between 8051 Microcontroller kit and PC.

Requirement for a batch of 30 students

S. No.	Description of Equipment	Quantity Required
1.	8085 Trainer Kit	15 Nos.
2.	8051 Trainer Kit	15 Nos.
3.	8086 Trainer Kit	15 Nos.
4.	8255 Addon card (PPI) compatible with 8085/8051/8086	3 Nos.
5.	8251 Addon card (Serial) compatible with 8085/8051/8086	3 Nos.
6.	8279 Addon card compatible with 8085/8051/8086	3 Nos.
7.	Stepper Motor & Interfacing card Compatible	3 Nos.
8.	ADC x DAC Interfacing card compatible with 8085/8051/8086	3 Nos.
9.	LED & LCD Interfacing card	3 Nos.
10.	8086 Macro assembler with PC P(IV)	3 Nos.
11.	Personal Computer	1 Nos.

512BMP02 - BIOMEDICAL INSTRUMENTATION LAB

1. Design of low noise pre-amplifier for ECG
2. Study of characteristics of temperature sensors – thermistor, thermocouple and RTD
3. Measurement of pulse rate using photo transducer
4. Measurement of respiration rate
5. Measurement of blood flow velocity using ultrasound transducer
6. Study of ESU – cutting and coagulation modes
7. pH Measurement and conductivity test
8. Measurement of heart rate using F-V converter
9. Galvanic skin resistance (GSR) measurement
10. Recording of Audiogram

Requirement for a batch of 30 students

S. No.	Description of Equipment	Quantity Required
1.	Low Persistence CRO	3 Nos.
2.	Low Frequency Oscillator (1 Hz to 5 KHz and above)	5 Nos.
3.	Digital Multimeter	5 Nos.
4.	Thermistor, Thermocouple, RTD module with accessories	1 No.
5.	Pulse rate measurement setup with accessories	1 No.
6.	Respiration rate measurement setup with accessories	1 No.
7.	Ultrasound Doppler flow meter	1 No.
8.	Electrosurgical unit	1 No.
9.	GSR Measurement setup with accessories	1 No.
10.	Audiometer (air conduction, bone conduction test)	1 No.
11.	PH meter	1 No.
12.	Conductivity meter	1 No.
13.	CRO (0-5 MHz)	5 Nos.
14.	Op-Amp [μ A741 or equivalent]	10 Nos.

SIXTH SEMESTER

612BMT01 - RADIOLOGICAL EQUIPMENT

AIM

To get the clear understanding of X-ray generation and radio isotopes and various techniques used for visualizing organs in detail.

OBJECTIVES

- To study the functioning of X-ray tubes and scattered radiation and method by which foginess can be reduced.
- To study the different types radio diagnostic unit.
- To know the techniques to visualize opaque, transparent organs.
- To study the special techniques adopted to visualize different sections of any organ.

UNIT I MEDICAL X-RAY EQUIPMENT

Nature of X-Rays - X-ray Absorption - Tissue Contrast. X-Ray Equipment (Block Diagram) – X-ray Tube, the collimator, Bucky Grid, power supply. Digital Radiography - discrete digital detectors, storage phosphor and film Scanning. X-Ray Image intensifier tubes - Fluoroscopy – Digital Fluoroscopy. Angiography, Cine angiography. Digital Subtraction Angiography. Mammography.

UNIT II COMPUTER TOMOGRAPHY

Principles of Tomography - First to Fourth generation scanners – Image reconstruction technique- Back projection and Iterative method. Spiral CT Scanning - Ultra fast CT Scanners- X-Ray Sources – Collimation – X-Ray Detectors – Viewing System.

UNIT III MAGNETIC RESONANCE IMAGING

Fundamentals of Magnetic Resonance- Interaction of nuclei with static Magnetic Field and Radio frequency wave – Rotation and Precession –induction of a magnetic resonance signal – bulk Magnetization – Relaxation Processes T1 and T2. Block diagram approach of MRI system- System Magnet (Permanent, Electromagnet and super conductors) , generation of Gradient magnetic Fields , Radio Frequency coils (sending and receiving) Shim coils, Electronic components.

UNIT IV NUCLEAR MEDICINE SYSTEMS

Radio isotopes- alpha, beta and gamma radiations. Radio pharmaceuticals. Radiation detectors - Gas Filled, ionization Chambers, proportional counter, GM counter and Scintillation Detectors. Gamma Camera- Principle of operation, Collimator, Photo multiplier tube, X-Y Positioning Circuit, Pulse height Analyzer. Principles of SPECT and PET.

UNIT V RADIATION THERAPY AND RADIATION SAFETY

Radiation therapy-Linear accelerator, betatron, cesium and cobalt .Radiation Protection in Medicine –Radiation Protection principles, Radiation measuring instruments- Dosimeter, film Badges, Thermo luminescent dosimeters – Electronic dosimeter- ICRP regulation Practical reduction of dose to staff and visitors.

TEXT BOOKS

1. Steve webb, Physics of Medical Imaging, , Taylor and Francis, 1988.
2. R. Hendee and Russell Ritenour "Medical Imaging Physics"-William,Wiley, Fourth Edition 2002.

REFERENCE BOOKS

1. Physics and Radiobiology of Nuclear Medicine –Third edition – Gopal B.Saha – Publisher – Springer, 2006.
2. Medical Physics and Biomedical Engineering –B.H Brown , PV Lawford, R H Small wood , D R Hose , D C Barber , CRC Press, 1999.
3. Standard handbook of Biomedical Engineering and Design – Myer Kutz Publisher – McGraw – Hill, 2003.
4. P.Raghunathan, "Magnetic Resonance Imaging and Spectroscopy in Medicine" Concepts and Techniques, Orient Longman, 2007.

612BMT02 – BIOMECHANICS

UNIT I INTRODUCTION

Scope of mechanics in medicine, mechanics of bone structure, determination of in-vivo elastic modulus. Biofluid mechanics, flow properties of blood.

UNIT II MECHANICS OF PHYSIOLOGICAL SYSTEMS

Heart valves, power developed by the heart, prosthetic valves. Constitutive equations for soft tissues, dynamics of fluid flow in cardiovascular system and effect of vibration - shear stresses in extra-corporal circuits.

UNIT III ORTHOPAEDIC MECHANICS

Mechanical properties of cartilage, diffusion properties of articular cartilage, mechanical properties of bone, kinetics and kinematics of joints, Lubrication of joints.

UNIT IV MATHEMATICAL MODELS

Introduction to Finite Element Analysis, Mathematical models - pulse wave velocities in arteries, determination of in-vivo elasticity of blood vessel, dynamics of fluid filled catheters.

UNIT V ORTHOPAEDIC APPLICATIONS

Dynamics and analysis of human locomotion - Gait analysis (determination of instantaneous joint reaction analysis), occupant response to vehicular vibration. Mechanics of knee joint during standing and walking.

TEXT BOOKS:

1. Dhanjoo N. Ghista, "Bio-mechanics of Medical Devices", Marcel Dekker, 1980.
2. Haufred Clynes, "Bio-medical Engineering Systems", McGraw Hill, 1998.

REFERENCES

1. Y.C. Fung, "Bio-Mechanics- Mechanical Properties of Tissues", Springer-Verlag, 1998.
2. Dhanjoo N. Ghista, "Orthopaedic Mechanics", Academic Press, 1990.

612BMT03 - DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS-II

UNIT I ULTRASONIC TECHNIQUE

Diagnosis: Basic principles of Echo technique, display techniques A, B and M mode, Application of ultrasound as diagnostic tool – Echocardiogram, abdomen, obstetrics and gynaecology, ophthalmology.

UNIT II PATIENT MONITORING AND BIOTELEMETRY

ICU/CCU Equipments, Infusion pumps, bed side monitors, Central consoling controls. Radio Telemetry (single, multi), Portable and Landline Telemetry unit, Applications in ECG and EEG Transmission.

UNIT III DIATHERMY

IR and UV lamp and its application. Thermography – Recording and clinical application. Short wave diathermy, ultrasonic diathermy, Microwave diathermy, Electro surgery machine - Current waveforms, Tissue Responses, Electro surgical current level.

UNIT IV EXTRA CORPOREAL DEVICES AND SPECIAL DIAGNOSTIC TECHNIQUES

Need for heart lung machine, functioning of bubble, disc type and membrane type oxygenators, finger pump, roller pump, electronic monitoring of functional parameter. Haemo Dialyser unit , Lithotripsy, Principles of Cryogenic technique and application, Endoscopy, Laproscopy.

UNIT V PATIENT SAFETY

Physiological effects of electricity – important susceptibility parameters – Macro shock – Micro shock hazards – Patient’s electrical environment – Isolated Power system – Conductive surfaces – Electrical safety codes and standards – Basic Approaches to protection against shock, Protection equipment design, Electrical safety analyzer – Testing the Electric system.

TEXT BOOK

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007
2. John G. Webster, "Medical Instrumentation Application and Design", John Willey and sons, 2002
3. Joseph J. Carr and John M. Brown, "Introduction to Biomedical equipment technology", John Willey and sons, New York, 1997

REFERENCE BOOKS

1. Principles of Biomedical Instrumentation and Measurement" – Richard Aston, Merrill Publishing Company, 1990.
2. Principles of Applied Biomedical Instrumentation L.A Geddas and L.E.Baker – 2004.
3. John G. Webster, "Bioinstrumentation", John Willey and sons, New York, 2004.
4. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw- Hill, New Delhi, 2003.
5. Standard Handbook of Biomedical Engineering & Design – Myer Kutz McGraw-Hill Publisher, 2003.

612BMT04 - INTERNET AND JAVA

UNIT I WORLD WIDE WEB

HTTP protocol, Web browsers Netscape, Internet explorer, Web site and web page design, XHTML, Dynamic HTML, CSS.

UNIT II JAVASCRIPT PROGRAMMING

Introduction, Control statements, Functions, Arrays and Objects.

UNIT III

Micromedia Dream Weaver, XML, Web Servers, Databases – SQL, MYSQL, DBI and ADO.NET.

UNIT IV JAVA PROGRAMMING

Language features, Classes, Object and methods. Sub-classing and dynamic binding, Multithreading, Overview of class library, Object method serialization, Remote method invocation, Java Servlets and Javasever pages.

UNIT V WEB DESIGN AND MEDICAL STANDARDS

Web Design case studies – Design and development of Dynamic Hospital Information System Web sites using Macromedia Dreamweaver, Java, XML, Javascript, Programming Techniques. HL7 Standards, DICOM standards.

TEXT BOOKS:

1. Deitel, Internet and World Wide Web, Pearson Education / PHI, 2007
2. Deitel, "Java How to Program", Pearson Education / PHI, 2006.
3. Herbert Schildt, The complete Reference JAVA 2, Fifth Edition, Tata McGRaw Hill Publishing Com.Ltd, New Delhi.
4. Achyut S Godbole and Atul Kahate, Web Technologies, TCP / IP to Internet Application Architecture, TMH, 2007.

REFERENCES:

1. Margaret Levine Young, "Internet The Complete Reference", Tata McGraw Hill, 1999.
2. Cay S. Horstmann & Gary Cornell, Core Javatm Volume – I & II, Pearson Education, 2006.
3. Balagurusamy.E.` Programming with Java, A premier` Second Edition, Tata McGraw Hill,2006

ELECTIVE I & II

612BMT05 - BIOFLUIDS AND DYNAMICS

UNIT I

BIO-FLUID MECHANICS: Newton's laws, Stress, Strain, Elasticity, Hooks-law, viscosity, Newtonian fluid, Non-Newtonian fluid, Viscoelastic fluids, vascular tree, Relationship between diameter, velocity and pressure of blood flow, Resistance against flow. BIOVISCOELASTIC FLUID: Viscoelasticity - Viscoelastic models, Maxwell, Voigt and Kelvin Models, Response to Harmonic variation, Use of viscoelastic models, Bio- Viscoelastic fluids: Protoplasm, Mucus, Saliva, Synovial fluids.

UNIT II

FLOW PROPERTIES OF BLOOD: Physical, Chemical and Rheological properties of blood. Apparent and relative viscosity, Blood viscosity variation: Effect of shear rate, hematocrit, temperature, protein contents of blood. Casson's equation, Problems associated with extracorporeal blood flow. RHEOLOGY OF BLOOD IN MICROVESSELS: Fahraeus -Lindquist effect and inverse effect, distribution of suspended particles in a narrow rigid tube. Nature of red blood cells in tightly fitting tubes, hematocrit in very narrow tube.

UNIT III

CARDIAC MECHANICS: Cardiovascular system. Mechanical properties of blood vessels: arteries, arterioles, capillaries and veins. Blood flow: Laminar and Turbulent, Physics of cardiovascular diseases, Prosthetic heart valves and replacements.

RESPIRATORY MECHANICS: Alveoli mechanics, Interaction of Blood and Lung P-V curve of Lung: Breathing mechanism, Airway resistance, Physics of Lung diseases.

UNITIV

SOFT TISSUE MECHANICS: Pseudo elasticity, non-linear stress-strain relationship, Viscoelasticity, Structure, function and mechanical properties of skin, ligaments and tendons.

UNIT V

ORTHOPEDIC MECHANICS: Mechanical properties of cartilage, diffusion properties of Articular cartilage, mechanical properties of bone, kinetics and kinematics of joints, lubrication of joints.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Y.C Fung, Biomechanics- Mechanical properties of living tissues,2nd ed, Springer-Verlag, 1993.
2. D.O Cooney, Biomedical engineering Principles. Marcel Dekker, INC New York.1976.

REFERENCES:

1. Silver Frederick H. Biomaterials, Medical Devices & Tissue Engineering: Chapman & Hall, London, 1994
2. Biomechanics by Nihanth ozkai,
D.A Mc Donald, Blood flow in arteries, Edward Arnold ltd, 1998.

612BMT06 – BIOMETRIC SYSTEMS

UNIT I BIOMETRIC FUNDAMENTALS

Key Biometric terms and Processes – Definitions-verification and identification – matching, Accuracy in Biometric Systems – False match rate - False nonmatch rate - Failure to enroll rate – Derived metrics - An Introduction to Biometric Authentication Systems- a taxonomy of application environment, a system model, biometrics and privacy.

UNIT II FINGERPRINT IDENTIFICATION TECHNOLOGY

History, Components, Application of Fingerprints, The Technology- Finger Scan Strengths and Weaknesses, Criminal Applications, Civil Applications, Commercial Applications, Technology Evaluation of Fingerprint Verification Algorithms.

UNIT III IRIS RECOGNITION

Introduction, Anatomical and Physiological underpinnings, Components, Sensing, Iris Scan Representation and Matching, Iris Scan Strengths and Weaknesses, System Performance, Future Directions.

UNIT IV FACE RECOGNITION

Introduction, components, Facial Scan Technologies, Face Detection, Face Recognition- Representation and Classification, Kernel- based Methods and 3D Models, Learning the Face Spare, Facial Scan Strengths and Weaknesses, Methods for assessing progress in Face Recognition.

UNIT V VOICE SCAN

Introduction, Components, Features and Models, Addition Method for managing Variability, Measuring Performance, Alternative Approaches, Voice Scan Strengths and Weaknesses, NIST Speaker Recognition Evaluation Program, Biometric System Integration.

TEXT BOOK:

1. James Wayman & Anil Jain, Biometric Systems – Technology, Design and Performance Evaluation, Springer-verlag London Ltd, USA, 2005
2. 2.Sanir Nanavati, Michael Thieme, Biometrics Identity Verification in a Networked world, Wiley Computer Publishing Ltd, New Delhi,2003.

REFERENCE:

1. John D. Woodward Jr., Biometrics, Dreamtech Press, New Delhi, 2003.

612BMT07 - COMPUTER ARCHITECTURE AND ORGANIZATION

UNIT I INTRODUCTION

Computing and Computers, Evolution of Computers, VLSI Era, System Design- Register Level, Processor Level, CPU Organization, Data Representation, Fixed – Point Numbers, Floating Point Numbers, Instruction Formats, Instruction Types. Addressing modes.

UNIT II DATA PATH DESIGN

Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Combinational and Sequential ALUs, Carry look ahead adder, Robertson algorithm, booth's algorithm, non-restoring division algorithm, Floating Point Arithmetic, Coprocessor, Pipeline Processing, Pipeline Design, Modified booth's Algorithm

UNIT III CONTROL DESIGN

Hardwired Control, Microprogrammed Control, Multiplier Control Unit, CPU Control Unit, Pipeline Control, Instruction Pipelines, Pipeline Performance, Superscalar Processing, Nano Programming.

UNIT IV MEMORY ORGANIZATION

Random Access Memories, Serial - Access Memories, RAM Interfaces, Magnetic Surface Recording, Optical Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associative Memory.

UNIT V SYSTEM ORGANIZATION

Communication methods, Buses, Bus Control, Bus Interfacing, Bus arbitration, IO and system control, IO interface circuits, Handshaking, DMA and interrupts, vectored interrupts, PCI interrupts, pipeline interrupts, IOP organization, operation systems, multiprocessors, fault tolerance, RISC and CISC processors, Superscalar and vector processor.

TEXT BOOK:

1. John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, Third edition, 1998.
2. V.Carl Hamacher, Zvonko G. Varanescic and Safat G. Zaky, " Computer Organisation", V edition, McGraw-Hill Inc, 1996.

REFERENCES:

1. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000.
2. Paraami, "Computer Architecture", BEH R002, Oxford Press.
3. P.Pal Chaudhuri, , "Computer organization and design", 2nd Ed., Prentice Hall of India, 2007.
4. G.Kane & J.Heinrich, ' MIPS RISC Architecture ', Englewood cliffs, New Jersey, Prentice Hall, 1992.

612BMT08 - DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING

UNIT I PRINCIPLES OF OBJECT ORIENTED PROGRAMMING

Introduction- Tokens-Expressions-contour Structures –Functions in C++, classes and objects, constructors and destructors, operators overloading and type conversions.

UNIT II ADVANCED OBJECT ORIENTED PROGRAMMING

Inheritance, Extending classes, Pointers, Virtual functions and polymorphism, File Handling Templates, Exception handling, Manipulating strings.

UNIT III DATA STRUCTURES & ALGORITHMS

Algorithm, Analysis, Lists, Stacks and queues, Priority queues-Binary Heap-Application, Heaps, skew heaps, Binomial –hashing-hash tables without linked lists

UNIT IV NONLINEAR DATA STRUCTURES

Trees-Binary trees, search tree ADT, AVL trees splay Trees, B-trees, Sets and maps in standard Library, Graph Algorithms-Topological sort, shortest path algorithm network flow problems-minimum spanning tree applications of depth-first-search-Introduction to NP - completeness.

UNIT V SORTING AND SEARCHING

Sorting – Insertion sort, Shell sort, Heap sort, Merge sort, Quick sort, Indirect sorting, Bucket sort, External sorting, Disjoint set class, Algorithm Design Techniques –Greedy algorithm, Divide and Conquer, Dynamic Programming, Randomized Algorithm, Back tracking algorithm.

TEXT BOOKS:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 3rd ed, Pearson Education Asia, 2007.
2. E. Balagurusamy, " Object Oriented Programming with C++", McGraw Hill Company Ltd., 2007.

REFERENCES:

1. Michael T. Goodrich, "Data Structures and Algorithm Analysis in C++", Wiley student edition, 2007.
2. Sahni, "Data Structures Using C++", The McGraw-Hill, 2006
3. Sourav Sahay, object oriented programming with C++, Oxford University Press, New Delhi,2006.
4. Seymour, "Data Structures", The McGraw-Hill, 2007.

612BMT09 - INTELLECTUAL PROPERTY RIGHTS (IPR)

UNIT I

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (i). Movable Property - Immovable Property and - Intellectual Property.

UNIT II

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures..

UNIT III

International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT) – TRIPS Agreement.

UNIT IV

Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.

UNIT V

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

TEXT BOOKS:

1. Subbaram N.R. "Handbook of Indian Patent Law and Practice ", S. Viswanathan Printers and Publishers Pvt. Ltd., 1998.

REFERENCES:

1. Eli Whitney, United States Patent Number: 72X, Cotton Gin, March 14, 1794.
2. Intellectual Property Today: Volume 8, No. 5, May 2001, [www.iptoday.com].
3. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000. www.ipmatters.net/features/000707_gibbs.html.

612BMT10 - INDIAN CONSTITUTION AND SOCIETY

UNIT I

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

UNIT II

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

UNIT III

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries – Assessment of working of the Parliamentary System in India.

UNIT V

Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

TEXT BOOKS:

1. Durga Das Basu, " Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.
2. R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.
3. Maciver and Page, " Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.
4. K.L.Sharma, (1997) "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi.

REFERENCES:

1. Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

612BMP01 - DIGITAL SIGNAL PROCESSING LAB

MATLAB / Equivalent Software Package (30% of the course)

1. Generation of sequences (functional & random), correlation and convolution
2. Spectrum Analysis using FFT
3. Filter Design & Analysis
4. Filter Implementation in time-domain & frequency domain
5. Study of Quantization errors in DSP algorithms
6. Multirate Filters
7. Adaptive filter
8. Equalization
9. Echo Cancellation

DSP Processor Implementation (70% of the course)

1. Waveform Generation
2. FIR Implementation
3. IIR Implementation
4. FFT
5. Finite word Length effect
6. Multirate filters

612BMP02 - INTERNET AND JAVA PROGRAMMING LABORATORY

1. Programs using basic elements and design of Web pages, hyperlinks and web navigation using HTML, XHTML and CSS.
2. Java script programs using control statements, functions, arrays and objects and applications in web environment
3. Macromedia Dreamweaver platform to design and develop web pages, insert images and links into web pages, create XHTML elements to be able insert script into Dreamweaver pages and site management
4. Programs relating to relational database model, database queries using SQL, MYSQL database server and interfaces
5. Design a Java interface for ADT Stack. Develop two different classes that implement this interface, one using array and the other using linked-list. Provide necessary exception handling in both the implementations.
6. Design a Vehicle class hierarchy in Java. Write a test program to demonstrate polymorphism.
7. Design classes for Currency, Rupee, and Dollar. Write a program that randomly generates Rupee and Dollar objects and write them into a file using object serialization. Write another program to read that file, convert to Rupee if it reads a Dollar, while leave the value as it is if it reads a Rupee.
8. Design a scientific calculator using event-driven programming paradigm of Java.
9. Write a multi-threaded Java program to print all numbers below 100,000 that are both prime and fibonacci number (some examples are 2, 3, 5, 13, etc.). Design a thread that generates prime numbers below 100,000 and writes them into a pipe. Design another thread that generates fibonacci numbers and writes them to another pipe. The main thread should read both the pipes to identify numbers common to both.
10. Design and development of a web based dynamic Hospital Information System

612BMP03 - DIAGNOSTIC AND THERAPEUTIC EQUIPMENT LAB

1. Recording and analysis of ECG signals
2. Recording and analysis of EEG signals.
3. Recording - Fatigue test of EMG signals.
4. Simulation of ECG – detection of QRS complex and heart rate
5. Study of Pacemaker simulator
6. Study of Defibrillator simulator
7. Study of shortwave and ultrasonic diathermy.
8. Study of biotelemetry
9. Electrical safety measurements.
10. Mini project.

SEVENTH SEMESTER
712BMT01 - PATTERN RECOGNITION AND NEURAL NETWORKS

UNIT I INTRODUCTION AND SIMPLE NEURAL NET

Elementary neurophysiology and biological neural network-Artificial neural network – Architecture, biases and thresholds, Hebb net, Perceptron, Adaline and Madaline.

UNIT II BACK PROPOGATION AND ASSOCIATIVE MEMORY

Back propogation network, generalized delta rule, Bidirectional Associative memory, Hopfield network

UNIT III NEURAL NETWORKS BASED ON COMPETITION

Kohonen Self organising map, Learning Vector Quantisation, counter propogation network.

UNIT IV UNSUPERVISED LEARNING AND CLUSTERING ANALYSIS

Patterns and features, training and learning in pattern recognition, discriminant functions, different types of pattern recognition. Unsupervised learning- hierarchical clustering, partitional clustering. Neural pattern recognition approach – perceptron model

UNIT V SUPERVISED LEARNING USING PARAMETRIC AND NON PARAMETRIC APPROACH

Bayesian classifier, non parametric density estimation, histograms, kernels, window estimators, k-nearest neighbour classifier , estimation of error rates.

TEXT BOOKS:

1. Hagan, Demuth and Beale, "Neural network design", Vikas Publishing House Pvt. Ltd., New Delhi , 2002.
2. Freeman J.A., and Skapura B.M, " Neural networks, algorithms, applications and programming techniques", Addison – Wesley,2003.
3. Duda R.O, Hart P.G, "Pattern classification and scene analysis", Wiley Edition,2000
4. Earl Gose, Richard Johnsonbaugh, Steve Jost, "Pattern Recognition and Image Analysis", Prentice Hall of India Pvt. Ltd., New Delhi, 1999.

REFERENCES:

1. Robert Schalkoff, " Pattern recognition, Statistical, Structural and neural approaches" John Wiley and Sons(Asia) Pte. Ltd., Singapore, 2005
2. Laurene Fausett , " Fundamentals of neural networks – Architectures, algorithms and applications", Prentice Hall, 1994.

712BMT02 - MEDICAL INFORMATICS

UNIT I MEDICAL INFORMATICS

Introduction - Structure of Medical Informatics –Internet and Medicine -Security issues, Computer based medical information retrieval, Hospital management and information system, Functional capabilities of a computerized HIS, e-health services, Health Informatics – Medical Informatics, Bioinformatics

UNIT II COMPUTERISED PATIENT RECORD

Introduction - History taking by computer, Dialogue with the computer, Components and functionality of CPR, Development tools, Intranet, CPR in Radiology- Application server provider, Clinical information system, Computerized prescriptions for patients.

UNIT III COMPUTERS IN CLINICAL LABORATORY AND MEDICAL IMAGING

Automated clinical laboratories-Automated methods in hematology, cytology and histology, Intelligent Laboratory Information System - Computerized ECG, EEG and EMG, Computer assisted medical imaging- nuclear medicine, ultrasound imaging ultrasonography-computed X-ray tomography, Radiation therapy and planning, Nuclear Magnetic Resonance.

UNIT IV COMPUTER ASSISTED MEDICAL DECISION-MAKING

Neuro computers and Artificial Neural Networks application, Expert system – General model of CMD, Computer –assisted decision support system-production rule system cognitive model, semester networks , decisions analysis in clinical medicine-computers in the care of critically patients-computer assisted surgery-designing

UNIT V RECENT TRENDS IN MEDICAL INFORMATICS

Virtual reality applications in medicine, Computer assisted surgery , Surgical simulation, Telemedicine - Tele surgery computer aids for the handicapped, computer assisted instrumentation in Medical Informatics - Computer assisted patient education and health - Medical education and health care information.

TEXT BOOKS:

1. 1.R.D.Lele Computers in medicine progress in medical informatics, Tata Mcgraw Hill Publishing computers Ltd,2005, New Delhi.
2. Mohan Bansal, Medicl informatics Tata Mcgraw Hill Publishing computers Ltd, 2003 New Delhi.

712BMT03 - MEDICAL OPTICS

UNIT I OPTICAL PROPERTIES OF THE TISSUES

Refraction, Scattering, absorption, light transport inside the tissue, tissue properties, Light interaction with tissues, optothermal interaction, fluorescence, speckles.

UNIT II INSTRUMENTATION IN PHOTONICS

Instrumentation for absorption, scattering and emission measurements, excitation light sources – high pressure arc lamp, solid state LEDs, Lasers, optical filters, polarizer, solid state detectors, time resolved and phase resolved detectors.

UNIT III APPLICATIONS OF LASERS

Laser in tissue welding, lasers in dermatology, lasers in ophthalmology, otolaryngology, urology.

UNIT IV OPTICAL TOMOGRAPHY

Optical coherence tomography, Elastography, Doppler optical coherence tomography, Application towards clinical imaging.

UNIT V SPECIAL OPTICAL TECHNIQUES

Near field imaging of biological structures, in vitro clinical diagnostic, fluorescent spectroscopy, photodynamic therapy.

TEXT BOOKS:

1. Tuan Vo Dirh, "Biomedical photonics – Handbook", CRC Press, Boca Raton, 2003.
2. Mark E. Brezinski., Optical Coherence Tomography: Principles and Applications, Academic Press, 2006.

REFERENCES:

1. Leon Goldman, M.D., & R. James Rockwell, Jr., "Lasers in Medicine", Gordon and Breach, Science Publishers Inc., New York, 1971.
2. R. Splinter and B.A Hooper, An Introduction to BioMedical Optics, Taylor and Francis, 2007.

712BMT04 - DIGITAL IMAGE PROCESSING

AIM

To study the image processing techniques.

OBJECTIVES

- To study the image fundamentals and image transforms
- To study the image enhancement techniques
- To study the image restoration procedures
- To study the image compression procedures

UNIT I DIGITAL IMAGE FUNDAMENTAL

Elements of digital image processing systems - Elements of visual perception – image sampling and quantization – basic relationships between pixels - matrix and singular value representation of discrete images.

UNIT II IMAGE TRANSFORMS

1-D DFT - 2-D DFT – DCT – DST – Walsh - Hadamard – Haar – Slant – KL – SVD and their properties.

UNIT III IMAGE ENHANCEMENT

Gray level transformation – Histogram processing – enhancement using arithmetic/logic operation – spatial filtering – smoothing and sharpening spatial filter – smoothing in frequency domain filter – homomorphic filtering

UNIT IV IMAGE RESTORATION AND RECOGNITION

Image degradation models – unconstrained and constrained restoration – inverse filtering – LMS filter – geometric mean filter – geometric transformation – pattern classes – optimal statistical classifier – neural networks and its uses in image processing.

UNIT V IMAGE COMPRESSION

Image compression models – elements of information theory – error free compression – lossy compression – run-length – Huffman coding – shift codes – arithmetic coding – bit plane coding – transform coding – JPEG standards – MPEG standards – wavelet transform – predictive techniques – block truncation coding schemes – facet modeling. Image segmentation – detection of discontinuities – edge linking and boundary detection – thresholding – region based segmentation – segmentation by morphological watersheds – use of motion in segmentation.

TEXT BOOK:

1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing" Pearson education, 2007.
2. Anil K. Jain, "Fundamentals of Digital Image Processing", PHI, 1997

REFERENCES:

1. Willian K. Pratt, "Digital Image Processing", John Wiley, NJ, 1987.
2. Sid Ahmed M. A., "Image Processing Theory, Algorithm and Architectures", McGraw Hill, 1995
3. Scott E. C. Umbaugh, "Computer Vision and Image Processing", Prentice Hall, Eaglewood Cliffs, NJ, 1998.

ELECTIVE III & IV
712BMT05 - CELL BIOLOGY AND TISSUE ENGINEERING

UNIT I BASIC CELL BIOLOGY

Cells – DNA/RNA and Proteins – Tissue Culture –
Antibodies – Tools for Protein Analysis – Tools for DNA Analysis – Recombinant DNA
and Protein Engineering – Gene Therapy – DNA – Antisense Technology – Viruses.

UNIT II CELL ENGINEERING

Principles of Cell Adhesion – Adhesion Molecules –
Immobilisation of Adhesion Ligands for Investigation of Cell – Substrate Interactions –
Mechanics of Cell Adhesion. Example: Platelet Adhesion – Principles of Cell Migration
– Intracellular Signaling Pathways.

UNIT III CELL MECHANICS

Cells Under Stress, Strain, Pressure and Flow Fields – The Role of Mass Transfer in Tissue
Function – Selected Examples of Mass Transfer Between
Blood and Tissue – Cell Motility – Chemotaxis – Angiogenesis and Other Examples.

UNIT IV BASIC TISSUE ENGINEERING TAXIS

Basic Definition – Current Scope of Development – Use in Therapeutics and Invitro testing –
Structure and Organization of Tissues – Transport Properties of Tissues – Introduction to Mass
Transfer – Diffusion of Simple Metabolites – Diffusion and Reaction of Proteins – Hormone and
Growth Factor Signaling.

UNIT V ORGAN TISSUE ENGINEERING

Seaffolds and Tissue Engineering – Basic Properties – Tissue Engineering of Bone Marrow – Liver
Nervous System – Engineering of Vascular Grafts – Regional Patency Thrombosis – Tissue
Engineering of Cartilage –Kidney.

TEXT BOOK:

1. Lanza R P, Langer R S and Chick W L, "Principles of Tissues Engineering",
Academic Press, 1997.

REFERENCES:

1. Bruce Alberts and Alexander Johnson, "Molecular Biology of the Cell", Garland
Publishing Inc., Newyork, Fourth Edition, 2002.
2. Joseph D Bronzino, "The Biomedical Engineering Handbook", Volume II, CRC Press,
Boca Raton, Second Edition, 2000.

712BMT06 - PHYSIOLOGICAL MODELLING

UNIT I PROPERTIES OF SYSTEMS AND ELECTRICAL ANALOG

System concept, system properties – Resistance, storage, resistance – compliance, piece-wise linear approximation, electrical analog for compliance, thermal storage, step response of first order systems – resistance- compliance systems, and pulse response of first order systems

UNIT II TRANSFER FUNCTIONS

Transfer functions and its use, Study of transfer function of first order and second order systems, engineering concept in coupled system, example of Transformed signals.

UNIT III IMPEDANCE CONCEPT

Transfer functions with impedance concept, prediction of performance, identification of the system from impedance function, periodic signals, relationship between transfer function and sinusoidal response, evaluation of transfer function from frequency response.

UNIT IV FEEDBACK SYSTEMS

Characteristics of physiological feedback systems, stability analysis of systems.

UNIT V SIMULATION OF BIOLOGICAL SYSTEMS

Simulation of thermal regulation, pressure and flow control in circulation, oculo motor system, endocrinal system, functioning of receptors.

TEXT BOOKS:

1. William B.Blessner, " System approach to Bio-medicine", McGraw-Hill book co., New York, 1969.
2. Manfred Clynes and John H.Milsum, "Bio-medical engineering system", McGraw-Hill book co., NewYork, 1970.
3. Michael C.K. Khoo," Physiological Control Systems -Analysis, Simulation and Estimation" Prentice Hall of India Pvt. Ltd., New Delhi, 2001

REFERENCE:

1. Douglas S. Rigg, "Control theory and physiological feedback mechanism", The William & Williams co., Baltimore, 1970.

712BMT07 - BIOINFORMATICS

UNIT I BIOINFORMATICS

Introduction, Overview of structural Bioinformatics ; Characteristics, Categories, Navigation and information retrieval of Bioinformatics databases,

UNIT II DATABASES

Description and Organisation of Sequence, Structure and Other databases; Database Warehousing and data mining in Bioinformatics.

UNIT III TOOLS

Need for tools, Knowledge discovery, Industry trends and data mining tools; Data submission tools, Data analysis tools, Prediction tools and modeling tools.

UNIT IV MACHINE LEARNING IN BIOINFORMATICS

Neural network, Genetic and fuzzy logic applications in Bioinformatics; Modeling for Bioinformatics – Hidden Markov, Comparative, probabilistic and molecular modeling

UNIT V ALGORITHMS

Classification algorithms, implementing algorithms , biological algorithms, bioinformatics tasks and corresponding algorithms and algorithms and bioinformatics software; Data analysis algorithms – Sequence comparison, Substitution matrices and sequence alignment optimal algorithm; Prediction algorithms – Gene prediction, Phylogenetic prediction and protein structure prediction algorithms.

TEXT BOOKS:

1. Orpita Bosu and Simminder Kaur Thukral, Bioinformatics Databases, Tools and Algorithms, Oxford University press, New Delhi, 2007.
2. Yi – Ping Phoebe Chen, Bioinformatics Technologies, Springer International Edition, New Delhi, 2007.

REFERENCES:

1. Harshawardhan P.Bal, Bioinformatics principles and applications, TataMcGraw Hill Publishing Company Ltd, New Delhi, 2007
2. Kenneth Baclawski, Tianhua Niu, Bioinformatics, Jaico Publishing House, Delhi, 2007.
3. Lukas K. Beehler and Hooman H. Rashidi, Bioinformatics basics Applications in biological science and medicine, Taylor and Francis Group, 2005,

712BMT08 - TOTAL QUALITY MANAGEMENT

UNIT I INTRODUCTION

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM.

UNIT II TQM PRINCIPLES

Leadership - Strategic quality planning, Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5s, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I

The seven traditional tools of quality - New management tools - Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II

Quality circles - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Cost of Quality - Performance measures.

UNIT V QUALITY SYSTEMS

Need for ISO 9000- ISO 9000-2000 Quality System - Elements, Documentation, Quality auditing- QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - Case studies of TQM implementation in manufacturing and service sectors including IT.

TEXT BOOK:

1. Dale H. Besterfield, et al., "Total Quality Management", Pearson Education Asia, 3rd Edition, Indian Reprint (2006).

REFERENCES:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S., "TQM - Text with Cases", Butterworth - Heinemann Ltd., Oxford, 3rd Edition, 2003.
3. Suganthi, L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
4. Janakiraman, B and Gopal, R.K, "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

712BMT09 - NANO ELECTRONICS

UNIT I INTRODUCTION TO NANOTECHNOLOGY

Background to nanotechnology: Types of nanotechnology and nanomachines – periodic table – atomic structure – molecules and phases – energy – molecular and atomic size – surface and dimensional space – top down and bottom up; Molecular Nanotechnology: Electron microscope – scanning electron microscope – atomic force microscope – scanning tunnelling microscope – nanomanipulator – nanotweezers – atom manipulation – nanodots – self assembly – dip pen nanolithography. Nanomaterials: preparation – plasma arcing – chemical vapor deposition – sol-gels – electrodeposition – ball milling – applications of nanomaterials;

UNIT II FUNDAMENTALS OF NANOELECTRONICS

Fundamentals of logic devices:- Requirements – dynamic properties – threshold gates; physical limits to computations; concepts of logic devices:- classifications – two terminal devices – field effect devices – coulomb blockade devices – spintronics – quantum cellular automata – quantum computing – DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons – performance estimation for the human brain. Ultimate computation:- power dissipation limit – dissipation in reversible computation – the ultimate computer.

UNIT III SILICON MOSFETs & QUANTUM TRANSPORT DEVICES

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts. Quantum transport devices based on resonant tunneling:- Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

UNIT IV CARBON NANOTUBES

Carbon Nanotube: Fullerenes - types of nanotubes – formation of nanotubes – assemblies – purification of carbon nanotubes – electronic properties – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – Nanotube for memory applications – prospects of an all carbon nanotube nanoelectronics.

UNIT V MOLECULAR ELECTRONICS

Electrodes & contacts – functions – molecular electronic devices – first test systems – simulation and circuit design – fabrication; Future applications: MEMS – robots – random access memory – mass storage devices.

TEXTBOOKS:

1. Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons and Burkhard Raguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002
2. T. Pradeep, NANO: The Essentials – Understanding Nanoscience and Nanotechnology, TMH, 2007
3. Rainer Waser (Ed.), Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices, Wiley-VCH, 2003

712BMT10 - COMPUTER NETWORKS

AIM

To introduce the concept, terminologies, and technologies used in modern data communication and computer networking.

OBJECTIVES:

- To introduce the students the functions of different layers.
- To introduce IEEE standard employed in computer networking.
- To make students to get familiarized with different protocols and network components.

UNIT I PHYSICAL LAYER

Data Communications – Networks - Networks models – OSI model – Layers in OSI model – TCP / IP protocol suite – Addressing – Guided and Unguided Transmission media Switching: Circuit switched networks – Data gram Networks – Virtual circuit networks Cable networks for Data transmission: Dialup modems – DSL – Cable TV – Cable TV for Data transfer.

UNIT II DATA LINK LAYER

Data link control: Framing – Flow and error control –Protocols for Noiseless and Noisy Channels – HDLC

Multiple access: Random access – Controlled access

Wired LANS : Ethernet – IEEE standards – standard Ethernet – changes in the standard – Fast Ethernet – Gigabit Ethernet.

Wireless LANS : IEEE 802.11–Bluetooth.

Connecting LANS: Connecting devices - Backbone networks - Virtual LANS Virtual circuit networks: Architecture and Layers of Frame Relay and ATM.

UNIT III NETWORK LAYER

Logical addressing: IPv4, IPv6 addresses

Internet Protocol: Internetworking – IPv4, IPv6 - Address mapping – ARP, RARP, BOOTP, DHCP, ICMP, IGMP, Delivery - Forwarding - Routing – Unicast, Multicast routing protocols.

UNIT IV TRANSPORT LAYER

Process-to-Process delivery - User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QoS) – Techniques to improve QoS.

UNIT V APPLICATION LAYER

Domain Name System (DNS) – E-mail – FTP – WWW – HTTP – Multimedia Network

Security: Cryptography – Symmetric key and Public Key algorithms - Digital signature – Management of Public keys – Communication Security – Authentication Protocols.

TEXT BOOKS:

1. Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill,: Unit I – IV, 2006.
2. Andrew S. Tannenbaum, "Computer Networks", Pearson Education, Fourth Edition,: Unit V, 2003.

REFERENCES:

1. Wayne Tomasi, "Introduction to Data Communication and Networking", 1/e, Pearson Education.
2. James .F. Kurose & W. Rouse, "Computer Networking: A Topdown Approach Featuring",3/e, Pearson Education.
3. C.Sivaram Murthy, B.S.Manoj, "Ad hoc Wireless Networks – Architecture and Protocols", Second Edition, Pearson Education.
4. Greg Tomshon, Ed Tittel, David Johnson. "Guide to Networking Essentials", fifth edition, Thomson India Learning, 2007.
5. William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2000.

712BMT11 - COMPUTER HARDWARE, INTERFACING AND INSTRUMENTATION

UNIT I INTEL ADVANCED PROCESSORS

80186, 80286- Architecture, Programming enhancements, 80c188EB interfacing.

UNIT II INTEL 80386, 80486 PROCESSOR

80386- Introduction, Special 80386 registers, Memory management, Protected mode, virtual 8086 mode, memory paging mechanism, 80486 Microprocessor – Introduction and architecture.

UNIT III PENTIUM PROCESSORS

Pentium Architecture- Memory Management- New Pentium instructions - Pentium Pro microprocessors - Pentium II, Pentium III, Pentium 4- Special Features and Software changes.

UNIT IV PC HARDWARE OVERVIEW

Functional Units & Interconnection, New Generation Mother Boards 286 to Pentium 4 Bus Interface- ISA- EISA- VESA- PCI- PCIX., Memory and I/O Port Addresses, Peripheral Interfaces and Controller.

UNIT V PC BASED DATA ACQUISITION

Plug-in data acquisition and control boards and programming – ADC, DAC, Digital I/O board and Timing board, Serial port and parallel port programming. Data acquisition and programming using serial interfaces – PC and microcontroller serial ports, USB and IEEE 1394.

TEXT BOOKS:

1. B.B.Brey The Intel Microprocessor 8086/8088/80186/80188,80286,80386, 80486 Pentium, Pentium Pro, PII, PIII & IV Architecture, Programming & Interfacing, Pearson India, 2007.
2. N.Mathivanan, PC-Based Instrumentation concepts and practice, Prentice Hall of India, New Delhi, 2007.

REFERENCES:

1. Douglas V.Hall, Microprocessor and Interfacing, Programming and Hardware. Revised second Edition, Indian edition, Tata McGraw Hill, New Delhi, 2007.
2. A.K.Ray, K.M. Bhurchandi, "Advanced microprocessors and peripherals", II Edition, Tata McGraw Hill 2006.
3. B.Govindarajulu, IBM PC and clones Hardware, Trouble Shooting and Maintenance, Second Edition, Tata McGraw Hill, New Delhi, 2005.

712BMT12 - REFRIGERATION AND AIR CONDITIONING

UNIT I REFRIGERATION CYCLES & REFRIGERANTS

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.

UNIT II SYSTEM COMPONENTS

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.

UNIT III CYCLING CONTROLS AND SYSTEM BALANCING

Pressure and Temperature controls. Range and Differential settings. Selection and balancing of system components - Graphical method.

UNIT IV PSYCHROMETRY

Moist air behaviour, Psychrometric chart, Different Psychrometric process analysis.

UNIT V AIR CONDITIONING

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.

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., 2 ed, 2003.
2. Dr.S.S.Thipse, "Refrigeration and Air Conditioning", Jaico Publishing House, 2007.
3. Manohar Prasad, "Refrigeration and Air Conditioning ", Wiley Eastern Ltd., 1995.

712BMP02 - DIGITAL IMAGE PROCESSING LAB

1. Display of Grayscale Images.
2. Histogram Equalization.
4. Non-linear Filtering.
5. Edge detection using Operators.
6. 2-D DFT and DCT.
7. Filtering in frequency domain.
8. Display of color images.
9. conversion between color spaces.
10. DWT of images.
11. Segmentation using watershed transform.

REFERENCE:

1. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.

LIST OF EQUIPMENTS:

Computer, Software MATLAB

**EIGHTH SEMESTER
ELECTIVE V & VI**

812BMT01 - BIOMEMS

UNIT I MEMS AND MICROSYSTEMS

Typical MEMs and Microsystems, materials for MEMS - active substrate materials- Silicon and its compounds, Silicon piezoresistors, Gallium Arsenide, quartz, polymers. Micromachining- photolithography, thin film deposition, doping, etching, bulk machining, wafer bonding, LIGA

UNIT II MICROSENSORS AND ACUATORS

Mechanics for MEMs design- static bending of thin plates, mechanical vibration, thermomechanics, fracture and thin film mechanics. Mechanical sensors and actuators – beam and cantilever – microplates, strain, pressure and flow measurements, gyroscope, piezoactuator. Thermal sensors and actuators- micromachined thermocouple probe, Peltier effect heat pumps, thermal flow sensors

UNIT III MICRO OPTO ELECTRO MECHANICAL SYSTEMS

Fundamental principle of MOEMS technology, light modulators, beam splitter, microlens, digital micromirror devices, light detectors, grating light valve, optical switch

UNIT IV MICROFLUIDIC SYSTEMS

Fluid dynamics, continuity equation, momentum equation, equation of motion, laminar flow in circular conduits, fluid flow in microconduits, in submicrometer and nanoscale. Microscale fluid, expression for liquid flow in a channel, fluid actuation methods, dielectrophoresis, microfluid dispenser, microneedle, micropumps-continuous flow system

UNIT V APPLICATIONS OF BIOMEMS

CAD for MEMs, Drug delivery, micro total analysis systems (MicroTAS) detection and measurement methods, microsystem approaches to polymerase chain reaction (PCR), DNA hybridization.

TEXT BOOKS:

1. Nitaigour Premchand Mahalik, " MEMS", Tata McGraw Hill Publishing Company, New Delhi, 2007.
2. Tai Ran Hsu , "MEMS and Microsystems design and manufacture", Tata McGraw Hill Publishing Company, New Delhi, 2002.

REFERENCE:

1. Wanjun Wang, Stephen A.Soper, "BioMEMs: Technologies and applications", CRC Press, New York, 2007.

812BMT02 - ASSIST DEVICES

AIM

To understand functioning and usage of electromechanical units which will restore normal functional ability of particular organ which is defective temporarily or permanently.

OBJECTIVES:

- To study various mechanical techniques that will help failing heart.
- To study the functioning of the unit which does the clearance of urea from the blood.
- To understand the tests to assess the hearing loss and development of electronic devices to compensate for the loss.
- To study the various orthodic devices and prosthetic devices to overcome orthopaedic problems.
- To understand electrical stimulation techniques used in clinical applications.

UNIT I CARDIAC ASSIST DEVICES

Principle of External counter pulsation techniques, intra aortic balloon pump, Auxillary ventricle and schematic for temporary bypass of left ventricle, prosthetic heart valves.

UNIT II HEMODIALYSERS

Artificial kidney, Dialysis action, hemodialyser unit, membrane dialysis, portable dialyser monitoring and functional parameters.

UNIT III HEARING AIDS

Common tests – audiograms, airconduction, boneconduction, masking techniques, SISI, Hearing aids – principles, drawbacks in the conventional unit, DSP based hearing aids.

UNIT IV PROSTHETIC AND ORTHODIC DEVICES

Hand and arm replacement – different types of models, externally powered limb prosthesis, feedback in orthodic system, functional electrical stimulation, sensory assist devices.

UNIT V RECENT TRENDS

Transcutaneous electrical nerve stimulator, bio-feedback.

TEXT BOOKS

1. Levine S.N. (ed), "Advances in Bio-medical engineering and Medical physics", Vol. I, II, IV, inter university publications, New York, 1968 (Unit I, IV, V).
2. Kolff W.J, "Artificial Organs", John Wiley and sons, New York, 1976. (Unit II).
3. Albert M.Cook and Webster J.G, "Therapeutic Medical Devices", Prentice Hall Inc., New Jersey, 1982 (Unit III).

812BMT03 - VLSI DESIGN

AIM

To introduce the technology, design concepts and testing of Very Large Scale Integrated Circuits.

OBJECTIVES:

- To learn the basic CMOS circuits.
- To learn the CMOS process technology.
- To learn techniques of chip design using programmable devices.
- To learn the concepts of designing VLSI subsystems.
- To learn the concepts of modeling a digital system using Hardware Description Language.

UNIT I CMOS TECHNOLOGY

A brief History-MOS transistor, Ideal I-V characteristics, C-V characteristics, Non ideal IV effects, DC transfer characteristics - CMOS technologies, Layout design Rules, CMOS process enhancements, Technology related CAD issues, Manufacturing issues.

UNIT II CIRCUIT CHARACTERIZATION AND SIMULATION

Delay estimation, Logical effort and Transistor sizing, Power dissipation, Interconnect, Design margin, Reliability, Scaling- SPICE tutorial, Device models, Device characterization, Circuit characterization, Interconnect simulation.

UNIT III COMBINATIONAL AND SEQUENTIAL CIRCUIT DESIGN

Circuit families –Low power logic design – comparison of circuit families – Sequencing static circuits, circuit design of latches and flip flops, Static sequencing element methodology-sequencing dynamic circuits – synchronizers.

UNIT IV CMOS TESTING

Need for testing- Testers, Test fixtures and test programs- Logic verification- Silicon debug principles- Manufacturing test – Design for testability – Boundary scan.

UNIT V SPECIFICATION USING VERILOG HDL

Basic concepts- identifiers- gate primitives, gate delays, operators, timing controls, procedural assignments conditional statements, Data flow and RTL, structural gate level switch level modeling, Design hierarchies, Behavioral and RTL modeling, Test benches, Structural gate level description of decoder, equality detector, comparator, priority encoder, half adder, full adder, Ripple carry adder, D latch and D flip flop.

TEXTBOOKS:

1. Weste and Harris: CMOS VLSI DESIGN (Third edition) Pearson Education, 2005.
2. Uyemura J.P: Introduction to VLSI circuits and systems, Wiley 2002.

REFERENCES:

1. D.A Pucknell & K.Eshraghian Basic VLSI Design, Third edition, PHI, 2003.
2. Wayne Wolf, Modern VLSI design, Pearson Education, 2003.
2. M.J.S.Smith: Application specific integrated circuits, Pearson Education, 1997.
3. J.Bhasker: Verilog HDL primer, BS publication,2001.
4. Ciletti Advanced Digital Design with the Verilog HDL, Prentice Hall of India, 2003.

812BMT04 - PROFESSIONAL ETHICS IN ENGINEERING

UNIT I ENGINEERING ETHICS

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories.

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics – Codes of Ethics – Industrial Standards – A Balanced Outlook on Law – The Challenger Case Study.

UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk – Chernobyl Case Studies and Bhopal.

UNIT IV RESPONSIBILITIES AND RIGHTS

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

UNIT V GLOBAL ISSUES

Multinational Corporations – Business Ethics – Environmental Ethics – Computer Ethics – Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct.

TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2005.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, 2000.

REFERENCES:

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

812BMT05 - MEDICAL IMAGING TECHNIQUES

AIM

To study the image reconstruction techniques.

OBJECTIVES:

- To study in detail, the processing techniques used in various imaging modalities.
- To study the quality assurance test for radiography, method of recording sectional images
- To study the functioning of radioisotopic imaging equipments
- To study the MRI, image acquisition and reconstruction
- To study the 3-D image display techniques

UNIT I ULTRASOUND IN MEDICINE

Production of ultrasound – properties and principles of image formation, capture and display – principles of A-mode, B-mode and M-mode display – Doppler ultra sound and colour flow mapping – applications of diagnostic ultra sound.

UNIT II X-RAY COMPUTED TOMOGRAPHY

principles of sectional imaging – scanner configuration – data acquisition system – image formation principles – conversion of x-ray data in to scan image – 2-D image reconstruction techniques – Iteration and Fourier method – types of CT scanners.

UNIT III MAGNETIC RESONANCE IMAGING

Principles of MRI pulse sequence – image acquisition and reconstruction techniques – MRI instrumentation magnetic gradient system RF coils – receiver system functional MRI – Application of MRI.

UNIT IV RADIO ISOTOPIC IMAGING

Rectilinear scanners – linear scanners – SPECT – PET Gamma camera radio nuclides for imaging – emission computed CT.

UNIT V INFRA RED IMAGING

9

Physics of thermography – imaging systems – pyroelectric vidicon camera clinical thermography – liquid crystal thermography.

TEXT BOOK:

1. Steve Webb, "The physics of medical imaging", Adam Hilger, Bristol, England, Philadelphia, USA, 1988.

REFERENCES:

1. A. C. Kak, "principles of computed tomography", IEEE press, Newyork.
2. G. A. Hay, "Medical Image formation perception and measurement".
3. Divyendu Sinha & Edward R.Dougherty, "Introduction to Computer Based Imaging Systems", PHI, 2003.

812BMT06 - SOFT COMPUTING

UNIT I FUZZY SET THEORY

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

UNIT II OPTIMIZATION

Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

UNIT III ARTIFICIAL INTELLIGENCE

Introduction, Knowledge Representation – Reasoning, Issues and Acquisition: Propositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning Under Uncertainty Basic knowledge Representation Issues Knowledge acquisition – Heuristic Search: Techniques for Heuristic search Heuristic Classification - State Space Search: Strategies Implementation of Graph Search Search based on Recursion Patent-directed Search Production System and Learning.

UNIT IV NEURO FUZZY MODELING

Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT V APPLICATIONS OF COMPUTATIONAL INTELLIGENCE

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

TEXT BOOKS:

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.
2. N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2006.

REFERENCES:

1. Elaine Rich & Kevin Knight, Artificial Intelligence, Second Edition, Tata Mcgraw Hill Publishing Comp., 2006, New Delhi.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
4. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
5. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.
6. Amit Konar, "Artificial Intelligence and Soft Computing Behaviour and Cognitive model of the human brain", CRC Press, 2008.

812BMT07 - RAPID PROTOTYPING

UNIT I INTRODUCTION

Basic operation-impact of rapid prototyping and tooling on product development-benefits applications

UNIT II RAPID PROTOTYPING PROCESSES

Introduction-classification-laminated object manufacturing-fused deposition modeling stereo lithography- solid ground curing-selective laser sintering-3 D printing.

UNIT III CAD PROCESSES

Introduction-data requirements-solid modeling-surface modeling. Geometric processing interface formats-model preparation-slicing, support structures and machine instructions.

UNIT IV MATERIALS FOR RAPID PROTOTYPING

Plastics-resins-metals-ceramics-selection of materials for suitable processesadvantages-limitations.

UNIT V RAPID TOOLING PROCESSES

Introduction-classification-indirect rapid tooling-silicone rubber moulding-epoxy moulding electro forming- vacuum casting- vacuum forming- rapid tools for injection moulding direct rapid tooling processes-SLS rapid tool-shape deposition manufacturing – laser deposition lamination- rapid tooling roots.

TEXT BOOK:

1. Ibrahim zeid, CAD/CAM theory and practice, Tata McGraw Hill,1998.

REFERENCES:

1. PAUL F.JACOBS, Rapid Prototyping and Manufacture. Fundamentals of Stereo lithography, 1995.
2. Rapid proto typing reports, CAD/CAM publishing, 1991.
3. Rapid News, University of Warwick, UK, 1995.
4. Rapid Tools for Injection Moulding
(www.vmreg.com/raptia/reports/CRIF.pdf)
Applications of RP techniques for Sheet Metal Forming
(www.raptia.org) Medical RP applications
([http:// home.att.net/~rppat/museum/mus-5.htm](http://home.att.net/~rppat/museum/mus-5.htm))

UNIT 1. EMBEDDED COMPUTING

Challenges of Embedded Systems – Embedded system design process. Embedded processors – 8051 Microcontroller, ARM processor – Architecture, Instruction sets and programming.

UNIT 2. MEMORY AND INPUT / OUTPUT MANAGEMENT

Programming Input and Output – Memory system mechanisms – Memory and I/O devices and interfacing – Interrupt handling.

UNIT 3. PROCESSES AND OPERATING SYSTEMS

Multiple tasks and processes – Context switching – Scheduling policies – Interprocess communication mechanisms – Performance issues.

UNIT 4. EMBEDDED C PROGRAMMING

Programming embedded systems in C – C-looping structures – Register allocation – Function calls – Pointer aliasing – structure arrangement – bit fields – unaligned data and endianness – inline functions and inline assembly – portability issues.

UNIT 5. EMBEDDED SYSTEM DEVELOPMENT

Meeting real time constraints – Multi-state systems and function sequences. Embedded software development tools – Emulators and debuggers. Design issues – Design methodologies – Case studies – Complete design of example embedded systems.

TEXT BOOKS

1. Wayne Wolf, "Computers as Components: Principles of Embedded Computer System Design", Elsevier, 2006.
2. Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems", Pearson Education, Second edition, 2007 (unit 1)
3. Andrew N Sloss, D. Symes, C. Wright, " Arm system developers guide", Morgan Kaufman/ Elsevier, 2006. (unit 4)

REFERENCES

1. Michael J. Pont, "Embedded C", Pearson Education , 2007.
2. Steve Heath, "Embedded System Design" , Elsevier, 2005.

Registrar