**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,
KAKINADA**

B.TECH BIOMEDICAL ENGINEERING

**I YEAR
COURSE STRUCTURE**

CODE	SUBJECT		T	P/D	C
	English		2 +1*	-	4
	Mathematics – I		3 +1*	-	6
	Mathematical Methods		3 +1*	-	6
	Applied Physics		2 +1*	-	4
	C Programming and Data Structures		3 +1*	-	6
	Network Analysis		2+1*	-	4
	Electronic Devices and Circuits		3+1*	-	6
	Engineering Drawing		-	3	4
	Computer Programming Lab		-	3	4
	IT Workshop		-	3	4
	Electronic Devices and Circuits Lab.	-	3	4	
	English Language Communication Skills Lab	-	3	4	
	TOTAL		**25**	**15**	**56**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA

B.TECH. BIO-MEDICAL ENGINEERING

**II YEAR I SEMESTER
COURSE STRUCTURE**

Code	Subject	T	P	C
	Electrical Technology	4+1*	-	4
	Switching Theory and Logic Design	4+1*	-	4
	Signals and Systems	4+1*	-	4
	Applied Chemistry and Biochemistry	4+1*	-	4
	Anatomy and Physiology	4+1*	-	4
	Bioelectricity and Electrodes	4+1*	-	4
	Applied Biochemistry Lab	-	3	2
	Anatomy and Physiology Lab	-	3	2
	TOTAL	**30**	**6**	**28**

II YEAR II SEMESTER

Code	Subject	T	P	C
	Managerial Economics and Financial Analysis	4+1*	-	4
	Environmental Studies	4+1*	-	4
	Pulse and Digital Circuits	4+1*	-	4
	Principles of Communications	4+1*	-	4
	Basic Clinical Sciences I	4+1*	-	4
	Biotransducers and Applications	4+1*	-	4
	Pulse and Digital Circuits Lab	-	3	2
	Transducers Lab	-	3	2
	TOTAL	**30**	**6**	**28**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,
KAKINADA**

B.TECH. BIO-MEDICAL ENGINEERING

**III YEAR I SEMESTER
COURSE STRUCTURE**

Code	Subject	T	P	C
	Digital Signal Processing	4+1*	-	4
	Linear and Digital IC Applications	4+1*	-	4
	Hospital System Management	4+1*	-	4
	Basic Clinical Sciences - II	4+1*	-	4
	Biofluids and Mechanics	4+1*	-	4
	Biomedical Equipment	4+1*	-	4
	Biomedical Equipment Lab	-	3	2
	Advanced English Communication Skills Lab	-	3	2
	TOTAL	**30**	**6**	**28**

III YEAR II SEMESTER

Code	Subject	T	P	C
	VLSI Design	4+1*	-	4
	Microprocessors and Interfacing	4+1*	-	4
	Biological Control Systems	4+1*	-	4
	Lasers and Fiber Optics in Medicine	4+1*	-	4
	Biomedical Signal Processing	4+1*	-	4
	Medical Imaging Techniques	4+1*	-	4
	I C Application Lab	-	3	2
	Biomedical Signal Processing Lab	-	3	2
	TOTAL	**30**	**6**	**28**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA

B.TECH. BIO-MEDICAL ENGINEERING

IV YEAR I SEMESTER
COURSE STRUCTURE

Subject Code	Subject	T	P	C
	Computer Networks	4+1*	-	4
	Artificial Neural Networks	4+1*	-	4
	Image Processing and Pattern Recognition	4+1*	-	4
	Rehabilitation Engineering	4+1*	-	4
	ELECTIVE-I	**4+1***	**-**	**4**
	Operating Systems			
	Micro controllers and Applications			
	Telemedicine			
	ELECTIVE-II	**4+1***		**4**
	Embedded and Real time Systems			
	Medical Informatics			
	Physiological Systems Modeling			
	Medical Imaging Techniques Lab	0	3	2
	Microprocessors Lab	0	3	2
	TOTAL	**30**	**6**	**28**

IV YEAR II SEMESTER
COURSE STRUCTURE

Subject Code	Subject	T	P	C
	BioMEMS	4+1*	-	4
	ELECTIVE-III			
	Digital Design through Verilog	3+1*	-	3
	Biomaterials			
	Transportation Phenomena in living systems			
	ELECTIVE-IV	3+1*	-	3
	Robotics and Automation			
	DSP Processors and Architectures			
	Quantitative Engineering Physiology			
	Digital Image Processing Lab	0	3	2
	Industry Oriented Mini Project	-	-	2
	Seminar	-	-	2
	Project work	-	-	10
	Comprehensive Viva	-	-	2
	TOTAL	**13**	**3**	**28**

NOTE: All University Examinations (Theory and Practical) are of 3 hours duration.
T : Theory periods per week P: Practical /Drawing Periods per week
C : Total Credits for the subject

I Year B. Tech BME   **T   P   C**
                                                                   2+1*   0   4

ENGLISH

1. INTRODUCTION :

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks.

In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

The text for non-detailed study is for extensive reading/reading for pleasure by the students. Hence, it is suggested that they read it on their own with topics selected for discussion in the class. The time should be utilized for working out the exercises given after each section , as also for supplementing the exercises with authentic materials of a similar kind for example, from newspaper articles, advertisements, promotional material etc*., However, the stress in this syllabus is on skill development and practice of language skills.*

2. OBJECTIVES:

a. To improve the language proficiency of the students in English with emphasis on LSRW skills.
b. To equip the students to study academic subjects with greater facility through the theoretical and practical components of the English syllabus.
c. To develop the study skills and communication skills in formal and informal situations.

3. SYLLABUS :
Listening Skills:
Objectives
1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language to be able to recognise them, to distinguish between them to mark stress and recognise and use the right intonation in sentences.
   • Listening for general content
   • Listening to fill up information
   • Intensive listening
   • Listening for specific information

Speaking Skills :
Objectives
1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.

   • Oral practice
   • Describing objects/situations/people
   • Role play – Individual/Group activities (Using exercises from all the nine units of the prescribed text: *Learning English : A Communicative Approach*.)
   • Just A Minute(JAM) Sessions.

Reading Skills:
Objectives
1. To develop an awareness in the students about the significance of silent reading and comprehension.
2. To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.

   • Skimming the text

5

• Understanding the gist of an argument
• Identifying the topic sentence
• Inferring lexical and contextual meaning
• Understanding discourse features
• Recognizing coherence/sequencing of sentences

NOTE : *The students will be trained in reading skills using the prescribed text for detailed study. They will be examined in reading and answering questions using 'unseen' passages which may be taken from the non-detailed text or other authentic texts, such as magazines/newspaper articles.*

Writing Skills :
Objectives
1. To develop an awareness in the students about writing as an exact and formal skill
2. To equip them with the components of different forms of writing, beginning with the lower order ones.

• Writing sentences
• Use of appropriate vocabulary
• Paragraph writing
• Coherence and cohesiveness
• Narration / description
• Note Making
• Formal and informal letter writing
• Editing a passage

4. TEXTBOOKS PRESCRIBED:

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content, divided into **Eight Units**, are prescribed:

For Detailed study
1. **LEARNING ENGLISH:** *A Communicative Approach*, KAKINADA: Orient Longman, 2006.   (Six Selected Lessons)

For Non-detailed study
2. **WINGS OF FIRE:** *An Autobiography – APJ Abdul Kalam*, Abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004.

A. STUDY MATERIAL:

Unit –I
1. Astronomy from LEARNING ENGLISH: *A Communicative Approach,* Orient Longman, 2005.

2. Chapters 1-4 **from** Wings of Fire**:** An Autobiography **– APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd.,2004**

Unit –II
3. Information Technology **from** LEARNING ENGLISH: *A Communicative Approach,* **Orient Longman, 2005.**
4. Chapters 5-8 **from** Wings of Fire**:** An Autobiography **– APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd.,2004**

Unit –III
5. Humour **from** LEARNING ENGLISH: *A Communicative Approach,* **Orient Longman, 2005.**
6. Chapters 9-12 **from** Wings of Fire**:** An Autobiography **– APJ Abdul Kalam, an abridged version with Exercises., Universities Press (India) Pvt. Ltd.,2004**

Unit –IV
7. Environment **from** LEARNING ENGLISH: *A Communicative Approach,* **Orient Longman, 2005.**
8. Chapters 13-16 **from** Wings of Fire**:** An Autobiography **– APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd.,2004**

Unit –V
9. Inspiration **from** LEARNING ENGLISH: *A Communicative Approach,* **Orient Longman, 2005.**
10. Chapters 17-20 **from** Wings of Fire**:** An Autobiography **– APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd.,2004.**

Unit – VI

11. Human Interest **from** LEARNING ENGLISH: *A Communicative Approach,* **Orient Longman, 2005.**
12. Chapters 21-24 **from** Wings of Fire**:** An Autobiography **– APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004.**

* Exercises from the lessons not prescribed shall also be used for classroom tasks.

Unit – VII

Exercises on

Reading and Writing Skills
Reading Comprehension
Situational dialogues
Letter writing
Essay writing

Unit – VIII

Practice Exercises on Remedial Grammar covering

Common errors in English, Subject-Verb agreement, Use of Articles and Prepositions,
Tense and aspect

Vocabulary development covering

Synonyms & Antonyms, one-word substitutes, prefixes & suffixes, Idioms & phrases, words often confused.

REFERENCES :

1. **Strengthen Your English,** Bhaskaran & Horsburgh, Oxford University Press
2. **Basic Communication Skills for Technology**, Andrea J Rutherfoord, Pearson Education Asia.
3. **Murphy's English Grammar with CD,** Murphy, Cambridge University Press
4. **English Skills for Technical Students** by Orient Longman
5. **Everyday Dialogues in English** by Robert J. Dixson, Prentice-Hall of India Ltd., 2006.
6. **English For Technical Communication**, Vol. 1 & 2, by K. R. Lakshmi Narayanan, Sci tech. Publications.
7. **A Hand book of English for Engineers & Technologists** by Dr. P. Eliah,   B. S. Publications.
8. **Developing Communication Skills** by Krishna Mohan & Meera Benerji (Macmillan)
9. **Speaking and Writing for Effective Business Communication,** Francis Soundararaj, MacMillan India Ltd., 2007.
10. **The Oxford Guide to Writing and Speaking,** John Seely, Oxford

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I Year B. Tech BME	T	P	C
	3+1*	0	6

MATHEMATICS – I

UNIT – I
Differential equations of first order and first degree – exact, linear and Bernoulli. Applications to Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories.

UNIT – II
Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax}, Sin ax, cos ax, polynomials in x, e^{ax} V(x), xV(x), method of variation of parameters.

UNIT – III
Rolle's Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – Generalized Mean Value theorem (all theorems without proof) Functions of several variables – Functional dependence- Jacobian-Maxima and Minima of functions of two variables with constraints and without constraints

UNIT – IV
 Radius, Centre and Circle of Curvature – Evolutes and Envelopes Curve tracing – Cartesian , polar and Parametric curves.

UNIT – V
Applications of integration to lengths, volumes and surface areas in Cartesian and polar coordinates multiple integrals - double and triple integrals – change of variables – change of order of integration.

UNIT – VI
Sequences – series – Convergences and divergence – Ratio test – Comparison test – Integral test – Cauchy's root test – Raabe's test – Absolute and conditional convergence

UNIT – VII
Vector Calculus: Gradient- Divergence- Curl and their related properties of sums- products- Laplacian and second order operators. Vector Integration - Line integral – work done – Potential function – area- surface and volume integrals Vector integral theorems: Green's theorem-Stoke's and Gauss's Divergence Theorem (With out proof). Verification of Green's - Stoke's and Gauss's Theorems.

UNIT – VIII
Laplace transform of standard functions – Inverse transform – first shifting Theorem, Transforms of derivatives and integrals – Unit step function – second shifting theorem – Dirac's delta function – Convolution theorem – Periodic function - Differentiation and integration of transforms-Application of Laplace transforms to ordinary differential equations Partial fractions-Heaviside's Partial fraction expansion theorem.

Text Books:
1. A text Book of Engineering Mathematics, Vol-1 T. K. V. Iyengar, B. Krishna Gandhi and Others, S. Chand & Company.
2. A text Book of Engineering Mathematics, C. Sankaraiah, V. G. S. Book Links.
3. A text Book of Engineering Mathematics, Shahnaz Bathul, Right Publishers.
4. A text Book of Engineering Mathematics, P. Nageshwara Rao, Y. Narasimhulu & N. Prabhakar Rao, Deepthi Publications.

References:
1. A text Book of Engineering Mathematics, B. V. Raman, Tata Mc Graw Hill.
2. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley India Pvt. Ltd.
3. A text Book of Engineering Mathematics, Thamson Book Collection.

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	T	P	C
	3+1*	0	6

MATHEMATICAL METHODS

UNIT – I
Matrices and Linear systems of equations: Elementary row transformations-Rank-Echelon form, Normal form – Solution of Linear Systems – Direct Methods- LU Decomposition- LU Decomposition from Gauss Elimination – Solution of Tridiagonal Systems-Solution of Linear Systems

UNIT – II
Eigen values, eigen vectors – properties – Cayley-Hamilton Theorem - Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonolization of matrix. Calculation of powers of matrix – Modal and spectral matrices.

UNIT – III
Real matrices – Symmetric, skew - symmetric, orthogonal, Linear Transformation – Orthogonal Transformation. Complex matrices: Hermitian, Skew-Hermitian and Unitary – Eigen values and eigen vectors of complex matrices and their properties. Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index - signature - Sylvester law.

UNIT – IV
. Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

Interpolation: Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences-Backward differences –Central differences – Symbolic relations and separation of symbols-Differences of a polynomial-Newton's formulae for interpolation – Central difference interpolation Formulae – Gauss Central Difference Formulae –Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

UNIT – V
Curve fitting: Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares. Numerical Differentiation and Integration– Trapezoidal rule – Simpson's 1/3 Rule –Simpson's 3/8 Rule.

UNIT – VI
Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods –Predictor-Corrector Methods- Adams-Moulton Method –Milne's Method.

UNIT – VII
Fourier Series: Determination of Fourier coefficients – Fourier series – even and odd functions – Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions. Fourier integral theorem (only statement)– Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

UNIT – VIII
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations. Method of separation of variables. z-transform – inverse z-transform - properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equation by z-transforms.

Text Books:
1. Mathematical Methods, T. K. V. Iyengar, B. Krishna Gandhi and Others, S. Chand & Company.
2. Mathematical Methods, C. Sankaraiah, V. G. S. Book Links.
3. A text book of Mathematical Methods, V. Ravindranath, A. Vijayalaxmi, Himalaya Publishers.
4. A text book of Mathematical Methods, Shahnaz Bathul, Right Publisshers.

References:
1. A text Book of Engineering Mathematics, B. V. Raman, Tata Mc Graw Hill.
2. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley India Pvt. Ltd.
3. Numerical Methods for Scientific and Engineering Computation, M. K. Jain, S. R. K. Iyengar & R. K. Jain, New Age International Publishers.
4. Elementary Numerical Analysis, Aitkinson & Han, Wiely India, 3rd Edition, 2006

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	T	P	C
	2+1*	0	4

APPLIED PHYSICS

UNIT I

BONDING IN SOLIDS : Introduction - Types of bonding in solids - Estimation of cohesive energy – Madelung constant.

CRYSTAL STRUCTURES AND X-RAY DIFFRACTION: Introduction -Space lattice - Basis - Unit cell - Lattice parameter - Bravais lattices – Crystal systems -   Structure and packing fractions of Simple cubic - Body centered cubic – Face centered cubic crystals - Directions and planes in crystals – Miller indices - Separation between successive [h k l] planes - Diffraction of X-rays by crystal planes - Bragg's law - Laue method - Powder method.

UNIT II

PRINCIPLES OF QUANTUM MECHANICS: Waves and particles - Planck's quantum theory – de Broglie hypothesis – Matter waves - Davisson and Germer experiment – G. P. Thomson experiment – Heisenberg uncertainty principle - Schrödinger's time independent wave equation - Physical significance of the wave function - Particle in one dimensional potential box.

UNIT III

ELECTRON THEORY OF METALS: Classical free electron theory - Mean free path - Relaxation time and drift velocity - Quantum free electron theory - Fermi-Dirac distribution (analytical) and its dependence on temparature – Fermi energy – Electron scattering and resistance.

BAND THEORY OF SOLIDS: Bloch theorem - Kronig-Penney model (qualitative treatment) - Origin of energy band formation in solids – Classification of materials into conductors, semi conductors & insulators - Concept of effective mass of an electron.

UNIT IV

DIELECTRIC PROPERTIES: Introduction - Dielectric constant - Electronic, ionic and orientational polarizations - Internal fields in solids – Clausius - Mossotti equation – Dielectrics in alternating fields – Frequency dependence of the polarizability - Ferro and Piezo electricity.

MAGNETIC PROPERTIES : Permeability - Magnetization - Origin of magnetic moment – Classification of magnetic materials - Dia, para and ferro magnetism - Hysteresis curve - Soft and hard magnetic materials.

UNIT V

SEMICONDUCTORS : Introduction - Intrinsic semiconductor and carrier concentration – Equation for conductivity - Extrinsic semiconductor and carrier concentration - Drift and diffusion - Einstein's equation - Hall effect – Direct & indirect band gap semiconductors.

SUPERCONDUCTIVITY: General properties - Meissner effect - Penetration depth - Type I and Type II superconductors - Flux quantization – DC and AC Josephson effect –BCS Theory - Applications of superconductors.

UNIT VI

LASERS: Introduction - Characteristics of Lasers - Spontaneous and stimulated emission of radiation - Einstein's coefficients - Population inversion - Ruby laser - Helium-Neon Laser – CO_2 laser -Semiconductor Laser – Applications of lasers.

UNIT VII

FIBER OPTICS AND HOLOGRAPHY: Introduction - Principle of optical fiber - Acceptance angle and acceptance cone - Numerical aperture – Types of optical fibers and refractive index profiles – Attenuation in optical fibers - Application of optical fibers – Basic principles of holography – Construction and reconstruction of image on hologram – Applications of holography.

UNIT VIII

SCIENCE & TECHNOLOGY OF NANOMATERIALS: Introduction to Nano materials - Basic principles of Nanoscience & Technology – Fabrication of nano materials – Physical & chemical properties of nanomaterials – Carbon nanotubes – Applications of nanotechnology.

TEXTBOOKS:
1. Applied Physics 2nd edition by Dr. P. Appala Naidu & Dr. M. Chandra Shekar, V.G.S. Book links.
2. Introduction to Solid State Physics by C. Kittel ; Wiley Eastern Ltd.
3. Nanotechnology by Mark Ratner and Daniel Ratner; Pearson Education.

REFERENCES:
1. Materials Science and Engineering by V. Raghavan; Prentice-Hall India.
2. Materials Science by M. Arumugam; Anuradha Agencies.
3. Solid State Physics by N.W. Ashcroft & N. David Merwin; Thomson Learning.
4. Materials Science by M.S.Vijaya & G. Rangarajan; Tata McGraw Hill.
5. Solid State Physics by P.K. Palanisamy; Scitech Publications (India) Pvt. Ltd.
6. Nano Materials by A.K. Bandyopadhyay, New Age International Publishers.
7. Applied Physics by P.K.Mittal; I.K. International.
8. Applied Physics by K. Vijay Kumar & T. Sreekanth; S. Chand & Company Ltd.

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I Year B. Tech BME	T	P	C
	3+1*	0	6

C PROGRAMMING AND DATA STRUCTURES

UNIT - I
Algorithm / pseudo code, flowchart, program development steps, structure of   C program, A Simple C program, identifiers, basic data types and sizes,   Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation.

Input-output statements, statements and blocks, if and switch statements, loops- while, do-while and for statements, break, continue, goto and labels, programming examples.

UNIT - II
Designing structured programs, Functions, basics, parameter passing, storage classes- extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, header files, C preprocessor, example c programs.

UNIT - III
Arrays- concepts, declaration, definition, accessing elements, storing elements, arrays and functions, two-dimensional and multi-dimensional arrays, applications of arrays. pointers- concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory managements functions, command line arguments, c program examples.

UNIT - IV
Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bitfields, C program examples.

UNIT - V
Input and output – concept of a file, text files and binary files, streams, standard I/o, Formatted I/o, file I/o operations, error handling, C program examples.

UNIT - VI
Searching – Linear and binary search methods, sorting – Bubble sort, selection sort, Insertion sort, Quick sort, merge sort.

UNIT – VII
Introduction to data structures, singly linked lists, doubly linked lists, circular list, representing stacks and queues in C using arrays and linked lists, infix to post fix conversion, postfix expression evaluation.

UNIT - VIII
Trees- Binary tress, terminology, representation, traversals, graphs- terminology, representation, graph traversals (dfs & bfs)

TEXT BOOKS :
1. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.
2. DataStructures Using C – A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.

REFERENCES :
1. C& Data structures – P. Padmanabham, B.S. Publications.
2. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education
3. C Programming with problem solving, J.A. Jones & K. Harrow, dreamtech Press
4. Programming in C – Stephen G. Kochan, III Edition, Pearson Eductaion.
5. Data Structures and Program Design in C, R.Kruse, C.L. Tondo, BP Leung, Shashi M, Second Edition, Pearson Education.

I Year B. Tech BME

	T	P	C
	2+1*	0	4

NETWORK ANALYSIS

UNIT – I Introduction to Electrical Circuits
Circuit Concept – R-L-C parameters – Voltage and Current sources – Independent and dependent sources-Source transformation – Voltage – Current relationship for passive elements – Kirchoff's laws – network reduction techniques – series, parallel, series parallel, star-to-delta or delta-to-star transformation.

UNIT – II A.C Circuits - I
R.M.S and Average values and form factor for different periodic wave forms, Steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation – Concept of self and mutual inductances – co-efficient of coupling series circuit analysis with mutual inductance.

UNIT – III   A.C Circuits - II
Resonance – series, parallel circuits, concept of band width and Q factor.
Three phase circuits: Phase sequence – Star and delta connection – Relation between line and phase voltages and currents in balanced systems – Calculations of active and reactive power.

UNIT – IV   Network topology
Definitions – Graph – Tree, Basic cutset and Basic Tieset matrices for planar networks – Loop and Nodal methods of analysis of Networks with independent and dependent voltage and current sources - Duality & Dual networks.

UNIT – V   Network Theorems
Tellegens, Superposition, Reciprocity, Thevinin's, Norton's, Max Power Transfer
theorem. Milliman's Theorem – Statement and proofs problem solving using dependent and independent sources for d.c and a.c excitation.

UNIT – VI   Two-port networks
Z,Y, ABCD, h-parameters – Conversion of one parameter to another parameter – condition for reciprocity and symmetry – 2 port network connections in series, parallel and cascaded – problem solving.

UNIT – VII   Transient Analysis
Transient response of R-L, R-C, R-L-C circuits (Series combinations only) for d.c. and sinusoidal excitations – Initial conditions - Solution using differential equation approach and Laplace transform methods of solutions.

UNIT – VIII   Filters
L.P, H.P, B.P, B.E, Prototype filters design – M-derived filters of L.P. and H.P.- Composite filter design of L.P. and H.P design of various symmetrical attenuators.

TEXT BOOKS :
1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition, 2000.
2. Networks, Lines and Fields - JD Ryder, PHI, 2nd Edition, 1999.

REFERENCES :
1. Engineering Circuit Analysis – William Hayt and Jack E Kemmerly, McGraw Hill, 5th Edition, 1993.
2. Network Analysis – N.C.Jagan and C.Lakshminarayana, B.S. Publications, 2006.
3. Electric Circuits – J.Edminister and M.Nahvi – Schaum's Outlines, TMH, 1999.
4. Electrical circuits by A.Chakarborthy, Dhanpath Rai & Co.,

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T	P	C
3+1*	0	6

ELECTRONIC DEVICES AND CIRCUITS

UNIT-I
ELECTRON DYNAMICS AND CRO: Motion of charged particles in electric and magnetic fields. Simple problems involving electric and magnetic fields only. Electrostatic and magnetic focusing. Principles of CRT, deflection sensitivity (Electrostatic and magnetic deflection), Parallel Electric and Magnetic fields, Perpendicular Electric and Magnetic fields.

UNIT- II
JUNCTION DIODE CHARACTERISTICS : Review of semi conductor Physics – n and p –type semi conductors, Mass Action Law, Continuity Equation, Hall Effect, Fermi level in intrinsic and extrinsic semiconductors, Open-circuited p-n junction, The p-n junction Energy band diagram of PN diode, PN diode as as a rectifier (forward bias and reverse bias), The current components in p-n diode, Law of junction, Diode equation, Volt-ampere characteristics of p-n diode, Temperature dependence of VI characteristic, Transition and Diffusion capacitances, Step graded junction, Breakdown Mechanisms in Semi Conductor (Avalanche and Zener breakdown) Diodes, Zener diode characteristics, Characteristics of Tunnel Diode with the help of energy band diagrams, Varactar Diode, LED, LCD. And photo diode

UNIT- III
RECTIFIERS, FILTERS AND REGULATORS : Half wave rectifier, ripple factor, full wave rectifier, Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L- section filter, Π- section filter, Multiple L-section and Multiple Πsection filter, and comparison of various filter circuits in terms of ripple factors, Simple circuit of a regulator using zener diode, Series and Shunt voltage regulators

UNIT- IV
TRANSISTOR and FET CHARACTERISTICS : Junction transistor, Transistor current components, Transistor as an amplifier, Transistor construction, Detailed study of currents in a transistor, Transistor alpha, Input and Output characteristics of transistor in Common Base, Common Emitter, and Common collector configurations, Relation between Alpha and Beta, typical transistor junction voltage values, JFET characteristics (Qualitative and Quantitative discussion), Small signal model of JFET, MOSFET characterisitics (Enhancement and depletion mode), Symbols of MOSFET, Comparison of Transistors, Introduction to SCR and UJT.

UNIT-V
BIASING AND STABILISATION : BJT biasing, DC equivalent model, criteria for fixing operating point, Fixed bias, Collector to base bias, Self bias techniques for stabilization, Stabilization factors, (S, S', S''), Compensation techniques, (Compensation against variation in V_{BE}, I_{co},) Thermal run away, Thermal stability,

UNIT- VI
AMPLIFIERS : Small signal low frequency transistor amplifier circuits: h-parameter representation of a transistor, Analysis of single stage transistor amplifier using h-parameters: voltage gain, current gain, Input impedance and Output impedance. Comparison of transistor configurations in terms of A_I , R_i , A_v , R_o,

UNIT- VII
FEEDBACK AMPLIFIERS : Concept of feedback, Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of Feedback on input and output characteristics, Voltage series, voltage shunt, current series, and current shunt feedback amplifiers with discrete components and their analysis

UNIT-VIII
OSCILLATORS : Condition for oscillations. RC-phase shift oscillators with Transistor and FET, Hartley and Colpitts oscillators, Wein bridge oscillator, Crystal oscillators, Frequency and amplitude stability of oscillators,

TEXT BOOKS :

1. Electronic Devices and Circuits – J.Millman, C.C.Halkias, and Satyabratha Jit Tata McGraw Hill, 2nd Ed., 2007.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall,9th Edition,2006.

REFERENCES :

1. Electronic Devices and Circuits – T.F. Bogart Jr., J.S.Beasley and G.Rico, Pearson Education, 6th edition, 2004.
2. Principles of Electronic Circuits – S.G.Burns and P.R.Bond, Galgotia Publications, 2nd Edn.., 1998.
3. Microelectronics – Millman and Grabel, Tata McGraw Hill, 1988.
4. Electronic Devices and Circuits – Dr. K. Lal Kishore, B.S. Publications, 2nd Edition, 2005.
5. Electronic Devices and Circuits- Prof GS N Raju I K International Publishing House Pvt .Ltd 2006

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ENGINEERING DRAWING

UNIT – I
Introduction to engineering graphics – construction of ellipse, parabola and hyperbola – cylindrical curves.

UNIT – II
Orthographic projections of points, lines and planes – axis inclined to one planes and inclined to both the planes.

UNIT – III
Orthographic projections of solids :
Cylinder, cone, prism, pyramid and sphere positions and axis inclined to both the planes.

UNIT – IV
Isomeric projections of lines, planes and simple solids

UNIT – V
Conversion of orthographic views into isometric views and vice-versa.

TEXT BOOKS :
1. Engineering drawings By N.D.Bhatt
2. Engineering graphics By K.L. Narayana & P.Kannayya

REFERENCES:-
1. Engineering drawing and graphics: Venugopal/ New age
2. Engineering drawing : Johle / TMH

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COMPUTER PROGRAMMING LAB

Objectives:
- To make the student learn a programming language.
- To teach the student to write programs in C solve the problems
- To Introduce the student to simple linear and non linear data structures such as lists, stacks, queues, trees and graphs.

Recommended Systems/Software Requirements:

- Intel based desktop PC
- ANSI C Compiler with Supporting Editors

Week l.
a) Write a C program to find the sum of individual digits of a positive integer.
b) A Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Week 2.
a) Write a C program to calculate the following Sum:
    $Sum = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$
b) Write a C program toe find the roots of a quadratic equation.

Week 3
a) Write C programs that use both recursive and non-recursive functions
        i) To find the factorial of a given integer.
        ii) To find the GCD (greatest common divisor) of two given integers.
        iii) To solve Towers of Hanoi problem.

Week 4
a) The total distance travelled by vehicle in 't' seconds is given by distance $= ut + 1/2at^2$ where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec^2). Write C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.
b) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Week 5
a) Write a C program to find both the larges and smallest number in a list of integers.
b) Write a C program that uses functions to perform the following:
        i) Addition of Two Matrices
        ii) Multiplication of Two Matrices

Week 6
a) Write a C program that uses functions to perform the following operations:
        i) To insert a sub-string in to given main string from a given position.
        ii) To delete n Characters from a given position in a given string.
b) Write a C program to determine if the given string is a palindrome or not

Week 7
a) Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.
b) Write a C program to count the lines, words and characters in a given text.

Week 8

a) Write a C program to generate Pascal's triangle.
b) Write a C program to construct a pyramid of numbers.

Week 9
Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:
$1+x+x^2+x^3+\ldots\ldots\ldots+x^n$
For example: if n is 3 and x is 5, then the program computes 1+5+25+125.
Print x, n, the sum
Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal ? If so, test for them too.

Week 10
a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
b) Write a C program to convert a Roman numeral to its decimal equivalent.

Week 11
Write a C program that uses functions to perform the following operations:
        i) Reading a complex number
        ii) Writing a complex number
        iii) Addition of two complex numbers
        iv) Multiplication of two complex numbers
(Note: represent complex number using a structure.)

Week 12
a) Write a C program which copies one file to another.
b) Write a C program to reverse the first n characters in a file.
(Note: The file name and n are specified on the command line.)

Week 13
Write a C program that uses functions to perform the following operations on singly linked list.:
        i) Creation ii) Insertion   iii) Deletion   iv) Traversal

Week 14
Write a C program that uses functions to perform the following operations on doubly linked list.:
        i) Creation ii) Insertion   iii) Deletion   iv) Traversal in both ways

Week 15
Write C programs that implement stack (its operations) using
        i) Arrays   ii) Pointers

Week 16
Write C programs that implement Queue (its operations) using
        i) Arrays   ii) Pointers

Week 17
Write a C program that uses Stack operations to perform the following:
        i) Converting infix expression into postfix expression
        ii) Evaluating the postfix expression

Week 18
Write a C program that uses functions to perform the following:
        i) Creating a Binary Tree of integers
        ii) Traversing the above binary tree in preorder, inorder and postorder.

Week 19
Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers :
        i) Linear search   ii) Binary search

Week 20

Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:

        i) Bubble sort   ii) Quick sort

Week 21

Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:

        i) Insertion sort ii) Merge sort

Week 22

Write C programs to implement the Lagrange interpolation and Newton- Gregory forward interpolation.

Week 23

Write C programs to implement the linear regression and polynomial regression algorithms.

Week 24

Write C programs to implement Trapezoidal and Simpson methods.

Text Books

1. C programming and Data Structures, P. Padmanabham, Third Edition, BS Publications
2. Data Structures: A pseudo code approach with C, second edition R.F. Gilberg and B.A. Forouzan
3. Programming in C, P.Dey & M. Ghosh, Oxford Univ.Press.
4. C and Data Structures, E Balaguruswamy, TMH publications.

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IT WORKSHOP

Objectives :

The IT Workshop for engineers is a 6 training lab course spread over 90 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, Power Point and Publisher.

PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows , Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered.

Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.

Productivity tools module would enable the students in crafting professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools and LaTeX.

PC Hardware

Week 1 – Task 1 : Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Week 2 – Task 2 : Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Week 3 – Task 3 : Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Week 4 – Task 4 : Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Week 5 – Task 5 : Several mini tasks would be that covers Basic commands in Linux and Basic system administration in Linux which includes: Basic Linux commands in bash, Create hard and symbolic links, Text processing, Using wildcards

Week 6 – Task 6 : Hardware Troubleshooting : Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

Week 7 – Task 7 : Software Troubleshooting : Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Week 8 – Task 8 : The test consists of various systems with Hardware / Software related troubles, Formatted disks without operating systems.

Internet & World Wide Web

Week 9 - Task 1 : **Orientation & Connectivity Boot Camp :** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Week 10 - Task 2 : Web Browsers, Surfing the Web : Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Week 11 - Task 3 : **Search Engines & Netiquette :** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors.

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Week 12 - Task 4 : Cyber Hygiene : Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install an anti virus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Week 13 Module Test A test which simulates all of the above tasks would be crafted and given to the students.

LaTeX and Word
Week 14 – Word Orientation : The mentor needs to give an overview of LaTeX and Microsoft/ equivalent (FOSS) tool word : Importance of LaTeX and MS/ equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.
Task 1 : Using LaTeX and word to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Week 15 - Task 2 : Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Track Changes.

Week 16 - Task 3 : Creating a Newsletter : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs

Week 17 - Task 4 : Creating a Feedback form - Features to be covered- Forms, Text Fields, Inserting objects, Mail Merge in Word.

Week 18 - LaTeX and Word Module Test - Replicate the given document inclusive of all features

Excel
Week 19 - Excel Orientation : The mentor needs to tell the importance of MS/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel –
Accessing, overview of toolbars, saving excel files, Using help and resources
Task 1 : Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

Week 20 - Task 2 : Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std.deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

Week 21 - Task 3 : Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Week 22 - Task 4 : Cricket Score Card - Features to be covered:-Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation

Week 23 – Excel Module Test - Replicate the given document inclusive of all features

LaTeX and MS/equivalent (FOSS) tool Power Point
Week 24 - Task1 : Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Powerpoint.

Week 25 - Task 2 : Second week helps students in making their presentations interactive.Topic covered during this week includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

Week 26 - Task 3 : Concentrating on the in and out of Microsoft power point and presentations in LaTeX. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes :- Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.

Week 27 - Task 4 : Entire week concentrates on presentation part of LaTeX and power point. Topic covered during this week includes -Using Auto content wizard, Slide Transition, Custom Animation, Auto Rehearsing

Week 28 - Task 5 : Power point test would be conducted. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

Publisher
Week 29 : Help students in preparing their personal website using Microsoft/ equivalent (FOSS) tool publisher. Topic covered during this week includes - Publisher Orientation, Using Templates, Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, Hosting website.

REFERENCES :
1. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
2. The Complete Computer upgrade and repair book,3rd edition Cheryl A Schmidt, WILEY Dreamtech
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. PC Hardware and A+Handbook – Kate J. Chase PHI (Microsoft)
5. LaTeX Companion – Leslie Lamport, PHI/Pearson.
6. All LaTeX and others related material is available at
(a) www.sssolutions.in and
(b) www.sontisoftsolutions.org

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ELECTRONIC DEVICES AND CIRCUITS LAB

PART A : (Only for viva voce Examination)
ELECTRONIC WORKSHOP PRACTICE (in 6 lab sessions) :
1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of Active Devices, Diodes, BJTs, Lowpower JFETs, MOSFETs, Power Transistors, LEDs, LCDs, Optoelectronic Devices, SCR, UJT, DIACs, TRIACs, Linear and Digital ICs.
3. Soldering practice – Simple Circuits using active and passive components.
4. Single layer and Multi layer PCBs (Identification and Utility).
5. Study and operation of
   • Multimeters (Analog and Digital)
   • Function Generator
   • Regulated Power Supplies
     1. Study and Operation of CRO.

PART B : (For Laboratory examination – Minimum of 16 experiments)
1. PN Junction diode characteristics   A. Forward bias B. Reverse bias.
2. Zener diode characteristics
3. Transistor CB characteristics (Input and Output)
4. Transistor CE characteristics (Input and Output)
5. Rectifier without filters (Full wave & Half wave)
6. Rectifier with filters (Full wave & Half wave)
7. FET characteristics
8. Measurement of h parameters of transistor in CB, CE, CC configurations
9. CE Amplifier
10. CC Amplifier (Emitter Follower).
11. Single stage R-C coupled Amplifier.
12. FET amplifier (Common Source)
13. Wien Bridge Oscillator
14. RC Phase Shift Oscillator
15. Feed back amplifier (Current Series).
16. Feed back amplifier (Voltage Series).
17. Hartley Oscillator.
18. Colpitts Oscillator.
19. SCR characteristics.

PART C:
Equipment required for Laboratories:
1. Regulated Power supplies (RPS)   -   0-30v
2. CROs   -   0-20M Hz.
3. Function Generators   -   0-1 M Hz.
4. Multimeters
5. Decade Resitance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Micro Ammeters (Analog or Digital) -   0-20 µA, 0-50µA, 0-100µA, 0-200µA
8. Voltmeters (Analog or Digital)   -   0-50V, 0-100V, 0-250V
9. Electronic Components   - Resistors, Capacitors, BJTs, LCDs, SCRs, UJTs, FETs, LEDs,
   MOSFETs,diodes(ge&sitype),transistors(npn & pnp type)

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ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

The **Language Lab** focuses on the production and practice of sounds of language and familiarises the students with the use of English in everyday situations and contexts.

Objectives:
1. **To expose the students to a variety of self-instructional, learner-friendly modes of language learning.**
2. **To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer-based competitive exams such GRE, TOEFL, GMAT etc.**
3. **To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.**
4. **To train them to use language effectively to face interviews, group discussions, public speaking.**
5. **To initiate them into greater use of the computer in resume preparation, report writing, format-making etc.**

SYLLABUS :
The following course content is prescribed for the **English Language Laboratory** sessions:
1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Situational Dialogues / Role Play.
4. Oral Presentations- Prepared and Extempore.
5. 'Just A Minute' Sessions (JAM).
6. Describing Objects / Situations / People.
7. Information Transfer
8. Debate
9. Telephoning Skills.
10. Giving Directions.

Minimum Requirement:

The English Language Lab shall have two parts:

i) **The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.

ii) **The Communication Skills Lab** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

System Requirement (Hardware component):
Computer network with Lan with minimum 60 multimedia systems with the following specifications:
  - i) P – IV Processor
    - a) Speed – 2.8 GHZ
    - b) RAM – 512 MB Minimum
    - c) Hard Disk – 80 GB
  - ii) Headphones of High quality

Suggested Software:
• Cambridge Advanced Learners' English Dictionary with CD.
• The Rosetta Stone English Library
• Clarity Pronunciation Power – Part I
• Mastering English in Vocabulary, Grammar, Spellings, Composition
• Dorling Kindersley series of Grammar, Punctuation, Composition etc.
• Language in Use, Foundation Books Pvt Ltd with CD.
● Oxford Advanced Learner's Compass, 7th Edition
• Learning to Speak English - 4 CDs
• Microsoft Encarta with CD
• Murphy's English Grammar, Cambridge with CD
▪ English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):
1. **Spoken English** (CIEFL) in 3 volumes with 6 cassettes, OUP.
2. **English Pronouncing Dictionary** Daniel Jones Current Edition with CD.

3. **Spoken English**- R. K. Bansal and J. B. Harrison, Orient Longman 2006 Edn.
4. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai
5. **Speaking English Effectively** by Krishna Mohan & NP Singh (Macmillan)
6. **A Practical Course in English Pronunciation**, (with two Audio cassettes) by J. Sethi, Kamlesh Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.
7. **A text book of English Phonetics for Indian Students** by T.Balasubramanian (Macmillan)
8. **English Skills for Technical Students,** WBSCTE with British Council, OL

DISTRIBUTION AND WEIGHTAGE OF MARKS
English Language Laboratory Practical Paper:
1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional marks and 50 year-end Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The year- end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

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ELECTRICAL TECHNOLOGY

UNIT I
DC MACHINES : Principle of operation of DC Machines- EMF equation – Types of generators – Magnetization and load characteristics of DC generators

UNIT II
D.C. MOTORS : DC Motors – Types of DC Motors – Characteristics of DC motors – 3-point starters for DC shunt motor – Losses and efficiency – Swinburne's test – Speed control of DC shunt motor – Flux and Armature voltage control methods.

UNIT III
TRANSFORMERS : Principle of operation of single phase transformer – types – Constructional features – Phasor diagram on No Load and Load – Equivalent circuit

UNIT IV
PERFORMANCE OF TRANSFORMERS : Losses and Efficiency of transformer and Regulation – OC and SC tests – Predetermination of efficiency and regulation (Simple Problems).

UNIT V
THREE PHASE INDUCTION MOTOR : Principle of operation of three-phase induction motors –Slip ring and Squirrel cage motors – Slip-Torque characteristics – Efficiency calculation – Starting methods.

UNIT VI
ALTERNATORS : Alternators – Constructional features – Principle of operation – Types - EMF Equation – Distribution and Coil span factors – Predetermination of regulation by Synchronous Impedance Method – OC and SC tests.

UNIT VII
SINGLE PHASE INDUCTION MOTORS : Principle of operation - Shaded pole motors – Capacitor motors, AC servomotor, AC tachometers, Synchros, Stepper Motors – Characteristics.

UNIT VIII
ELECTRICAL INSTRUMENTS : Basic Principles of indicating instruments – Moving Coil and Moving iron Instruments (Ammeters and Voltmeters)

TEXT BOOKS :
1. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.
2. Basic Electrical Engineering - T.K. Nagasarkar and M.S.Sukhija, Oxford University Press, 2005

REFERENCES :
1. Principles of Electrical Engineering - V.K Mehta, S.Chand Publications.
2. Theory and Problems of basic electrical engineering - I.J. Nagarath amd D.P Kothari, PHI Publications
3. Essentials of Electrical and Computer Engineering - David V. Kerns, JR. J. David Irwin

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SWITCHING THEORY AND LOGIC DESIGN

UNIT I
NUMBER SYSTEMS & CODES : Philosophy of number systems – complement representation of negative numbers-binary arithmetic-binary codes-error detecting & error correcting codes –hamming codes.

UNIT II
BOOLEAN ALGEBRA AND SWITCHING FUNCTIONS : Fundamental postulates of Boolean Algebra - Basic theorems and properties - switching functions–Canonical and Standard forms-Algebraic simplification digital logic gates, properties of XOR gates –universal gates-Multilevel NAND/NOR realizations.

UNIT III
MINIMIZATION OF SWITCHING FUNCTIONS : Map method, Prime implicants, Don't care combinations, Minimal SOP and POS forms, Tabular Method, Prime –Implicant chart, simplification rules.

UNIT IV
COMBINATIONAL LOGIC DESIGN
Design using conventional logic gates, Encoder, Decoder, Multiplexer, De-Multiplexer, Modular design using IC chips, MUX Realization of switching functions Parity bit generator, Code-converters, Hazards and hazard free realizations.

UNIT V
PROGRAMMABLE LOGIC DEVICES, THRESHOLD LOGIC : Basic PLD's-ROM, PROM, PLA, PLD Realization of Switching functions using PLD's. Capabilities and limitations of Threshold gate, Synthesis of Threshold functions, Multigate Synthesis.

UNIT VI
SEQUENTIAL CIRCUITS - I : Classification of sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples) Basic flip-flops-Triggering and excitation tables. Steps in synchronous sequential circuit design. Design of modulo-N Ring & Shift counters, Serial binary adder,sequence detector.

UNIT VII
SEQUENTIAL CIRCUITS - II : Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and Merger chart methods-concept of minimal cover table.

UNIT VIII
ALGOROTHIMIC STATE MACHINES : Salient features of the ASM chart-Simple examples-System design using data path and control subsystems-control implementations-examples of Weighing machine and Binary multiplier.

TEXTBOOKS :
1. Switching & Finite Automata theory – Zvi Kohavi, TMH,2nd Edition.
2. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.

REFERENCES :
1. An Engineering Approach To Digital Design – Fletcher, PHI. Digital Logic – Application and Design – John M. Yarbrough, Thomson.
2. Fundamentals of Logic Design – Charles H. Roth, Thomson Publications, 5th Edition, 2004.
3. Digital Logic Applications and Design – John M. Yarbrough, Thomson Publications, 2006.

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SIGNALS AND SYSTEMS

UNIT I

SIGNAL ANALYSIS : Analogy between vectors and signals, Orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, Closed or complete set of orthogonal functions, Orthogonality in complex functions, Exponential and sinusoidal signals, Concepts of Impulse function, Unit step function, Signum function.

UNIT II

FOURIER SERIES REPRESENTATION OF PERIODIC SIGNALS : Representation of Fourier series, Continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum

UNIT III

FOURIER TRANSFORMS : Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform.

UNIT IV

SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS : Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

UNIT V

CONVOLUTION AND CORRELATION OF SIGNALS : Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property of Fourier transforms. Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function.Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

UNIT VI

SAMPLING : Sampling theorem – Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling.

UNIT VII

LAPLACE TRANSFORMS : Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

UNIT VIII

Z–TRANSFORMS : Fundamental difference between continuous and discrete time signals, discrete time signal representation using complex exponential and sinusoidal components, Periodicity of discrete time usingcomplex exponential signal, Concept of Z- Transform of a discrete sequence. Distinction between Laplace, Fourier and Z transforms. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms.

TEXT BOOKS :
1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.
REFERENCES :
1. Signals & Systems - Simon Haykin and Van Veen,Wiley, 2nd Edition.
2. Network Analysis - M.E. Van Valkenburg, PHI Publications, 3rd Edn., 2000.
3. Fundamentals of Signals and Systems Michel J. Robert, MGH International Edition, 2008.
4. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, Pearson education.3rd Edition, 2004.

II Year B.Tech. BME – I Semester

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APPLIED CHEMISTRY AND BIOCHEMISTRY

UNIT-I

Electro Chemistry: Conductance, Specific Equivalent and Molecular Conductance -Cell constant -Measurement of Equivalent Conductance –Galvanic Cell

Standard Electrode Potentials -Calculation of E. M. F of a cell –Determination of pH by E. M. F methods.

UNIT-II

Polymers: applications of Polyethylene, Teflon, PVC, Bakelite, Rubber -Natural Rubber.

UNIT-III

Lubricants and water Technology: Definition -Theory of Lubrication, properties of Lubrication. Nature of Impurities present in water, Hardness of water and its Determination, Different methods of Treatment of water- Lime soda, Zeolite, Ion exchange process- Analysis of water.

UNIT-IV

Biochemistry of Living Cell, Sub-cellular. Fractionation using the Differential Centrifugation Method. Functions of each Organelle, Transport of Substances across Biological Membrane Function. Redox potential, Oxidative phosphorylation.

UNIT-V

Chemical nature of Enzymes - study of the Properties of Enzymes and kinetics by Spectrophotometer. Diagnostic and therapeutic uses of Enzymes.

UNIT-VI

Carbohydrate, Protein & Lipid metabolism (Briefly), Nucleic Acid chemistry. Protein synthesis. Transcription and Translation, Replication, Polymerase Chain Reaction(PCR) Immunological Techniques or Immunoassay – Radio Immuno Assay (RIA), Enzyme- Linked Immunosorbent Assay (ELISA), Chemiluminiscence.

UNIT-VII

Blood Chemistry: Chemical Composition of Blood, Separation of Serum Proteins and lipoproteins by Electrophoresis and Ultracentrifugation Acid Base Balance and Biochemical Measurements of Acid-Base and Electrolyte status of the patients, Urine Analysis.

UNIT-VIII

General methods of biochemical analysis carried out in the estimation of blood constituents, such as glucose etc. Principles and different methods of chromatography – fluorometry, flame photometry, Automation and Biochemical Analysis. Applications of isotopes in biochemistry.

TEXT BOOKS

1. Robert Murray, Peter A. Mayes, Victor W. Rodwell, Daryl K. Granner, Harper's Biochemistry, 26th Edition, McGraw-Hill Companies, February 2003.
2. Jain & Jain, Engineering Chemistry" Dhanpat Rai Publishing company,. New Delhi.

REFERENCE

1. Rao, N. Mallikarjuna, Medical Biochemistry, New Age International Pvt Ltd,2002.
2. Lalit M. Srivastava, Nibhriti Das & Subrata sinha, Essentials of practical Biochemistry, CBS Publishers, Ist edition, 2002.

II Year B.Tech. BME – I Semester

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ANATOMY AND PHYSIOLOGY

UNIT-I

Skeletal system: classification of Bones, Joints and Muscles- Structure and function.Major Muscles of Limbs and their Actions. Functional Concept of the Human body, Bone and Muscle Physiology,

UNIT-II

Nervous system and special senses: Brain and spinal cord, Peripheral and Autonomic Nervous System, nerve physiology, Electroencephalogram and Electrocorticogram.
Anatomy and physiology of Eye and Ear.

UNIT-III

Cardiovascular system: heart, arterial and venous system, Performance Characteristics of Heart and Major Blood Vessels, Electrocardiography

UNIT-IV

Respiratory system: Trachea and Lungs. Respiratory Physiology.

UNIT-V

Endocrine System: Endocrine Glands, Physiology of Endocrine Regulatory System.

UNIT-VI

Digestive System: Oesophagus, Stomach, Intestines, Liver, Gall Bladder and Pancreas

UNIT-VII

Lymphatic system: Spleen, glands and Lymph nodes

UNIT-VIII

Reproductive and Urinary Systems: Male and Female. Counter Current Concept and its Application of Concentration Of Urine

TEXT BOOKS
1. Charles E. Tobin, Basic Human Anatomy, McGraw Hill, 1980.
2. J Gibson, Modern Physiology & Anatomy for Nurses; Black-well Scientific Publishers, 1981.

REFERENCE:
1. Best and Taylor, The Living Body; B.I Publication, 1980. .
2. C. Tandan & Dr. Chandhramoli; Textbook of physiology for Dental studies. Dorpan Publications.
3. Gorden Sears, W. S & Winwood W. S;Anatomy & Physiology for Nurses, Revised edition

II Year B.Tech. BME – I Semester

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BIOELECTRICITY AND ELECTRODES

UNIT-I

Bioelectricity generation at the cellular & sub cellular level. Different biopotentials and their characteristics.

UNIT-II

Nernst Equation: Derivations and its significance. Refractory Period Characteristics of Stimulus. Strength-Duration relationship. Electrical equivalent circuit of Axon. Membrane time and space constants.

UNIT-III

Hodgkin- huxley formulation, Membrane conductance, Nerve conduction, membrane properties from current voltage relations, Models of squid axon. Propagation of impulses in unmyelinated and myelinated nerve fiber. Electrical properties of receptors. Intensity-frequency relationship. Electrical properties of synaptic junctions - EPSP and IPSP.

UNIT-IV

Characteristics of Action potentials at SA Node, Atria, A V Node, Purkinje fibers and Ventricles. ECG Complexes. 12 lead ECG. Standard leads of Einthoven. Pericardial leads and Augmented limb leads. Relationship between unipolar extremity leads and standard Bipolar leads.

UNIT-V

Biopotential electrodes: classification & characteristics. Electrode-Electrolyte Interface, Equivalent Circuit Properties of Needle & Micro Electrodes, Electrodes for Surgery, Physiotherapy & Analytical instruments.

UNIT-VI

Electrodes for ECG EEG EMG, EOG. Electrodes for surgery, physiotherapy and Analytical Instruments, Ion-sensitive electrodes used in Biochemistry analysers.

UNIT-VII

Electrical activity of skeletal muscles, Motor unit potentials, neuromuscular transmission,
EMG wave form. Surface and needle electrodes for EMG. Velocity and their changes in normal and abnormal states. Fatigue and conduction, chemical significance. Gradation of muscular activity.

UNIT-VIII

Application of Bioelectric phenomena Forward, Inverse problems. Electro Encephalogram. Impedance Plethysmography, Measurement of Tissue Resistance.

TEXT BOOKS

1. Robert Plonsey and Roger Barr, Bioelectricity, McGraw Hill, 1986.
2. John Webster. Medical Instrumentation.- Application and Design. John Wiley and Sons. Inc., New York. Third edition 2003.

REFERENCE

1. L. A Geddes, Principles of Applied Biomedical Instrumentation, John Willy & Sons,1989.
2. Plonsey Robert and Flemming David G. Bioelectrical phenomena, McGraw Hill, 1969.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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II Year B.Tech. BME – I Semester

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APPLIED BIOCHEMISTRY LAB

1. Study of Plasma protein electrophoresis.
2. Study of Chromatography to separate amino acids in protein mixtures.
3. Study of Colorimetry.
4. Study of Spectrophotometry.
5. Study of pH meter
6. Study of Flame photometry-Analysis of Na and K in an unknown sample
7. Quantitative estimation of glucose.
8. Quantitative estimation of urea.
9. Quantitative estimation of creatinine
10. Quantitative estimation of Serum proteins, A/G Ratio
11. CSF Analysis
12. Clearance Tests – Demonstration.
13. Test for presence of (a) Reducing Sugars (b) Proteins. (c) Ketone Bodies.
(d) Blood. (e) Bile Salts. (f) Bile Pigments.

Equipment required
1. Electrophoresis apparatus
2. Chromatograph
3. Colorimeter.
4. Spectrophotometer.
5. pH meter
6. Flame photometer

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II Year B.Tech. BME – I Semester

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ANATOMY AND PHYSIOLOGY LAB

1. Histology Practicals. Showing the slides of Primary tissues.
2. Demonstration of Brain Dissection.
3. Dissected Upper limbs & Lower limbs -Its demonstration.
4. Dissection of Pelvis and Pelvic Organs Abdomen and Abdominal Organs.
5. Dissection of thorax – showing heart & major blood vessels, lungs and respiratory system.
6. Recording of B. P. and Effects of Physical Exertion and Posture on this Parameter.
7. Recording Mechanical Response of the Muscle on Application of Induced Electric Signal,
8. Study of Rate of Conduction of Nerve Impulse.
9. Isolated frog's Heart Perfusion and Effect of Ions (Mg, Ca, K) using Slow Micro Injector (Demonstration).
10. Analysis of Na,K in an unknown sample using flame photometer (Demonstration).
11. Test of Hearing using Tuning Fork.
12. Recording of EMG, ECG, and EEG by Polygraph (Demonstration).

Equipment required

1. microscope
2. sphygmomanometer
3. stethoscope
4. kymograph
5. flame photometer
6. Tuning Forks of different resonant frequencies
7. poly graph

II Year B.Tech. BME – II Semester

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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Unit I *Introduction to Managerial Economics:*

Definition, Nature and Scope of Managerial Economics–Demand Analysis: Demand Determinants, Law of Demand and its exceptions.

Unit II *Elasticity of Demand*: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

Unit III Theory of Production and Cost Analysis: Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale.
Cost Analysis: Cost concepts, Opportunity cost, Fixed vs. Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems)- Managerial Significance and limitations of BEA.

Unit IV Introduction to Markets & Pricing Policies:
Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly.
Objectives and Policies of Pricing- **Methods of Pricing:** Cost Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two-Part Pricing, Block Pricing, Bundling Pricing, Peak Load Pricing, Cross Subsidization.

Unit V Business & New Economic Environment: Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-liberalization scenario.

Unit VI Capital and Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance.
Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

Unit VII Introduction to Financial Accounting: Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

Unit VIII Financial Analysis through ratios: Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

TEXT BOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, 2/e, TMH, 2005.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2003.

REFERENCES:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 4th Ed.
3. Suma Damodaran, Managerial Economics, Oxford University Press.
4. Lipsey & Chrystel, Economics, Oxford University Press.
5. S. A. Siddiqui & A. S. Siddiqui, Managerial Economics & Financial Analysis, New age International Space Publications.
6. Domnick Salvatore: Managerial Economics In a Global Economy, 4th Edition, Thomson.
7. Narayanaswamy: Financial Accounting—A Managerial Perspective, PHI.
8. Raghunatha Reddy & Narasimhachary: Managerial Economics& Financial Analysis, Scitech.
9. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas.
10. Truet and Truet: Managerial Economics:Analysis, Problems and Cases, Wiley.
11. Dwivedi:Managerial Economics, 6th Ed., Vikas.

Prerequisites: Nil

Objective: To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making.

Codes/Tables: Present Value Tables need to be permitted into the examinations Hall.

Question Paper Pattern: 5 Questions to be answered out of 8 questions.
Each question should not have more than 3 bits.

II Year B.Tech. BME – II Semester

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ENVIRONMENTAL STUDIES

UNIT - I
Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness.

UNIT - II
Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest 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.

UNIT - III
Ecosystems : 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 ological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem:
a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT - IV
Biodiversity and its conservation : Introduction - Definition: genetic, species andecosystem diversity. - Bio-geographical 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-sports 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.

UNIT - V
Environmental Pollution : Definition, Cause, 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

Solid waste Management : Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

UNIT - VI
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 -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 Protection Act. -Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT - VII
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.

UNIT - VIII
Field work : Visit to a local area to document environmental assets River /forest grassland/hill/mountain -Visit to a local polluted site-Urban/Rural/industrial/ Agricultural Study of common plants, insects, birds. -Study of simple cosystemspond,
river, hill slopes, etc.

TEXT BOOK:
   1   Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
   2   Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE:

1 Textbook of Environmental Sciences and Technology by M. Anji Reddy, BS Publication.

II Year B.Tech. BME – II Semester   T   P   C
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PULSE AND DIGITAL CIRCUITS

UNIT I
LINEAR WAVESHAPING
High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT II
NON-LINEAR WAVE SHAPING
Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT III
SWITCHING CHARACTERISTICS OF DEVICES
Diode as a switch, piecewise linear diode characteristics, Transistor as a switch, Break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor-switching times.

UNIT IV
MULTIVIBRATORS
Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using transistors.

UNIT V
TIME BASE GENERATORS
General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator, Current time base generators.

UNIT VI
SYNCHRONIZATION AND FREQUENCY DIVISION
Principles of Synchronization, Frequency division in sweep circuit, Astable relaxation circuits, Monostable relaxation circuits, Synchronization of a sweep circuit with symmetrical signals, Sine wave frequency division with a sweep circuit.

UNIT VII
SAMPLING GATES
Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Reduction of pedestal in gate circuits, Applications of sampling gates.

UNIT VIII
 REALIZATION OF LOGIC GATES USING DIODES & TRANSISTORS
AND, OR gates using Diodes, Resistor, Transistor Logic, Diode Transistor Logic.

TEXT BOOKS
1.   Pulse, Digital and Switching Waveforms   J. Millman and H. Taub, McGraw-Hill, 1991.
2.   Solid State Pulse circuits - David A. Bell, PHI, 4th Edn.., 2002 .
REFERENCES
1.   Pulse and Digital Circuits – A. Anand Kumar, PHI.
2.   Wave Generation and Shaping   L. Strauss.
3.   Pulse, Digital Circuits and Computer Fundamentals - R.Venkataraman.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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II Year B.Tech. BME – II Semester	T	P	C
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PRINCIPLES OF COMMUNICATIONS

UNIT I
Introduction : Block diagram of Electrical communication system, Radio communication : Types of communications, Analog, pulse and digital Types of signals, Fourier Transform for various signals, Fourier Spectrum, Power spectral density, Autocorrelation, correlation, convolution.

UNIT II
Amplitude Modulation : Need for modulation, Types of Amplitude modulation, AM, DSB SC, SSB SC, Power and BW requirements, generation of AM, DSB SC, SSB SC, Demodulation of AM : Diode detector, Product demodulation for DSB SC & SSB SC.

UNIT III
Angle Modulation : Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

UNIT IV
Pulse Modulations : Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM, Time Divison Multiplexing, Frequency Divison Multiplexing, Asynchronous Multiplexing.

UNIT V
Digital Communication : Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison.

UNIT VI
Digital Modulation : ASK, FSK, PSK, DPSK, QPSK demodulation, coherent and incoherent reception, Modems.

UNIT VII
Information Theory : Concept of information, rate of information and entropy, Source coding for optimum rate of information, Coding efficiency, Shanon-Fano and Huffman coding.

UNIT VIII
Error control coding : Introduction, Error detection and correction codes, block codes, convolution codes.

TEXTBOOKS
1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 20th reprint, 2004.
2. Principles of Communications – H. Taub and D. Schilling, TMH, 2003.

REFERENCES
1. Electronic Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.
2. Communication Systems Engineering – John. G. Proakis and Masoud Salehi, PHI, 2nd Ed. 2004.

II Year B.Tech. BME - II Semester

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BASIC CLINICAL SCIENCES-I

UNIT-I
NEPHROLOGY: Principles of dialysis; Haemodialysis, Acetate dialysis, Bicarbonate dialysis. Peritonial dialysis, Chronic ambulatory peritoneal dialysis, Haemoperfusion, Sequential ultra filtration. Haemofiltration, Adequacy of dialysis, Clearance, dialysance,

UNIT-II
Components of dialysing system, Dialysate, composition of dialysate, Types of dialysers, controls and monitoring devices for dialysers. Clinical significance. Renal transplantation: Basic principles.

UNIT-III
NEUROLOGY: Diseases of nervous system, spinal cord lesions, motor nervous disease, Prolapsed intravertebral disc, Neuropathies, Myasthenia gravis, Diseases of muscle.

UNIT-IV
DIAGNOSTIC INVESTIGATIONS IN NEUROLOGY. Electro encephalography.Computerized axial tomography, Angiography, Pneumoencephalography, neuromuscular stimulation, Electromyography. Clinical applications. Clinical significance, Diseases of muscle, Motor neuron disorders, The electrical study of reflexes. The silent period. The F response, The H reflex, The axion reflexes. Disorders of neuromuscular transmission

UNIT-V
CARDIOLOGY: Heart structure and function, Cardiac cycle, various valves and their function, Cardio vascular measurements. Prosthetic devices. Monitors. Heart lung machine applications and clinical significance. CVP and SWAN catheters. Electro cardiography: Source of ECG potentials: Dipole theory, conduction system, Normal and abnormal ECG's. Diagnostic applications, interpretation of ECG. Cardiacpacing. Diagnostic indications. Criteria for selection. Therapeutic indications. Complications.
Temporary pacing. Permanent pacing.

UNIT-VI
CARDIAC ASSIST DEVICES: Arterial and Ventricular fibrillation, application of cardiac assist devices. Cardiac catheterisation. Echocardiography, Cine angiography, Treadmill and Ergometer Applications and Clinical significance. Diagnostic usage of ultrasound scanners. Doppler ultrasound measurement. Clinical significance. Open heart surgery grafts, bypass surgery. Instrumentation used for open-heart surgery, Organization of I.C.C.U Clinical aspects.

UNIT-VII
GENERAL SURGERY: Surgical patient. Clinically significant investigations, Pre operative preparation. Study and operation of surgical equipment. laproscopy and its use in various surgeries

UNIT-VIII
GASTROENTROLOGY: Anatomy and physiology of G.I.T. clinically significant symptoms, signs and diseases. Nutritional support and parenteral therapy. Height and weight estimations according to age. Intravenous cannulae, I. V Sets, Infusion pumps, stomach wash tubes. Various endoscopic procedures, liver biopsy etc.

TEXT BOOKS:
1. Strauss, Maurice B. &Louis G.Welt. Diseases of kidney, vol. 1&2 Little Brown.1997
2. James G. Mcleod, Physiological Approach to Clinical Neurology, Butterworth-Heinemann Ltd, 3rd edition.

REFERENCES:
1. D.Goldstein, mehmet Oz, Cardiac Assist Devices, Blackwell Future,2002.
2. Robert F Rushmer , Cardio vascular Dynamics.WB Saunders, 1976.
3. T.L Dent. W.E. Stodel, J.G.turcotte, Surgical Endoscopy, year book Medical pub,1985.
4. Jones DB,Wu JS, Soper NJ, Laproscopic surgery: Principles and Procedures2nd ed, Marcel Dekker, 2004.

II Year B.Tech. BME - II Semester

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BIOTRANSDUCERS AND APPLICATIONS

UNIT-I

INTRODUCTION: Classification, Basic requirements of bio transducers, Quasi state effects (linearity, Hysterisis), Amplitude distortion, Phase distortion, Sampling errors, Input and Output impedance effects, Factors influencing the choice and design of the transducer in Measuring the Physiological Parameters.

UNIT-II

TEMPERATURE TRANSDUCERS (Measurement Principle, Design and Applications): Thermo resistive, Thermo electric, PN junction diode- Thermometers, frequency change temperature Transducers, Chemical Thermometry, Radiation Thermometry.

UNIT-III

DISPLACEMENT, TRANSDUCERS: Potentiometric Transducers: Resistive, Resistive strain gauges. L V. D. T, Inductive displacement transducer, Capacitive displacement transducers, Ultrasonic methods.

UNIT-IV

FORCE & VELOCITY TRANSDUCERS: Differentiation and Integration methods, Doppler system, Methods based on the mass bauer effect, Electro magnetic methods. Acceleration transducers: Piezo electric transducers

UNIT-V

PRESSURE TRANSDUCERS: Occlusive cuff methods. Force balance methods. Direct hydraulically coupled Catheter transducer system, Diaphragm displacement pressure transducers. Electrical transduction methods for Catheter tip transducer. Optical transducers. Implantable pressure transducer, Micro pressure transducer.

UNIT-VI

FLOW TRANSDUCERS: Flow probe design and application: Catheter tip electromagnetic Intra vascular probe & electronic system. Doppler shift flow meters, Pressure gradient technique, Intra vascular Thermistor probe, Water filled plethysmography, Air filled plethysmography, Fick & Rapid injection indicator dilution methods.

UNIT-VII

BIOTELEMETRY: Radio Telemetry principles, FM, AM, PCM. Transmission of biological data through radio telemetry. Single channel, multi channel systems. Block diagrams and functions of bio signal transmitters and receivers.

UNIT- VIII

Bioelectric Amplifiers - Different types of Bioelectric amplifiers, Principle of Operational Amplifier, Instrumentation Amplifier characteristics, Integrator, Differentiator, Log Amplifier and Antilog Amplifier. Signal Conditioning

TEXT BOOKS:

1. John Webster. Medical Instrumentation.- Application and Design. John Wiley and Sons. Inc., New York. Third edition 2003.
2. Tatsuo Togawa, Toshiyo Tamura & P, Ake Oberg, Biomedical Transducers and Instruments, CRC Press, Boca Raton, 1997.
3. Introduction to Measurements and Instrumentation, second edition,Arun K Ghosh, PHI, New Delhi 2007

REFERENCE:

1. Richard. S. C.Cobbold; Transducers for Biomedical Measurements- principles and application; Krieger pub Co, 1992
2. L. A Geddes, L.E.Baker, Principles of Applied Biomedical Instrumentation, John Wiley & Sons. 1989.

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II Year B.Tech. BME - II Semester

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PULSE AND DIGITAL CIRCUITS LAB

Minimum Twelve experiments to be conducted:
1. Linear wave shaping.
2. Non Linear wave shaping – Clippers.
3. Non Linear wave shaping – Clampers.
4. Transistor as a switch.
5. Study of Logic Gates & Some applications.
6. Study of Flip-Flops & some applications.
7. Sampling Gates.
8. Astable Multivibrator.
9. Monostable Multivibrator.
10. Bistable Multivibrator.
11. Schmitt Trigger.
12. UJT Relaxation Oscillator.
13. Bootstrap sweep circuit.

Equipment required for Laboratories:
1. RPS   -   0 – 30 V
2. CRO   -   0 – 20 M Hz.
3. Function Generators   -   0 – 1 M Hz
4. Components
5. Multi Meters

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TRANSDUCERS LAB

1. L.V.D.T & STRAIN GAUGE Designing of Oscillator & proportional amplifier
2. Resistance Thermometry (R. T. D)
3. Thermister & Thermocouple Designing of Bridge Circuit & Reference Junction Compensation Circuit
4. Photo Sensors: Photo Diode, Solar Cell, and Photo Transistor
5. pH Measurement
6. Pressure Measurement Designing of Instrumentation Amp With Different Gains
7. Level Measurement
8. P. I. D P.I, P.D, P. I. D Designing Of Integrator & Differentiator Using Components
9. Op-Amp As Adder Subtractor Designing of Adder & Subtractor Using Components
10. Speed Measurement
11. L. D. R & Piezo Electric Transducers
12. Inductive & Capacitive Pickup

The transducers/ equipment required to do the above experiments
1. L.V.D.T
2. STRAIN GAUGE (cantilever strain gauge)
3. Resistance Thermometry (R. T. D)
4. Thermister
5. Thermocouple
6. Photo Sensors: Photo Diode, Solar Cell, and Photo Transistor, L. D. R
7. pH Meter
8. Sealed pressure transducer for Pressure Measurement
9. Micro controller based Level Measurement system
10. P. I. D setup
11. Electric pickup and magnetic pickup for Speed Measurement
12. Piezo Electric Transducer
13. Inductive & Capacitive Pickup
14. Signal generators
15. C.R.O
16. Digital storage C.R.O
17. Multimeter

III Year B.Tech. BME - I Semester

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DIGITAL SIGNAL PROCESSING

UNIT I
INTRODUCTION: Introduction to Digital Signal Processing: Discrete time signals & sequences, linear shift invariant systems, stability, and causality. Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems.

UNIT II
DISCRETE FOURIER SERIES: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT. Relation between Z-transform and DFS

UNIT III
FAST FOURIER TRANSFORMS: Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT, and FFT for composite N

UNIT IV
REALIZATION OF DIGITAL FILTERS: Review of Z-transforms, Applications of Z – transforms, solution of difference equations of digital filters, Block diagram representation of linear constant-coefficient difference equations, Basic structures of IIR systems, Transposed forms, Basic structures of FIR systems, System function,

UNIT V
IIR DIGITAL FILTERS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples: Analog-Digital transformations

UNIT VI
FIR DIGITAL FILTERS : Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique, Comparison of IIR & FIR filters.

UNIT VII
MULTIRATE DIGITAL SIGNAL PROCESSING: Decimation, interpolation, sampling rate conversion, Implementation of sampling rate conversion.

UNIT VIII
INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSPs Multiple access memory, multiport memory, VLSI Architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

Architecture of TMS 320C5X- Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Registrar, Index Registrar, Auxiliary Registger Compare Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, Some flags in the status registers, On- chip registers, On-chip peripherals

TEXT BOOKS:
1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis,
    Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI
3. Digital Signal Processors – Architecture, Programming and Applications,, B.Venkataramani, M. Bhaskar, TATA McGraw Hill, 2002

Reference Books:
1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
2. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA Mc-Graw Hill, 2007.
3. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
4. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris, Thomson, 2007.
5. Digital Signal Processing – Alan V. Oppenheim, Ronald W. Schafer, PHI Ed., 2006

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LINEAR AND DIGITAL IC APPLICATIONS

UNIT I
INTEGRATED CIRCUITS
Classification, chip size and circuit complexity, basic information of Op-amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC characteristics, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

UNIT II
OP-AMP APPLICATIONS
Basic application of Op-amp, instrumentation amplifier, ac amplifier, V to I and I to V converters, sample & hold circuits, multipliers and dividers, Differentiators and Integrators, Comparators, Schmitt trigger, Multivibrators, introduction to voltage regulators, features of 723.

UNIT III
ACTIVE FILTERS & OSCILLATORS
Introduction, 1st order LPF, HPF filters. Band pass, Band reject and all pass filters. Oscillator types and principle of operation – RC, Wien and quadrature type, waveform generators – triangular, sawtooth, square wave and VCO.

UNIT IV
TIMERS & PHASE LOCKED LOOPS
Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.

UNIT V
D-A AND A- D CONVERTERS
Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC specifications.

UNIT VI
Classification of Integrated circuits, comparison of various logic families, standard TTL NAND Gate- Analysis& characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tristate outputs, CMOS transmission gate, IC interfacing- TTL driving CMOS & CMOS driving TTL .

UNIT VII
 Design using TTL-74XX & CMOS 40XX series, code converters, decoders, Demultiplexers, decoders & drives for LED & LCD display. Encoder, priority   Encoder, multiplexers & their applications, priority generators/checker circuits.   Digital arithmetic circuits-parallel binary adder/subtractor circuits using 2's, Complement system. Digital comparator circuits.

UNIT VIII
SEQUENTIAL CIRCUITS
 Flip-flops & their conversions. Design of synchronous counters. Decade counter, shift registers & applications, familiarities with commonly available 74XX & CMOS 40XX series of IC counters.
Memories: ROM architecture, types & applications, RAM architecture, Static & Dynamic RAMs, synchronous DRAMs.

TEXT BOOKS
1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
2. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 1987.
3. Digital Fundamentals – Floyd and Jain, Pearson Education,8th Edition, 2005.

REFERENCES:
1. Operational Amplifiers and Linear Integrated Circuits – R.F. Coughlin and Fredrick F. Driscoll, PHI, 1977.
2. Operational Amplifiers and Linear Integrated Circuits: Theory and Applications –Denton J. Daibey, TMH.
3. Design with Operational Amplifiers and Analog Integrated Circuits - Sergio Franco, McGraw Hill, 3rd Ed., 2002.

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HOSPITAL SYSTEM MANAGEMENT

UNIT-I

Classification of Hospital Systems: General Hospital -Specialist Hospital -Teaching -Research, Primary Health Centre -Their role, Functions. Role of Biomedical Engineers

UNIT-II

Aspects of Hospital Services- Outpatient- Inpatient supportive emergency drug and medical supply Nursing Services Dietry services Transport services

UNIT-III

Hospital Planning -Location –Orientation, budgeting, communication with in the hospital outside the hospitals, electric power supply for various theatres and rooms, diesel generator, stand by power supply.

UNIT-IV

Air conditioning of important theatres and equipment housings, water supply requirements and management, lifts, fire fighting and equipments. Sanitation with in the hospitals, laundry services.

UNIT-V

Computer and Information Management in Hospitals: Computer aided hospital management: Application Administration/Discharge records of patient's –patients billing -maintenance of patients records, Their history. Maintenance of inventory of medicines and drugs - purchase.

UNIT-VI

Electrical Factors in Hospital Design, voltage stabilizer, uninterrupted power supply for intensive care units and computerised monitoring units-safety precautions.

UNIT-VII

Electrical factors in Hospital Design: interference of systems, protection, grounding of ECG, EEG, ENG and other therapeutic equipments.

UNIT-VIII

Biomedical equipment services their purchase, servicing and maintenance –keeping intact and throwing the condemned equipment, Training of men for medical equipments, preventive and periodical maintenance procedures.

TEXT BOOKS
1. S. I, Goel & Ram Kumar, Hospital Administration and Management, Deep and Deep Publications, New Delhi.2002.
2. Principles of Hospital Administration and Management by Ravi Bindra, Adroit publishers, 2004

REFERENCE:
1. Source book of Modern Technology for Hospitals and Health care by Ashok Sahni, ISHA, BANGALORE, 1992.
2. I.Donald Snook, Opportunities in Hospital Administration Careers, McGraw-Hill, 1997.

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BASIC CLINICAL SCIENCES -II

UNIT-I

Orthopaedics: classification of joints, reduction replacements

UNIT-II

Pathology: general pathology, investigations. Blood bank: blood groups, blood transfusion, exchange transfusion.

UNIT-III

Anaesthesia: general Anaesthesia, uptake of Anaesthetic gases and vapours, Preanaesthetic care and preparation. Postoperative care Laws of gases. Recommendations and preventions. Patient monitoring during surgery. Monitoring of respiration and temperature. Invasive and non-invasive monitoring, recent trends. Organization of theatres, CSSD..

UNIT-IV

Measurement of Intra vascular pressures. Blood flows. Plethysmography. Humidity and Temperature measurements, Clinical significance. Mechanism of Respiration, Gas exchange. Artificial respiration, Diagnostic and Therapeutic indications.

UNIT-V

Radio therapy: Principles of radiation oncology and cancer radio therapy. Perspective, Radio sensitivity and radio resistance of tumours and Tissues. Classification of Tumours according to cell Radio sensitivity. Cell survival theory, Oxygen effect. Cell repair, Radio curability of tumours. Therapeutic ratio. normal Tissue tolerance dose. Modification of radiation response Physical, chemical and Biomedical modifiers.

UNIT-VI

Management on radiation:. Radioactive protection. Somatic effects, LD 50. Cause of radiation death skin blood and blood forming organs. Reproductive organs. Embryo late effects of radiation, Radiation carcinogenesis, leukaemogenesis. Cataract, Genetic effects. Hazards and permissible exposures. Maximum permissible occupational doses. Hazards in various branches of radiation. Protective lines of defence. Protective measures. Physical measurements and medical tests.

UNIT-VII

Nuclear medicine: determination of distribution of radioactive material with in the body. Organ imaging procedures central nervous system, cardio vascular system, respiratory system thyroid, liver, spleen, pancreas, skeletal system, kidney.

UNIT-VIII

Thyroid function studies, Tests for renal function, Body spaces, Haematological procedures, Blood flow. Gastro intestinal function. Radio immunoassay, Therapeutic uses of Radio isotopes, Thyroid diseases, Thyroid cancer, Polycythemia, meta static bone diseases. Malignancy, plural effusion and ascites.

TEXT BOOKS :
1. John Crawford Adams, Outline of Orthopaedics. Churchill Livingstone, 2001.
2. Ronald. D. Miller., Miller's Anaesthesia: 2 volume set, 2004.
3. W.J. Meredith & J.B.Massey, Fundamental Physics of Radiology. Johns and Cunningham
REFERENCE :

1. Ramesh chandra The Physics of Radiology-An Introduction to Nuclear Medicine.
2. Lawrence A.Kaplan etal., Clinical Chemistry: Theory, Analysis, Correlation, 4th ed, 2002.

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BIOFLUIDS AND MECHANICS

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.

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 extracarporeal blood flow.

UNIT-III
RHEOLOGY OF BLOOD IN MICROVESSELS: Fahraeus -Lindquist effect and inverse effect, distribution of suspended particles in a narrow rigid tube. Nature of red cells in tightly fitting tubes, hematocrit in very narrow tube

UNIT-IV
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-V
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.

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

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

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

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.

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

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BIOMEDICAL EQUIPMENT

UNIT-I

Bio Amplifiers and signal conditioning circuits. RECORDERS & DISPLAY DEVICES: General features of Thermal, Ink Jet, Photo graphic, Dot Recorders. General features of Display Devices for Bio -Signals.

UNIT-II

Diagnostic Equipment:- E.C.G, T.M.T, E.E.G, E.M.G, P.F.T, Phono cardiography. (Working principle, Types of Electrodes used, Calibration, Basic Trouble Shooting). Ophthalmoscope, Retinoscope.

UNIT-III

Analytical equipment: pH Meter, Conductivity Meter, Electrophoresis, Chromatography, Flame Photo Meter, Spectro Photometer, Biochemistry Analysers, Electrolyte Analysers, Cell Counter, Blood Gas Analyser. (Working principle, Types of Electrodes. Calibration. Basic Trouble Shooting.)

UNIT-IV

MONITORING EQUIPMENT: Arrhythmia monitors, Holter monitor. Blood Pressure Monitors, Central monitoring stations in critical care units, Ambulatory monitors, foetal monitors. Incubator", Apnea monitors.

UNIT-V

THERAPEUTIC EQUIPMENT:-

Infusion pumps, Suction Apparatus.

Pacemaker: Synchronous -Asynchronous, External -Internal, Demand & Fixed type Pacemaker, Programmable Pacemakers. Defibrillators: AC & DC Defibrillators, Synchronous & Asynchronous. Electrical Safety. Nerve stimulators, Bladder stimulators, Implant able Stimulators, Short wave Diathermy,Micro wave Diathermy, Ultra Sound Diathermy

UNIT-VI

Heamo dialyser, Qualitative requirements, General scheme of operation, Types of exchangers, Block diagram, Electronic control and monitoring systems. Heart Lung machine: Governing principle, Qualitative Requirements, Functional details of thin film membrane type blood oxyginarators. *I. A. B. P:-* principle & application.

UNIT-VII

SURGICAL EQUIPMENT: electro surgical generators:- Unipolar, Bipolar. Hazards of electro surgical units & Safety measures. Anaesthesia delivery systems, Different types of Ventilators, Humidifiers, Neubilisers, Surgical microscope & O.T table

UNIT-VIII

Patient Electrical Safety, Types of Hazards, Natural protective Mechanism, Leakage current, Patient Isolation, Hazards in operation rooms. Grounding conditions in Hospital Environment.

TEXT BOOKS
1. Handbook of Bio Medical Instrumentation -R. S. Khandpur. 2003
2. Joseph .J. Carr, John M. Brown; Introduction to Biomedical Equipment Technology, Pearson.
3. John Webster. Medical Instrumentation.- Application and Design. John Wiley and Sons. Inc., New York. Third edition 2003.
REFERENCE:
1. Bronzino, Joseph; Handbook of Biomedical Engineering. 2nd edition, CRC Press, 2000.
2. Bio-Medical Instruments Theory & Design. Welkowitz, Walter & Others, 2nd Edition, Academic Press, 1991

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BIOMEDICAL EQUIPMENT LAB

STUDY, OPERATION AND TROUBLE SHOOTING OF:
1. ECG Monitor
2. EEG,EMG
3. Pace Maker
4. DC Defibrillator
5. Short Wave Diathermy Unit
6. Ultrasound Diathermy Unit
7. Safety Evaluation Circuits
8. Audiometer
9. Hearing Aids
10. Pneumo tachograph and signal conditioners (PFT)
11. Ultra Sound Scanner
12. Electro surgical generators.

Equipment required to do the above experiments

1. ECG simulator, amplifier, Monitor
2. EEG simulator , amplifier
3. EMG simulator , amplifier.
4. Arrhythmia simulator,Pace Maker
5. Arrhythmia simulator,DC Defibrillator
6. Short Wave Diathermy
7. Ultrasound Diathermy
8. Safety analyzer
9. Audiometer
10. Hearing Aids
11. Pneumo tachograph and signal conditioners (PFT)
12. Ultra Sound Scanner
13. Electro surgical generators.
14. C.R.O
15. Digital storage C.R.O
16. Multimeter

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ADVANCED ENGLISH COMMUNICATION SKILLS LAB

1. Introduction

The introduction of the English Language Lab is considered essential at 3rd year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be an integrated theory and lab course to enable students to use 'good' English and perform the following:

- Gather ideas and information, to organise ideas relevantly and coherently.
- Engage in debates.
- Participate in group discussions.
- Face interviews.
- Write project/research reports/technical reports.
- Make oral presentations.
- Write formal letters.
- Transfer information from non-verbal to verbal texts and vice versa.
- To take part in social and professional communication.

2. Objectives:

This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.

3. Syllabus:

The following course content is prescribed for the Advanced Communication Skills Lab:

- ➢ Functional English - starting a conversation – responding appropriately and relevantly – using the right body language – role play in different situations.
- ➢ Vocabulary building – synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrases.
- ➢ Group Discussion – dynamics of group discussion , intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.
- ➢ Interview Skills – concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing.
- ➢ Resume' writing – structure and presentation, planning, defining the career objective, projecting ones strengths and skill-sets, summary, formats and styles, letter-writing.
- ➢ Reading comprehension – reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading.
- ➢ Technical Report writing – Types of formats and styles, subject matter – organization, clarity, coherence and style, planning, data-collection, tools, analysis.

4. Minimum Requirement:

The English Language Lab shall have two parts:

i)   **The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.

ii)   **The Communication Skills Lab** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

System Requirement (Hardware component):

Computer network with Lan with minimum 60 multimedia systems with the following specifications:

iii)   P – IV Processor
- a) Speed – 2.8 GHZ
- b) RAM – 512 MB Minimum
- c) Hard Disk – 80 GB

iv)   Headphones of High quality

5. Suggested Software:
   The software consisting of the prescribed topics elaborated above should be procured and used.

Suggested Software:
- **Clarity Pronunciation Power** – part II
- **Oxford Advanced Learner's Compass**, 7th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE**(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **The following software from 'train2success.com'**
  - ➢ **Preparing for being Interviewed,**
  - ➢ **Positive Thinking,**
  - ➢ **Interviewing Skills,**
  - ➢ **Telephone Skills,**
  - ➢ **Time Management**
  - ➢ **Team Building,**
  - ➢ **Decision making**

- **English in Mind**, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

6. Books Recommended:
1. **Effective Technical Communication**, M. Ashraf Rizvi, Tata Mc. Graw-Hill Publishing Company Ltd.
2. **A Course in English communication** by Madhavi Apte, Prentice-Hall of India, 2007.
3. **Communication Skills** by Leena Sen, Prentice-Hall of India, 2005.
4. **Academic Writing- A Practical guide for students** by Stephen Bailey, Rontledge Falmer, London & New York, 2004.
5. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai
6. **Body Language- Your Success Mantra** by Dr. Shalini Verma, S. Chand, 2006.
7. **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice**, New Age International (P) Ltd., Publishers, New Delhi.
8. Books on **TOEFL/GRE/GMAT/CAT** by Barron's/cup
9. **IELTS series with CDs** by Cambridge University Press.
10. **Technical Report Writing Today** by Daniel G. Riordan & Steven E. Pauley, Biztantra Publishers, 2005.
11. **Basic Communication Skills for Technology** by Andra J. Rutherford, 2nd Edition, Pearson Education, 2007.
12. **Communication Skills for Engineers** by Sunita Mishra & C. Muralikrishna, Pearson Education, 2007.
13. **Objective English** by Edgar Thorpe & Showick Thorpe, 2nd edition, Pearson Education, 2007.
14. **Cambridge Preparation for the TOEFL** Test by Jolene Gear & Robert Gear, 4th Edition.
15. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press.

DISTRIBUTION AND WEIGHTAGE OF MARKS:
Advanced Communication Skills Lab Practicals:
1. The practical examinations for the English Language Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the English Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

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VLSI DESIGN

UNIT I
INTRODUCTION : Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS technologies-Oxidation, Lithography, Diffusion, Ion implantation, Metallisation, Encapsulation, Probe testing, Integrated Resistors and Capacitors.

UNIT II
BASIC ELECTRICAL PROPERTIES : Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, figure of merit   o; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT III
VLSI CIRCUIT DESIGN PROCESSES : VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2   m CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

UNIT IV
GATE LEVEL DESIGN : Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Basic circuit concepts, Sheet Resistance RS and its concept to MOS, Area Capacitance Units, Calculations -   - Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out, Choice of layers

UNIT V
SUBSYSTEM DESIGN : Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters, High Density Memory Elements.

UNIT VI
SEMICONDUCTOR INTEGRATED CIRCUIT DESIGN : PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach.

UNIT VII
VHDL SYNTHESIS : VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools, Test Principles.

UNIT VIII
CMOS TESTING : CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chiplevel Test Techniques, System-level Test Techniques, Layout Design for improved Testability.

TEXTBOOKS :
1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005 Edition.
2. Principles of CMOS VLSI Design - Weste and Eshraghian, Pearson Education, 1999.

REFERENCES :
   1. Chip Design for Submicron VLSI: CMOS Layout & Simulation, - John P. Uyemura, Thomson Learning.
   2. Introduction to VLSI Circuits and Systems - John .P. Uyemura, JohnWiley, 2003.
   3. Digital Integrated Circuits - John M. Rabaey, PHI, EEE, 1997.
   4. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
     5. VLSI Technology – S.M. SZE, 2nd Edition, TMH, 2003.

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MICROPROCESSORS AND INTERFACING

UNIT-I
An over view of 8085, Architecture of 8086 Microprocessor. Special functions of General purpose registers. 8086 flag register and function of 8086 Flags. Addressing modes of 8086. Instruction set of 8086. Assembler directives, simple programs, procedures, and macros.

UNIT-II
Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation.

UNIT-III
Pin diagram of 8086-Minimum mode and maximum mode of operation. Timing diagram. Memory interfacing to 8086 (Static RAM & EPROM). Need for DMA. DMA data transfer Method. Interfacing with 8237/8257.

UNIT-IV
8255 PPI – various modes of operation and interfacing to 8086. Interfacing Keyboard, Displays, 8279 Stepper Motor and actuators. D/A and A/D converter interfacing.

UNIT-V
Interrupt structure of 8086. Vector interrupt table. Interrupt service routines. Introduction to DOS and BIOS interrupts. 8259 PIC Architecture and interfacing cascading of interrupt controller and its importance.

UNIT-VI
Serial data transfer schemes. Asynchronous and Synchronous data transfer schemes. 8251 USART architecture and interfacing. TTL to RS 232C and RS232C to TTL conversion. Sample program of serial data transfer. Introduction to High-speed serial communications standards, USB.

UNIT-VII
Advanced Micro Processors - Introduction to 80286, Salient Features of 80386, Real and Protected Mode Segmentation & Paging, Salient Features of Pentium, Branch Prediction, Overview of RISC Processors.

UNIT-VIII
8051 Microcontroller Architecture, Register set of 8051, Modes of timer operation, Serial port operation, Interrupt structure of 8051, Memory and I/O interfacing of 8051.

TEXT BOOKS :
  1. Advanced microprocessor and Peripherals - A.K.Ray and K.M.Bhurchandi, TMH, 2000.
  2. Micro Controllers – Deshmukh, Tata McGraw Hill Edition.

REFERENCES :
  1. Micro Processors & Interfacing – Douglas U. Hall, 2007.
  2. The 8088 and 8086 Micro Processors – PHI, 4th Edition, 2003.
  3. Micro Computer System 8086/8088 Family Architecture, Programming and Design - By Liu and GA Gibson, PHI, 2nd Ed.,

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III Year B.Tech. BME - II Semester　　　　　　　　　　　　　　**T　　P　　C**
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BIOLOGICAL CONTROL SYSTEMS

UNIT-I
Dynamic Systems and their Control. Modelling and Block Diagrams. Open and Closed loop Systems.

UNIT-II
Principles and General Engineering Techniques of Feedback Control. Basic Closed Loop Relation. Closed Loop Dynamics of First Order and Second Order.

UNIT-III
System Stability and Compensation. Frequency Response and Techniques. Root Locus Method. Introduction to Non-linear Control.

UNIT-IV
Examples of Biological Control Systems. Pupil Control System. Visual Fixation System. Oculo-motor System.

UNIT-V
Skeletal Muscle Servomechanism. The Semicircular Canal. Free Swinging Limbs. Thermo Regulation.

UNIT-VI
Respiration Models and Controls. Cardiovascular Control Systems.

UNIT-VII
Sugar Level Control Mechanism. Endocrine Control System. Excretion Control.

UNIT-VIII
Human Operator Tracking Characteristics. Biological Receptors-Receptor Characteristics. Transfer Function Models of Receptors.

TEXT BOOKS
1. Ogata Katsuhika, Modem Control Engineering, Second Edition, Prentice Hall of India, 1992.
2. Michel C Khoo, Physiological Control Systems -Analysis, simulation and estimation, Prentice Hall of India, 2001.

REFERENCE:
1. Milsum John H. , Biological Control Systems Analysis, McGraw-Hill, 1996

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III Year B.Tech. BME - II Semester　　　　　　　　　　　　**T　　P　C**
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LASERS AND FIBRE OPTICS IN MEDICINE

UNIT-I
Laser – Properties, Laser interaction with tissues, Photo medicine & Photo biology lasers used for medical applications-CO2, Ruby, Nd-YAG, Ar, Kr, He-Ne.

UNIT-II
Optical fibers – Coherent and incoherent bundles, Light transmission and image transmission systems in rigid and flexible endoscopes.

UNIT-III
Application of Lasers in Ophthalmology-laser refractor, laser accuracy testing, Laser treatment of Corneal ulcers, Laser Photo coagulators.

UNIT-IV
Laser & Fiber optics in Dermatology.

UNIT-V
Endoscopy: Bronchoscope, Gastroscope.

UNIT-VI
Laser and Fiber optics applications in surgery.

UNIT-VII
Laser and Fiber optics applications in Dentistry – Laser Induced carrier inhibition, Laser effects on Dental soft tissues.

UNIT-VIII
Standards, Potential Hazards of lasers, safety regulations and precautions. Medical surveillance.

TEXT BOOKS
1. Biomedical Aspects of the Laser, by Leon Goldman, Springer Verlag, 1967
2. Lasers in Medicine by H. K. Koebmer, John Wiley & Sons, 1980.

REFERENCE:
1. Laser Applications in Medicine and Biology vol l, II, III Plenum Press, (1971 & 1974) by M. L. Wel Basht.
2. Laser Hand Book, Vol 11, Academic Press London (1972) by F. T. Arrechi
3. Introduction to Lasers and Their Applications by Oshea callen and Rhodes, Addison . Wesley- 1977.
4. Lasers in Photo medicine and Photo Biology by E. D. R. Pratesi & C. A Sacchi, Springer verlac 1980.

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BIOMEDICAL SIGNAL PROCESSING

UNIT-I

Discrete and continuous Random variables, Probability distribution and density functions. Gaussian and Rayleigh density functions, Correlation between random variables.

UNIT-II

Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random rocesses. Noise power spectral density analysis, Noise bandwidth, noise figure of systems.

UNIT-III

Data Compression Techniques: Lossy and Lossless data reduction Algorithms. ECG data compression using Turning point, AZTEC, CORTES, Hoffman coding, vector quantisation, DCT and the K L transform.

UNIT-IV

Cardiological Signal Processing: Pre-processing. QRS Detection Methods. Rhythm analysis. Arrhythmia etection Algorithms. Automated ECG Analysis. ECG Pattern Recognition. Heart rate variability analysis.

UNIT-V

Adaptive Noise Canceling: Principles of Adaptive Noise Canceling. Adaptive Noise Canceling with the LMS daptation Algorithm. Noise Canceling Method to Enhance ECG Monitoring. Fetal ECG Monitoring.

UNIT-VI

Signal Averaging, polishing–mean and trend removal, Prony's method. Linear prediction. Yule–walker(Y–W) quations.

UNIT-VII

Neurological Signal Processing: Modeling of EEG Signals. Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves. Auto Regressive(A.R.) modeling of seizure EEG. Sleep Stage analysis. Inverse Filtering. Least squares and polynomial modeling.

UNIT-VIII

Original Prony's Method. Prony's Method based on the Least Squares Estimate. Analysis of Evoked Potentials.

TEXT BOOKS

1. Rangaraj M. Rangayyan – Biomedical Signal Analysis. IEEE Press, 2001.
2. D.C.Reddy, Biomedical Signal Processing- principles and techniques, Tata McGraw-Hill, 2005.
3. Biomedical Digital Signal Processing, Willis J.Tompkins, PHI,

REFERENCE:

1. Weitkunat R, Digital Bio signal Processing, Elsevier, 1991.
2. Akay M , Biomedical Signal Processing, Academic: Press 1994
3. Cohen.A, Biomedical Signal Processing -Vol. I Time & Frequency Analysis, CRC Press, 1986.

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MEDICAL IMAGING TECHNIQUES

UNIT-I

Fundamentals of X-ray: Electromagnetic Radiation, Interactions between X-rays and Matter, Intensity of an X-ray Beam, Attenuation. Generation and Detection of X-rays: X-ray Generation, Fillers, Beam Restrictors and Grids, Intensifying Screens Fluorescent Screens, X-ray detectors.

UNIT-II

X-Ray Image Characteristics: Spatial Resolution, Image Noise, Image Contrast, Receiver Operating Curve (ROC), Image Subtraction, Digital Radiography. X-raydiagnostic methods, Biological effects of ionising radiation.

UNIT-III

Conventional Tomography, Longitudinal Section Tomography, Computed Tomography,Reconstruction Techniques: Algebraic, Iterative reconstruction Techniques,Radon Transform and its applications. Back Projection, Filter Back Projection Algorithms.

UNIT-IV

Radio Nuclide Imaging: Fundamentals of Radioactivity, Generation and Detection of Nuclear Emission, Diagnostic Methods using Radiation Detector. Radio Nuclide
Imaging Systems: SPECT, PET, Attenuation compensation. Characteristics of Radio nuclide Images, Internal Radiation, Dosimetry and Biological effects,

UNIT-V

Fundamentals of Acoustic Propagation: Reflection and Refraction, Attenuation, Absorption, Scattering, Non linearity Parameter and Doppler effect. Image Characteristics: Ultrasonic Texture, Speckle reduction, Compensation of Phase Aberration, Tissue Characterization. Transducer Beam Characteristics, Axial and
Lateral Resolution, Focusing arrays.

UNIT-VI

Ultrasonic Diagnostic Methods: Pulse-Echo Systems, Transmission Methods, Doppler Methods, Duplex Methods, Duplex Imaging. Biological effects due to Ultrasound.

UNIT-VII

Magnetic Resonance Imaging: Fundamentals of Nuclear Magnetic Resonance, Fourier Spectrum of the NMR Signal, Spin Density, Relaxation Times, Pulse Sequences. Generation and Detection of NMR signal: Magnetic field Gradients, The NMR Coil/ Probe, The Transmitter, and The Receiver.

UNIT-VIII

Characteristics of Magnetic Resonance Imaging: Spatial Resolution, Image contrast.Imaging Methods: Data Acquisition, Spin.Echo Imaging, Gradient Echo Imaging, Blood Flow Imaging, NMR Spectroscopy, Sensitivity and Resolution, Imaging Safety.Biological Effects of Magnetic Fields.

TEXT BOOK

1. K.Kirk Shung, Michael B. Smith, Benjamin Tsui. Principles of Medical Imaging.,Pub : Academic Press, 1992
2. Rangaraj M. Rangayyan, Biomedical Image Analysis", CRC Press, Boca Raton,FL, 2005.

REFERENCE:

1. Avinash C. Kak, Principles of Computerised Tomographic Imaging. IEEE PRESS

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IC APPLICATIONS LAB

Minimum Twelve Experiments to be conducted :
1. Study of OP AMPs – IC 741, IC 555, IC 565, IC 566, IC 1496 – functioning, parameters and Specifications.
2. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
3. Integrator and Differentiator Circuits using IC 741.
4. Active Filter Applications – LPF, HPF (first order)
5. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
6. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
7. Function Generator using OP AMPs.
8. IC 555 Timer – Monostable Operation Circuit.
9. IC 555 Timer – Astable Operation Circuit.
10. Schmitt Trigger Circuits – using IC 741 and IC 555.
11. IC 565 – PLL Applications.
12. IC 566 – VCO Applications.
13. Voltage Regulator using IC 723.
14. Three Terminal Voltage Regulators – 7805, 7809, 7912.
15. 4 bit DAC using OP AMP.

Equipment required for Laboratories:
1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components:-   IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912 and other essential components.
8. Analog IC Tester

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BIOMEDICAL SIGNAL PROCESSING LAB

1. Computation of Convolution and Correlation Sequences.
2. Analog and Digital Signal Conditioning.
3. Signal Averaging Improvement in the SNR Using Coherent Averaging.
4. Signal Averaging Improvement in the SNR Using Incoherent Averaging.
5. Exponential Averaging.
6. Data Polishing: Mean and Trend Removal.
7. Design or I I R Filter.
8. Design of F I R Filter.
9. PSD Estimation.
10. Data Compression Techniques: AZTEC. TP.
11. Data Compression Technique: CORTES.
12. Data Compression Technique: K. L. Transform.

Using Matlab and signal processing toolbox. (10 keys / 60 intake)

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COMPUTER NETWORKS

UNIT – I
Introduction : OSI, TCP/IP and other networks models, Examples of Networks: Novell Networks ,Arpanet, Internet, Network Topologies WAN, LAN, MAN.

UNIT - II
Physical Layer : Transmission media copper, twisted pair wireless, switching and encoding asynchronous communications; Narrow band, broad band ISDN and ATM.

UNIT - III
Data link layer : Design issues, framing, error detection and correction, CRC, Elementary Protocol-stop and wait, Sliding Window, Slip, Data link layer in HDLC, Internet, ATM.

UNIT - IV
Medium Access sub layer : ALOHA, MAC addresses, Carrier sense multiple access. IEEE 802.X Standard Ethernet, wireless LANS. Bridges

UNIT - V
Network Layer : Virtual circuit and Datagram subnets-Routing algorithm shortest path routing, Flooding, Hierarchical routing, Broad cast, Multi cast, distance vector routing.

UNIT – VI
Dynamic routing – Broadcast routing. Rotary for mobility. Congestion, Control Algorithms – General Principles – of Congestion prevension policies. Internet working: The Network layer in the internet and in the ATM Networks.

UNIT –VII
Transport Layer: Transport Services, Connection management, TCP and UDP protocols; ATM AAL Layer Protocol.

UNIT – VIII
Application Layer – Network Security, Domain name system, SNMP, Electronic Mail; the World WEB, Multi Media.

TEXT BOOKS :
1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson
   Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan.Third
   Edition TMH.

REFERENCES :
1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition,
   Pearson Education
2. Understanding communications and Networks, 3rd Edition, W.A. Shay,
   Thomson

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ARTIFICIAL NEURAL NETWORKS

UNIT I
INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS : Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between Brain and the Computer, Comparison Between Artificial and Biological Neural Networks, Network Architecture, Setting the Weights, Activation Functions, Learning Methods.

UNIT II
FUNDAMENTAL MODELS OF ARTIFICIAL NEURAL NETWORKS : Introduction, McCulloch – Pitts Neuron Model, Architecture, Learning Rules, Hebbian Learning Rule, Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Leastmean Squre (LMS) rule, Competitive Learning Rule, Out Star Learning Rule, Boltzmann Learning, Memory Based Learning.

UNIT III
FEED FORWARD NETWORKS : Introduction, Single Layer Perceptron Architecture, Algorithm, Application Procedure, Perception Algorithm for Several Output Classes, Perceptron Convergence Theorem, Brief Introduction to Multilayer Perceptron networks, Back Propagation Network (BPN), Generalized Delta Learning Rule, Back Propagation rule, Architecture, Training Algorithm, Selection of Parameters, Learning in Back Propagation, Application Algorithm, Local Minima and Global Minima, Merits and Demerits of Back Propagation Network, Applications, Radial Basis Function Network (RBFN), Architecture, Training Algorithm for an RBFN with Fixed Centers.

UNIT IV
ADALINE AND MADALINE NETWORKS : Introduction, Adaline Architecture, Algorithm, Applications, Madaline, Architecture, MRI Algorithm, MRII Algorithm.

UNIT V
COUNTER PROPAGATION NETWORKS : Winner Take – all learning, out star learning, Kohonen Self organizing network, Grossberg layer Network, Full Counter Propagation Network (Full CPN), Architecture, Training Phases of Full CPN, Training Algorithm, Application Procedure, Forward Only counter Propagation Network, Architecture, Training Algorithm, Applications, Learning Vector Quantizer (LVQ).

UNIT VI
ASSOCIATIVE MEMORY NETWORKS - I : Types, Architecture, Continuous and Discrete Hopfield Networks, Energy Analysis, Storage and Retrival Algorithms, Problems with Hopfield Networks.

UNIT VII
ASSOCIATIVE MEMORY NETWORKS – II : Boltzman Machine, Bidirectional Associative Memory, Adaptive Resonance Theory Networks Introduction, Architecture, Algorithm.

UNIT VIII
APPLICATIONS OF NEURAL NETWORKS : Implementation of A/D Converter using Hopfield Network, Solving Optimization Problems, Solving Simultaneous Linear Equation, Solving Traveling Salesman Problems using Hopfield Networks, Application in Pattern Recognition, Image Processing.

TEXTBOOKS :
   1. Introduction to Artificial Neural Systems - J.M.Zurada, Jaico Publishers, 3rd Edition.
   2. Introduction to Neural Networks Using MATLAB 6.0 - S.N. Shivanandam, S. Sumati, S. N. Deepa, TMH.

REFERENCES :
   1. Elements of Artificial Neural Networks - Kishan Mehrotra, Chelkuri K. Mohan, and Sanjay Ranka, Penram International.
   2. Artificial Neural Network – Simon Haykin, Pearson Education, 2nd Ed.
   3. Fundamental of Neural Networks – Laurene Fausett, Pearson, 1st Ed.
   4. Artificial Neural Networks - B. Yegnanarayana, PHI.

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IMAGE PROCESSING AND PATTERN RECOGNITION

\UNIT-I
Basic Concepts, Pattern Recognition Systems, Fundamental Problems in pattern recognition system design, Design concepts and Methodologies – Character recognition – Speech recognition – Finger print Recognition – Pattern Recognition Model.

UNIT – II:
Decision Functions – Linear Decision functions – Distance functions. Minimum distance classification, clustering concepts, Cluster seeking algorithms, Maximum distance, K- means Algorithms.

UNTI – III:
Bayes classified decision function – For Baye's classifier Baye's Classifier for normal patterns. Trainable pattern classifiers – deterministic approach, perception approach reward – punishment concept.

UNIT – IV:
Gradient approach – Gradient Descent algorithms – LMSE Algorithms – Multi category classification.

UNIT – V:
Trainable pattern classifiers, statistical approach – stochastic approximation methods, Robbin Minro algorithms – increment correction algorithms, LMSE algorithms. Syntactic patter recognition – formulation – syntax directed recognition – picture descript.

UNIT – VI:
Digital Image fundamentals: Representation, elements – image transforms – Fast Fourier transform, DCT and DWT.

UNIT – VII:
Image enhancement- Spatial domain - frequency domain methods – Histogram, Modification techniques – Image Smoothing, image sharpening.

UNIT – VIII:
Image encoding - Fidelity criteria, Encoding process, Mapping – Quantizer coder – Image Segmentation – Masks – Point detection – Line Detection – Edge Detection.

TEXT BOOKS:
1. Digital Image Processing – by R.C. Gonzalez & R.E. Woods, Addison Wesley.
2. Pattern Recognition Principles – J.T.TOU.R.C. Gonzalez, Addison Wesley.
REFERENCE:
1. Fundamentals of Digital Image Processing – by A.K. Jain, PHI Pearson Education

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REHABILITATION ENGINEERING

UNIT-I

Engineering concepts in rehabilitation Engineering. Anthropometry: Methods for Static and dynamic Measurements: Area Measurements,Measurement of characteristics and movement, Measurement of Muscular Strength and Capabilities. Measurement tools and processes in Rehabilitation engineering: fundamental principles, structure, function; performance and behaviour. Subjective and objective measurement methods.

UNIT-II

Ergonomic aspects in designating devices: Introduction to Models in Process Control, Design of Information Devices, Traditional Devices, V.D.U' s, Using colour, Design of Controls

UNIT-III

Engineering concepts in sensory rehabilitation Engineering. Sensory augmentation and substitution: Visual system: Visual augmentation, Tactual vision substitution, and Auditory vision substitution. Auditory system: Auditory augmentation, Audiometer, *Hearing aids*, cochlear implantation, visual auditory substitution, tactual auditory substitution, Tactual system: Tactual augmentation, Tactual substitution,

UNIT-IV

ARTIFICIAL LARYNX (pneumatic & electronic): Analyzing artificial electronic larynx, Augmentative communication, control and computer access (AAC): user interface; outputs; acceleration techniques; Intervention and other issues;

UNIT-V

Orthopedic Prosthetics and Orthotics in rehabilitation:
Engineering concepts in motor rehabilitation, applications. Computer Aided Engineering in Customized Component Design. Intelligent prosthetic knee. A hierarchically controlled prosthetic hand. A self-aligning orthotic knee joint. Externally powered and controlled Orthotics and Prosthetics. FES systems-Restoration of hand function, restoration of standing and walking, Hybrid Assistive Systems (HAS).

UNIT-VI

Active Prostheses: Active above knee prostheses. Myoelectric hand and arm prostheses- different types, block diagram, signal flow diagram and functions. The MARCUS intelligent Hand prostheses

UNIT-VII

Robotic manipulation aids: modes of operation and control.
Environmental control systems: Environmental control and Access to computers.

UNIT-VIII

Computer applications in Rehabilitation engineering: Interfaces in compensation for visual perception. Improvement of orientation and mobility, Computer assisted lip reading, Brain computer interface.

TEXTBOOK

1. Bronzino, Joseph; Handbook of biomedical engineering. 2nd edition,CRC Press, 2000.
2. Robinson C.J Rehabilitation engineering. CRC press 1995

REFERENCE:

1. Horia- Nocholai Teodorecu, L.C.Jain , intelligent systems and technologies in rehabilitation engineering; CRC; December 2000.
2. Etienne Grandjean, Harold Oldroyd, Fitting the task to the man, Taylor & Francis,1988.

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OPERATING SYSTEMS
(ELECTIVE-1)

UNIT I
Computer System and Operating System Overview; Overview of Computer System hardware – Instruction execution – I/O function – Interrupts – Memory hierarchy – I.O Communication techniques. Operating System Objectives and functions – Evaluation of operating System – Example Systems.

UNIT II
Process Description – Process Control-process states – Process and Threads - Examples of Process description and Control.

UNIT III
Concurrency: Principles of Concurrency – Mutual Exclusion – Software and hardware approaches – semaphores – Monitors – Message Passing – Readers Writers Problem.

UNIT IV
Principles of deadlock – deadlock prevention, detection and avoidance dining philosophers problem – example Systems.

UNIT V
Memory Management: Memory Management requirements – loading programmes in to main memory – virtual memory – hardware and Control structures – OS Software – Examples of Memory Management.

UNIT VI
Uniprocessor Scheduling: Types of Scheduling – Scheduling algorithms – I/O management and Disc Scheduling – I/o devices – organization – of I/O function – OS design issues – I/O buffering – Disk I/O – disk scheduling Policies – examples System.

UNIT VII
File Management and Security: Overview of file management – file organization and access – File Directories – File sharing – record blocking – secondary Storage Management – example system.

UNIT VIII
Security: Security threats – Protection – intruders – Viruses – trusted System.

TEXT BOOKS:
1. Operating Systems' – Internal and Design Principles, Fifth Edition–2005, Pearson education./PHI
2. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne,7 th Edition John Wiley

REFERENCES
1. Operating Systems A design approach- Crowley,TMH.
2. Modern Operating Systems, Andrew S Tanenbaum. 2 nd Edition, PHI/PEARSON

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MICROCONTROLLERS AND APPLICATIONS
(ELECTIVE-I)

UNIT I
OVERVIEW OF ARCHITECTURE AND MICROCONTROLLER RESOURCES
Architecture of a microcontroller – Microcontroller resources – Resources in advanced and next generation microcontrollers – 8051 microcontroller – Internal and External memories – Counters and Timers – Synchronous serial-cum-asynchronous serial communication - Interrupts.

UNIT II
8051 FAMILY MICROCONTROLLERS INSTRUCTION SET
Basic assembly language programming – Data transfer instructions – Data and Bitmanipulation instructions – Arithmetic instructions – Instructions for Logical operations on the tes among the Registers, Internal RAM, and SFRs – Program flow control instructions – Interrupt control flow.

UNIT III
REAL TIME CONTROL : INTERRUPTS
Interrupt handling structure of an MCU – Interrupt Latency and Interrupt deadline – Multiple sources of the interrupts – Non-maskable interrupt sources – Enabling or disabling of the sources – Polling to determine the interrupt source and assignment of the priorities among them – Interrupt structure in Intel 8051.

UNIT IV
REAL TIME CONTROL : TIMERS
Programmable Timers in the MCU's – Free running counter and real time control – Interrupt interval and density constraints.

UNIT V
SYSTEMS DESIGN : DIGITAL AND ANALOG INTERFACING METHODS
Switch, Keypad and Keyboard interfacings – LED and Array of LEDs – Keyboardcum- Display controller (8279) – Alphanumeric Devices – Display Systems and its interfaces – Printer interfaces – Programmable instruments interface using IEEE 488 Bus – Interfacing with the Flash Memory – Interfaces – Interfacing to High
Power Devices – Analog input interfacing – Analog output interfacing – Optical motor shaft encoders – Industrial control – Industrial process control system – Prototype MCU based Measuring instruments – Robotics and Embedded control – Digital Signal Processing and Digital Filters.

UNIT VI
REAL TIME OPERATING SYSTEM FOR MICROCONTROLLERS
Real Time operating system – RTOS of Keil (RTX51) – Use of RTOS in Design – Software development tools for Microcontrollers.

UNIT VII
16-BIT MICROCONTROLLERS
Hardware – Memory map in Intel 80196 family MCU system – IO ports – Progammable Timers and High-speed outputs and input captures – Interrupts – instructions.

UNIT VIII
ARM 32 Bit MCUs
Introduction to 16/32 Bit processors – ARM architecture and organization – ARM / Thumb programming model – ARM / Thumb instruction set – Development tools.

TEXT BOOKS
1. Microcontrollers Architecture, Programming, Interfacing and System Design – Raj Kamal, Pearson Education, 2005.
2. The 8051 Microcontroller and Embedded Systems – Mazidi and Mazidi, PHI, 2000.

REFERENCES
1. Microcontrollers (Theory & Applications) – A.V. Deshmuk, WTMH, 2005.
2. Design with PIC Microcontrollers – John B. Peatman, Pearson Education, 2005.

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TELEMEDICINE
(ELECTIVE-I)

Unit I:
History of telemedicine, Block diagram of telemedicine system, Definition of telemedicine, Tele health, Tele care, organs of telemedicine, scope, Benefits, and limitations of telemedicine.

Unit II:
Type of information; Audio, Video, Still images, Text and data, fax, type of communications and network, PSTN, POTS, ANT, ISDN, Internet, Air/ wireless communications: GSM satellite, and Micro wave. Different Modulation techniques. Types of antennas depending on requirements, Integration and operational issues: - system integration, store –and - forward operation, Real-time Telemedicine.

Unit –III:
Data Exchange: Network Configration, circuit and packet switching, H. 320 series (Video phone based ISBN) T. 120, H.324 (Video phone based PSTN). Video Conferencing.

Unit –VI:
Data Security and Standards: Encryption, Cryptography, Mechanisms of encryption, phases of Ecryption. Protocols: TCP/IP, ISO-OSI, Standards to followed DICOM, HL7.

Unit – V:
Ethical and legal aspects of Telemedicine: Confidentiality, and the law, patient rights and consent, access to medical Records, Consent treatment, jurisdictional Issues, Intellectual property rights.

Unit – VI:
Tele radiology: Definition, Basic parts of teleradiology system: Image Acquisition system Display system, Communication network, Interpretation section. Tele pathology: multimedia databases, color images of sufficient resolution: Dynamic range, spatial resolution, compression methods, Interactive control of color, Controlled sampling security and confidentiality tools.

Unit – VII
And tele catriology Teleoncology, Telesurgery.

Unit – VIII
Applications of Telesurgey

TEXTBOOKS:
1. Olga (EDT) Ferrer – Roca, M.Sosa (EDT) Iudicissa Hand book of Telemedicine IOS press 2002
2. A.C. Norris, Essentials of Telemedicine and Telecare John Sons & Ltd, 2002

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EMBEDDED AND REAL TIME SYSTEMS
(ELECTIVE –II)

UNIT I
INTRODUCTION : Embedded systems overview, design challenge, processor technology, IC technology, Design Technology, Trade-offs. Single purpose processors RT-level combinational logic, sequential logic (RT-level), custom single purpose processor design (RT-level), optimizing custom single purpose processors.

UNIT II
GENERAL PURPOSE PROCESSORS : Basic architecture, operation, Pipelining, Programmer's view, development environment, Application Specific Instruction-Set Processors (ASIPs) – Micro Controllers and Digital Signal Processors.

UNIT III
STATE MACHINE AND CONCURRENT PROCESS MODELS : Introduction, models Vs. languages, finite state machines with data path model (FSMD), using state machines, program state machine model (PSM), concurrent process model, concurrent processes, communication among processes, synchronization among processes, implementation, data flow model, real-time systems.

UNIT IV
COMMUNICATION INTERFACE : Need for communication interfaces, RS232 / UART, RS422 / RS485, USB, Infrared, IEEE 1394 Firewire, Ethernet, IEEE 802.11, Blue tooth.

UNIT V
EMBEDDED / RTOS CONCEPTS – I : Architecture of the Kernel, Tasks and Task scheduler, Interrupt service routines, Semaphores, Mutex.

UNIT VI
EMBEDDED/RTOS CONCEPTS – II : Mailboxes , Message Queues, Event Registers, Pipes, Signals

UNIT VII
EMBEDDED / RTOS CONCEPTS – III : Timers, Memory Management, Priority inversion problem, Embedded operating systems Embedded Linux, Real-time operating systems, RT Linux, Handheld operating systems, Windows CE.

UNIT VIII
DESIGN TECHNOLOGY : Introduction, Automation, Synthesis, Parallel evolution of compilation and synthesis, Logic Synthesis, RT synthesis, Behavioral Synthesis, Systems Synthesis and Hardware/ Software Co-Design, Verification, Hardware/Software co-simulation, Reuse of intellectual property codes.

TEXT BOOKS :
1. Embedded System Design – A Unified Hardware/Software Introduction - Frank Vahid, Tony D. Givargis, John Wiley, 2002.
2. Embedded / Real Time Systems – KVKK Prasad, Dreamtech Press, 2005.

REFERENCES :
1. Embedded Microcomputer Systems – Jonathan W. Valvano, Brooks / Cole, Thompson Learning.
2. An Embedded Software Primer – David E. Simon, Pearson Ed., 2005.
3. Introduction to Embedded Systems – Raj Kamal, TMS, 2002.
4. Embedded Real Time Systems Programming – Sri Ram V Iyer, Pankaj Gupta, TMH, 2004.

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MEDICAL INFORMATICS
(Elective-II)

UNIT-I

Introduction and Overview of hospital information system. Patient history taking mechanisms.

UNIT-II

Patient Data Processing, Database Management, Communication of Medical data across different hospital units. Networking and Integration of patient data.

UNIT-III

Data from Patients, Coding and Classification , The Patient Record, Biosignal Analysis, Medical Imaging, Image Processing and Analysis.

UNIT-IV

Patient-Centered Information Systems ,Primary Care, Clinical Departmental Systems, Clinical Support Systems, Nursing Information Systems.

UNIT-V

Medical Knowledge and Decision Support, Methods for Decision Support, Clinical Decision-Support Systems, Strategies for Medical Knowledge Acquisition, Predictive Tools for Clinical Decision Support.

UNIT-VI

Institutional Information Systems, Modeling of Health Care for Information Systems Development, Hospital Information Systems: Clinical Use, Technical Choices, Health Information Resources.

UNIT-VII

Methodology for Information Processing , Logical Operations, Biostatistical Methods, Biosignal Processing Methods, Pattern Recognition, Modeling for Decision Support, Structuring the Computer-based Patient Record, Evaluation of Clinical Information Systems.

UNIT-VIII

Methodology for Information Systems: Human-Computer Interaction in Health Care ,Costs and Benefits of Information Systems, Security in Medical Information Systems, Standards in Health-care Informatics and Telematics, Project Management,

TEXT BOOK

1. Bemmel, J.Van; Musen, M.A. Handbook of Medical Informatics 1st ed. 1997.

REFERENCES:

1. R.D.Lele ,Computers in Medicine Tata McGraw Hill, 2005.
2. Davidson, P., Best Practice Series: Healthcare Information Systems, Auerbach Publications, 2000

IV Year B.Tech. BME - I Semester

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PHYSIOLOGICAL SYSTEMS MODELING
(Elective-II)

UNIT-I

The problem of system modeling in Physiology. Types of Nonlinear models of physiological systems. Deductive and Inductive modeling.

UNIT-II

Nonparametric modeling: Volterra models. Wiener models. Efficient volterra kernel estimation Analysis of estimation errors.

UNIT-III

Parametric modeling: Basic parametric model forms and Estimation procedures. Volterra kernels of nonlinear differential equations. Discrete-time volterra kernels of NARMAX models. From Volterra kernel measurements to Parametric models. Equivalence between continuous and Discrete -parametric models.

UNIT-IV

Preliminary tests and Data preparation. Model specification and Estimation. Model validation and Interpretation. Outline of step-by-step procedure.

UNIT-V

Applications: Neurosensory systems:Cardiovascular system, Renal system, Metabolic-Endocrine system.

UNIT-VI

Modeling of multiinput/multioutput systems: The Two-input case. Application s of Two-input modeling to physiological systems. The Multiinput case spatiotemporal and spectrotemporal modeling.

UNIT-VII

Modeling of neuronal systems: A General model of membrane and Synaptic dynamics, Functional integration in the Single neuron, Neuronal systems with Pointprocess inputs Modeling of neuronal ensembles.

UNIT-VIII

Modeling of Closed-loop systems: Autoregressive form of Closed-loop model, Network model form of Closed-loop systems.

TEXT BOOK

1. Vasilis Z. Marmarelis, Nonlinear dynamic modeling of physiological systems, Wiley-IEEE Press, 2004.

REFERENCE:

1. David T. Westwick, Robert E. Kearney, Identification of Nonlinear Physiological Systems, Wiley-IEEE Press, 2003.
2. Michel C Khoo, Physiological Control Systems -Analysis, simulation and estimation, Prentice Hall of India, 2001.

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MEDICAL IMAGING TECHNIQUES LAB

Implementation of the below Algorithms.
1. Algorithms for Low Pas filter, High Pass Filter, Median Filter
2. Prewitt Edge, Quick Edge Detector
3. Miller's Algorithm
4. Cooley -Turkey Algorithm
5. Numerical Implementation of the Two Dimensional F. F. T.
6. Reconstruction Algorithm for Parallel Projections.
7. Reconstruction Algorithm for Fan Beam Projections
8. Re-Sorting Algorithm
9. Back Projection Algorithm.
10. A.R.T. (Algebraic Reconstruction Techniques).
11. S. A. R. T.
12. S. I. R T (Simultaneous Iterative Reconstruction Technique)

Additional requirements along with the computer facilities
C compiler
Matlab with signal processing and image processing toolboxes. (10 keys / 60 intake)

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MICROPROCESSOR LAB

I. Microprocessor 8086 :
  1. Introduction to MASM/TASM.
  2. Arithmetic operation – Multi byte Addition and Subtraction, Multiplication and Division – Signed and unsigned Arithmetic operation, ASCII – arithmetic operation.
  3. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
  4. By using string operation and Instruction prefix: Move Block, Reverse string, Sorting, Inserting, Deleting, Length of the string, String comparison.
  5. DOS/BIOS programming: Reading keyboard (Buffered with and without echo) – Display characters, Strings.

II. Interfacing :
  1. 8259 – Interrupt Controller : Generate an interrupt using 8259 timer.
  2. 8279 – Keyboard Display : Write a small program to display a string of characters.
  3. 8255 – PPI : Write ALP to generate sinusoidal wave using PPI.
  4. 8251 – USART : Write a program in ALP to establish Communication between two processors.

III. Microcontroller 8051
  1. Reading and Writing on a parallel port.
  2. Timer in different modes.
3. Serial communication implementation.

Equipment required for Laboratories:
  1. 8086 µP Kits
  2. 8051 Micro Controller kits
  3. Interfaces/peripheral subsystems
        i)   8259 PIC
        ii)   8279-KB/Display
        iii)   8255 PPI
        iv)   8251 USART

  4. ADC Interface
  5. DAC Interface
  6. Traffic Controller Interface
  7. Elevator Interface

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BIOMEMS

UNIT-I

Introduction: history of MEMS, market for MEMS, overview of MEMS processes, properties of silicon, a sample MEMS process. Basics of Microtechnology: definitions and terminology, a sample process, lithography and etching.MEMS Biosensors: Bio Flow Sensors, MEMS Images. Introduction to MEMS Pro design software.

UNIT-II

Micromachining: subtractive processes (wet and dry etching), additive processes (evaporation, sputtering, epitaxial growth). Fundamental Devices and Processes: basic mechanics and electrostatics for MEMS, parallel plate actuators, pull-in point, comb drives.

UNIT-III

Fundamental Devices and Processes: more electrostatic actuators; MEMS foundries, Cronos MUMPs (multi user MEMS process). MUMPs Multi User MEMS Process: JDS Uniphase MUMPs processing sequence and design rules. MUMPs and SUMMIT: design rules; applications; micro hinges and deployment actuators.

UNIT-IV

CMOS MEMS: CMOS foundry processes, integrated IC/MEMS, MEMS postprocessing, applications. Cleanroom lab techniques: clean rooms, gowning procedures; safety, fire, toxicity; acids and bases; photolithography.

UNIT-V

MicroOptoElectroMechanical Systems (MOEMS): micro scanners, digital mirror display, retinal scanning display. Grating light valve, corner cube retroreflector, optical switches, other micro-optical devices.

UNIT-VI

Thermal Transducers: bimorphs, "heatuators", cilia arrays. Piezoresistivity; Scanning Probe Microscopy: scanning tunneling microscope (STM), atomic force microscope (AFM).

UNIT-VII

Scaling Laws. Wireless MEMS: mechanical and electrical resonators, Q-factor, switches, filters. Power for MEMS: thin film batteries, micro fuel cells, energy fields.

UNIT-VIII

MEMS Packaging and Assembly: microassembly: serial and parallel, deterministic and stochastic; microgrippers: HexSil process; packaging techniques. The Future of MEMS: bioMEMS - neural implants, gene chips, diagnostic chips; MEMS in space; mechanical computers; invisible and ubiquitous computing.

TEXT BOOKS:

1. HSU, TAI RAN, **MEMS AND MICROSYSTEMS Design And Manufacture,** Tata McGraw-Hill,2002.
2. Rai-Choudhury, Prosenjit; Mems and Moems Technology and Applications SPIE 2000.

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DIGITAL DESIGN THROUGH VERILOG
(ELECTIVE – III)

UNIT I
INTRODUCTION TO VERILOG : Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Programming Language Interface (PLI), Module, Simulation and Synthesis Tools, Test Benches.
LANGUAGE CONSTRUCTS AND CONVENTIONS : Introduction, Keywords, Identifiers, White Space Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Memory, Operators, System Tasks, Exercises.

UNIT II
GATE LEVEL MODELING : Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Additional Examples, Design of Flip-flops with Gate Primitives, Delays, Strengths and Contention Resolution, Net Types, Design of Basic Circuits, Exercises.

UNIT III
BEHAVIORAL MODELING : Introduction, Operations and Assignments, Functional Bifurcation, *Initial* Construct, *Always* Construct, Examples, Assignments with Delays, *Wait* construct, Multiple Always Blocks, Designs at Behavioral Level, Blocking and Non blocking Assignments, The *case* statement, Simulation Flow. *if* and *if-else* constructs, *assign-deassign* construct, *repeat* construct, *for* loop, the *disable* construct, *while* loop, *forever* loop, parallel blocks, *force-release* construct, Event.

UNIT IV
MODELING AT DATA FLOW LEVEL : Introduction, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators.
SWITCH LEVEL MODELING.
Introduction, Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitives, Instantiations with Strengths and Delays, Strength Contention with Trireg Nets, Exercises.

UNIT V
SYSTEM TASKS, FUNCTIONS, AND COMPILER DIRECTIVES : Introduction, Parameters, Path Delays, Module Parameters, System Tasks and Functions, File-Based Tasks and Functions, Compiler Directives, Hierarchical Access, General Observations, Exercises,
FUNCTIONS, TASKS, AND USER-DEFINED PRIMITIVES : Introduction, Function, Tasks, User- Defined Primitives (UDP), FSM Design (Moore and Mealy Machines)

UNIT VI
DIGITAL DESIGN WITH SM CHARTS : State Machine Charts, Derivation of SM Charts, Realization of SM Charts, Implementation of the Dice Game, Alternative realizations for SM Charts using Microprogramming, Linked State Machines.

UNIT VII
DESIGNING WITH PROGRAMMABLE GATE ARRAYS AND COMPLEX PROGRAMMABLE
LOGIC DEVICES : Xilinx 3000 Series FPGAs, Designing with FPGAs, Using a One-Hot State Assignment, Altera Complex Programmable Logic Devices (CPLDs), Altera FLEX 10K Series CPLDs.

UNIT VIII
VERILOG MODELS : Static RAM Memory, A simplified 486 Bus Model, Interfacing Memory to a Microprocessor Bus, UART Design, Design of Microcontroller CPU.
TEST BOOKS :
1. Design through Verilog HDL – T.R. Padmanabhan and B. Bala Tripura Sundari, WSE, 2004 IEEE Press.
2. A Verilog Primier – J. Bhaskar, BSP, 2003.
REFERENCES :
1. Fundamentals of Logic Design with Verilog – Stephen. Brown and Zvonko Vranesic, TMH, 2005.
2. Digital Systems Design using VHDL – Charles H Roth, Jr. Thomson Publications, 2004.
3. Advanced Digital Design with Verilog HDL – Michael D. Ciletti, PHI, 2005.
4. Digital systems Design using VHDL – Charles H Roth, Jr. Thomson Publications, 2004.

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BIOMATERIALS
(ELECTIVE – III)

UNIT I
Properties of Materials. Classes of materials used in medicine: Metals, Polymers, Hydrogels Bioresorbable and Biodegradable Materials, Ceramics, Natural materials composites thin films, grafts, Coatings medical fibers and Biological functional materials, Smart materials, Pyrolytic Carbon for long-term medical Implants textured and Porous materials non-fouling surfaces

UNIT-II
Host reactions to : Inflammation, Wound healing and the Foreign body response.
Systemic toxicity and Hypersensitivity. Blood coagulation and Blood-materials Interactions. Tumorigenesis.

UNIT-III
Testing biomaterials:In Vitro assessment of tissue compatibility In vivo assessment of tissue compatibility. Testing of blood-materials interactions.
Degradation of materials in the biological environment: Effects of the Biological environment on metals, polymers and ceramics.

UNIT-IV
Applications of materials in medicine, Dentistry and Biology: Cardiovascular medical devices. Nonthrombogenic treatments and Strategies. Dental implantation adhesive and Sealants. Ophthalmologic applications-intraocular lens implants.

UNIT-V
Orthopedic biomaterials, Performance of drug delivery systems, Sutures. Burn dressings and Skin substitutes.

UNIT-VI
Artificial organs and tissues: Implantable cardiac assist devices. Materials for extracorporeal devices. Cochlear implants. Artificial red blood cell substitutes.

UNIT-VII
Sterilization of implants and Devices implants and Device failure. Surface properties with Biological responses. Implant retrieval and Evaluation.

UNIT-VIII
Standards development and regulation of medical products using biomaterials. Nano bio materials.

TEXT BOOKS:
1. Biomaterials Science: An Introduction to Materials in Medicine Buddy D. Ratner, Frederick J. Schoen, Allan S. Hoffman, Jack E. Lemons
2. Hench L L Ethridgc E.C. Biomaterials, an interfacial approach, Academic press 1982

REFERENCE:
1. Bronzino J D, the biomedical engineering handbook CRC Press.

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TRANSPORTATION PHENOMENA IN LIVING SYSTEMS
(ELECTIVE – III)

UNIT-I
Heat Transport: Body temperature regulation modes of heat transfer.

UNIT-II
Heat transportation in Tissues, Muscles, Skin and other Organs in different environmental temperatures.

UNIT-III
Models of heat transfer in the body.

UNIT-IV
Fundamentals and applications of mass transport. Introduction to Mass Transport. Diffusion with Convection or Electrical Potentials. Transport in Porous Media. Transvascular Transport. Solvent and Solute Transport across the Kidney Glomerulus.

UNIT-V
Processes of mass transfer Diffusion, Osmosia, ElectroOsmasia. Ultra filtration. Reverse Osmosia through natural Membrane systems, Reverse Osmosia through artificial synthetic Membranes.

UNIT-VI
Mass Transport and Biochemical Interactions, Oxygen Transport from the Lungs to the Tissues.

UNIT-VII
Mass transfer: Mass transfer in Kidney, Skeletal, Nervous, G. I. system, Cardio Pulmonary system.

UNIT-VIII
Mass transfer in dialysers and oxygenators.

TEXT BOOKS
1. Fournier, Ronald L,.Basic transport phenomena in biomedical engineering.Taylor & Francis. 1998

REFERENCE:
1. David.O. Cooney, Biomedical engg. Principles: An introduction to fluid, Heat & Mass transport process Vol &
2 ; Marcel Dekker inc,.
2. Medical physiology by Ganong
3. Physiology by Best and Taylar

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ROBOTICS AND AUTOMATION
(ELECTIVE-IV)

UNIT – I BASIC CONCEPTS
Automation and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system, Dynamic stabilization of Robotics.

UNIT – II POWER SOURCES AND SENSORS
Hydraulic, Pneumatic and electric drivers – Determination HP of motor and gearing ratio, variable speed arrangements, Path Determination - Machinery Vision – Ranging – Laser – Acoustic, Magnetic Fiber Optic and Tactile Sensor

UNIT – III MANUPULATORS
Construction of Manupulators, Manupulator Dynamic and Force Control, Electronic and Pneumatic manupulators.

UNIT – IV ACTUATORS AND GRIPPERS
Pneumatic, Hydraulic Actuators, Stepper Motor Control Circuits, End Effecter, Various types of Grippers, Design consideration.

UNIT – V
Differential transformation and manipulators, Jacobians – problems.Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.

UNIT VI KINEMATICS
Forward and Inverse Kinematic Problems, Solutions of Inverse Kinematic problems, Multiple Solution, Jacobian Work Envelop – Hill Climbing Techniques.

UNIT VII PATH PLANNING
Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion – Robot programming, languages and software packages.

UNIT VIII CASE STUDY
Multiple Robots – Machine Interface – Robots in Manufacturing and Non-Manufacturing applications – Robot Cell Design Selection of a Robot.

TEXT BOOKS:
1. Industrial Robotics / Groover M P /Pearson Edu.
    2.   Robotics / Fu K S/ McGraw Hill.
    3.

REFERENCES:
1. Robotics, CSP Rao and V.V. Reddy, Pearson Publications (In press)
2. Robotics and Control / Mittal R K & Nagrath I J / TMH.
3. An Introduction to Robot Technology, / P. Coiffet and M. Chaironze / Kogam Page Ltd. 1983 London.
4. Robotic Engineering / Richard D. Klafter, Prentice Hall
5. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science
6. Introduction to Robotics / John J Craig / Pearson Edu.
7. Robot Dynamics and Control by Mark W. Spong and M. Vidyasagar, John Wiley & Sons.

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DSP PROCESSORS AND ARCHITECTURES
(ELECTIVE – IV)

UNIT I
INTORODUCTION TO DIGITAL SIGNAL PROCESING : Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

UNIT II
COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS : Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT III
ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES : Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT IV
EXECUTION CONTROL AND PIPELINING : Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

UNIT V
PROGRAMMABLE DIGITAL SIGNAL PROCESSORS : Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

UNIT VI
IMPLEMENTATIONS OF BASIC DSP ALGORITHMS : The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

UNIT VII
IMPLEMENTATION OF FFT ALGORITHMS : An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT VIII
INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES :
Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

TEXT BOOKS :
   1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
   2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

REFERENCES :
   1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkata Ramani and M. Bhaskar, TMH, 2004.
   2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005.

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QUANTITATIVE ENGINEERING PHYSIOLOGY
(Elective-IV)

UNIT-I - Cellular Physiology
Introduction to Physiology, Introduction to Modeling and Review of Electric Circuits.

UNIT-II
Review of Cellular Physiology, Cellular Metabolism and Kinetics, Membrane Dynamics.

UNIT-III
Ion Transport types of transport and Cellular Homeostasis, The Resting Potential.

UNIT-IV
Regulation of Cell Function and Cell Cycle Detailed aspects of Neoplasia, Uses of DNA Micro-Arrays,

UNIT-V -Neuromuscular Physiology
Review of Nervous System, The Action Potential, Propagation of Action Potentials measurement by Patch Clamp.

UNIT-VI
Skeletal Muscle, Neuromuscular Junction and Synaptic Transmission, Smooth Muscle, study of Demyelinating Diseases.

UNIT-VII - Cardiovascular Physiology
Review of Cardiovascular Physiology, The ECG, causes and classification of Arrhythmias, characteristics of Defibrillation phenomena.

UNIT-VIII
Pressure Volume Relationships, Models of Circulation, Cardiac Output, Cardiac Regulation, Physiological aspects of Myocardial infarction.

Text Books:
1. Text Book of Physiology by Guyton.
2. Text Book of Physiology by West & Todd

REFERENCE:
1. Text Book of Physiology by Choudary.

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DIGITAL IMAGE PROCESSING LAB

1. Image data Compression
2. Maximum distance algorithm.
3. K- mean algorithm.
4. Gradient descent algorithm.
5. LMSE algorithm.
6. Image Enhancement –Histogram.
7. Image Smoothing.
8. Image Sharpening.
9. Masks.
10. Point Detection.
11. Line Detection.
12. Edge Detection.

Additional requirements along with the computer facilities
Using Matlab with signal processing and image processing toolboxes. (10 keys / 60 intake)

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INDUSTRY ORIENTED MINI PROJECT
(HOSPITAL TRAINING)

1. NEPHROLOGY: Operation of dialysers and Estimation of renal function

2. NEUROLOGY: study and operation of EEG, EMG equipment, recording ofEEG signals normal and abnormal recordings

3. Special techniques and features of equipment, YAG laser, stunt tubes, cerebral angiography.

4. CARDIOLOGY: study and operation of various pacemakers, DC Defibrillators, monitors.

5. GASTROENTEROLOGY: study and operation of infusion pumps, endoscopic instruments and other lab equipments.

6. GENERAL SURGERY: Study and Operation of Surgical equipment for both Adult and Paediatric. Suction apparatus, Cautery, Light Sources.

7. Study and operation of Laproscopic instruments, micro surgical equipments

8. ORTHOPAEDICS: study and operation of physiotherapy equipment. Prosthetic devices.

9. PATHOLOGY & BLOOD BANK: Study and operation of Various Instruments used for pathological tests, Plasmaphoresis Instruments

10. ANAESTHESIA: study and operation of various equipments used in theatres like electro surgical generators, cold light sources, servo ventilators, Anaesthesia equipment, ventilators, CSSD equipment, oxygen plant/oxygen concentrators.

11. IMAGING SCIENCE: operation of X-Ray plants, X-Ray film developing technique, ultrasound scanning, CAT, MRI.

12. RADIO THERAPY: study and operation of radiotherapy equipment.