ANNA UNIVERSITY

CHENNAI - 600 025

UNIVERSITY DEPARTMENTS

REGULATIONS 2012

CURRICULA AND SYLLABI FOR

I TO VIII SEMESTERS

B.E. BIOMEDICAL ENGINEERING (FULL TIME)

Attested

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Centre For Academic Courses
Anna University, Chennai-600 025.

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R – 2012

B.E. BIOMEDICAL ENGINEERING

I – VIII SEMESTERS CURRICULA AND SYLLABI

SEMESTER I

CODE No.	COURSE TITLE	L	T	P	C
THEORY					
HS8151	Technical English - I	3	1	0	4
MA8151	Mathematics I	3	1	0	4
PH8151	Engineering Physics	3	0	0	3
CY8151	Engineering Chemistry	3	0	0	3
GE8151	Computing Techniques	3	0	0	3
GE8152	Engineering Graphics	2	0	3	4
PRACTICAL					
PH8161	Physics Laboratory	0	0	2	1
CY8161	Chemistry Laboratory	0	0	2	1
GE8161	Computer Practices Laboratory	0	0	3	2
GE8162	Engineering Practices Laboratory	0	0	3	2
	TOTAL	17	2	13	**27**

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SEMESTER II

CODE No.	COURSE TITLE	L	T	P	C
THEORY					
HS8251	Technical English – II	3	1	0	4
MA8251	Mathematics II	3	1	0	4
BM8201	Anatomy & Physiology	3	0	0	3
BM8202	Electron Devices and Circuits	3	1	0	4
BM8203	Medical Physics	3	0	0	3
EC8251	Circuit Theory	3	1	0	4
PRACTICAL					
BM8211	Circuit Analysis Laboratory	0	0	3	2
BM8212	Electron Devices and Circuits Laboratory	0	0	3	2
	TOTAL	**18**	**4**	**6**	**26**

SEMESTER III

CODE No.	COURSE TITLE	L	T	P	C
THEORY					
MA8357	Transform Techniques and Partial Differential Equation	3	1	0	4
GE8351	Environmental Science and Engineering	3	0	0	3
BM8301	Fundamentals of Biochemistry	3	0	0	3
BM8302	Sensors and Measurements	3	0	0	3
EC8353	Signals and Systems	3	0	0	3
EE8306	Basics of Electrical Engineering	3	0	0	3
PRACTICAL					
BM8311	Biochemistry and Human Physiology Laboratory	0	0	3	2
BM8312	Sensors and Measurements Laboratory	0	0	3	2
	TOTAL	**18**	**1**	**6**	**23**

SEMESTER IV

CODE No.	COURSE TITLE	L	T	P	C
THEORY					
MA8355	Probability and Random Processes	3	1	0	4
BM8401	Biomedical Instrumentation and Measurements	3	0	0	3
BM8402	Pathology and Microbiology	3	0	0	3
EC8351	Digital Electronics and System Design	3	0	0	3
EC8452	Operational Amplifiers and Analog Integrated Circuits	3	0	0	3
PRACTICAL					
BM8411	Bio Medical Instrumentation Laboratory	0	0	3	2
BM8412	Integrated Circuits Laboratory	0	0	3	2
BM8413	Pathology and Microbiology Laboratory	0	0	3	2
	TOTAL	**15**	**1**	**9**	**22**

SEMESTER V

CODE No.	COURSE TITLE	L	T	P	C
THEORY					
BM8501	Analog and Digital Communication	3	0	0	3
BM8502	Control System for Bio Medical Engineering	3	1	0	4
BM8503	Diagnostic and Therapeutic Equipment I	3	0	0	3
EC8503	Microprocessor and Micro controllers	3	0	0	3
EC8551	Discrete Time Signal Processing	3	1	0	4
E1	Elective –I	3	0	0	3
PRACTICAL					
HS8561	Employability Skills	0	0	2	1
EC8511	Micro controller and Interfacing Laboratory	0	0	3	2
EC8561	Digital Signal Processing Laboratory	0	0	3	2
	TOTAL	**18**	**2**	**8**	**25**

SEMESTER VI

CODE No.	COURSE TITLE	L	T	P	C
THEORY					
BM8601	Bio Mechanics	3	0	0	3
BM8602	Diagnostic and Therapeutic Equipment II	3	0	0	3
BM8603	Hospital Management	3	0	0	3
BM8604	Radiological Equipment	3	0	0	3
E2	Elective –II	3	0	0	3
E3	Elective –III	3	0	0	3
PRACTICAL					
BM8611	Diagnostic &Therapeutic Equipment Laboratory	0	0	3	2
BM8612	Medical Electronics System Design Laboratory	0	0	3	2
	TOTAL	**18**	**0**	**6**	**22**

SEMESTER VII

CODE No.	COURSE TITLE	L	T	P	C
THEORY					
BM8701	Medical Informatics	3	0	0	3
BM8702	Pattern Recognition and Neural Networks	3	0	0	3
BM8751	Principles of Digital Image Processing	3	0	0	3
E4	Elective IV	3	0	0	3
E5	Elective V	3	0	0	3
E6	Elective VI	3	0	0	3
PRACTICAL					
BM8711	Hospital Training	0	0	4	2
BM8712	Medical Image Processing Lab	0	0	3	2
	TOTAL	**18**	**0**	**7**	**22**

SEMESTER VIII

CODE No.	COURCE TITLE	L	T	P	C
E7	Elective VII	3	0	0	3
E8	Elective VIII	3	0	0	3
PRACTICAL					
BM8811	Project Work	0	0	12	6
	TOTAL	**6**	**0**	**12**	**12**

TOTAL NO OF CREDITS: 179

ELECTIVES

CODE No.	COURSE TITLE	L	T	P	C
BM8001	Advanced Bio analytical and Therapeutic Techniques	3	0	0	3
BM8002	Advanced Microprocessors	3	0	0	3
BM8003	Bio Materials and Artificial Organs	3	0	0	3
BM8004	Bio MEMS	3	0	0	3
BM8005	Bio Signal Processing	3	0	0	3
BM8006	Biomaterials and Characterization	3	0	0	3
BM8007	Biometric Systems	3	0	0	3
BM8008	Brain Computer Interface and Applications	3	0	0	3
BM8009	Computer Hardware and Interfacing	3	0	0	3
EC8011	Embedded and Real - Time Systems	3	0	0	3
BM8011	Medical Optics	3	0	0	3
BM8012	Neural Engineering	3	0	0	3
BM8013	Physiological Modeling	3	0	0	3
BM8014	Principles of Tissue Engineering	3	0	0	3
BM8015	Rehabilitation Engineering	3	0	0	3
GE8751	Engineering Ethics and Human Values	3	0	0	3

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MG8654	Total Quality Management	3	0	0	3
CS8251	Data Structures and Object Oriented Programming in C++	3	0	0	3
EC8071	Cryptography and Network Security	3	0	0	3
EC8072	Electro Magnetic Interference and Compatibility	3	0	0	3
EC8073	Foundations of Nano- Electronics	3	0	0	3
EC8074	Multimedia Compression and Communication	3	0	0	3
EC8075	Robotics	3	0	0	3
EC8076	Soft Computing and Applications	3	0	0	3
EC8451	Computer Architecture and Organization	3	0	0	3
EC8651	Digital VLSI	3	0	0	3
CS8075	Foundation Skills In Integrated Product Development	3	0	0	3
GE8072	Disaster Management	3	0	0	3
GE8073	Human Rights	3	0	0	3

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HS8151 **TECHNICAL ENGLISH I** **L T P C**

(For all branches of B.E / B.Tech programmes) **3 1 0 4**

OBJECTIVES

- To enable all students of engineering and technology develop their basic communication skills in English.
- To give special emphasis to the development of speaking skills amongst the students of engineering and technology students.
- To ensure that students use the electronic media such as interne and supplement the learning materials used in the classroom.
- To inculcate the habit of reading for pleasure.

UNIT I

Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); **Speaking -** Speaking about one's place, important festivals etc. – Introducing oneself, one's family / friend; **Reading -** Skimming a reading passage – Scanning for specific information - Note-making; **Writing -** Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one's leisure time activities, hometown, etc.); **Grammar -** Prepositions - Reference words- Wh-questions - Tenses (Simple); **Vocabulary -** Word formation - Word expansion (root words / etymology); **E-materials -** Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

UNIT II

Listening - Listening and responding to video lectures / talks**; Speaking -** Describing a simple process (filling a form, etc.) - Asking & answering questions - Telephone skills – Telephone etiquette; **Reading –** Critical reading - Finding key information in a given text - Sifting facts from opinions**; Writing -** Biographical writing (place, people) - Lab descriptions (general/ specific description of laboratory experiments) - Definitions - Recommendations; **Grammar -** Use of imperatives - Subject-verb agreement**; Vocabulary -** Compound words - Word Association**; E-materials -** Interactive exercises for Grammar and Vocabulary - Listening exercises with sample telephone conversations / lectures – Picture-based activities.

UNIT III

Listening - Listening to specific task - focused audio tracks; **Speaking -** Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); **Reading -** Reading and interpreting visual material**; Writing -** Jumbled

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sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause & effect / compare & contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) - Paraphrasing**; Grammar -** Tenses (Past) - Use of sequence words - Adjectives**; Vocabulary -** Different forms and uses of words, Cause and effect words**; E-materials -** Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

UNIT IV

Listening - Watching videos / documentaries and responding to questions based on them**; Speaking -** Responding to questions - Different forms of interviews - Speaking at different types of interviews; **Reading -** Making inference from the reading passage - Predicting the content of a reading passage; **Writing -** Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays**; Grammar -** Adverbs **–** Tenses – future time reference; **Vocabulary -** Single word substitutes - Use of abbreviations & acronyms**; E-materials -** Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.

UNIT V

Listening - Listening to different accents, Listening to Speeches / Presentations, Listening to broadcast & telecast from Radio & TV**; Speaking -** Giving impromptu talks, Making presentations on given topics**; Reading -** Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email **Writing -** Creative writing, Poster making**; Grammar -** Direct and indirect speech**; Vocabulary -** Lexical items (fixed / semi fixed expressions); **E-materials -** Interactive exercises for Grammar & Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents, - Interpreting posters

TOTAL : 60 PERIODS

OUTCOMES:

Learners should be able to:

- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.
- Listen/view and comprehend different spoken discourses/excerpts in different accents.

TEXT BOOKS:

1. Mindscapes: English for Technologists and Engineers, Orient Black Swan, 2012.
2. S.P. Dhanavel, English and Communication Skills for students of Science and Engineering. Oriented Black Swan, Chennai, 2011

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REFERENCE BOOKS:

1. Pickett, Nell Ann, Ann A.Laster and Katherine E.Staples. **Technical English: Writing, Reading and Speaking.** New York: Longman, 2001.
2. Bailey, Stephen. **Academic Writing: A practical guide for students.** New York: Rutledge, 2011.
3. Morgan, David and Nicholas Regan**. Take-Off: Technical English for Engineering.** Reading: Garnet Publishing Limited, 2008.
4. Thorn, Michael and Alan Badrick. **An Introduction to Technical English.** Harlow**:** Prentice Hall Europe, 1993.
5. Rizvi, M.Ashraf. **Effective Technical Communication.** New Delhi: Tata McGraw-Hill Publishing Company, 2007.

EXTENSIVE READERS:

1. Murthy, Sudha. **Wise & Otherwise**. New Delhi: Penguin Books India, 2006.
2. Gates, Bill and Collins Hemingway. **Business @ the Speed of Thought: Succeeding in the Digital Economy.** New York: Warner Business Books, 2000.

WEBSITE RESOURCES:

- www.uefap.com
- www.eslcafe.com
- www.listen-to-english.com
- www.owl.english.purdue.edu
- www.chompchomp.com

MA8151 MATHEMATICS – I L T P C

(Common to all branches of B.E. / B.Tech. Programmes in I Semester) 3 1 0 4

OBJECTIVES:

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To make the student knowledgeable in the area of infinite series and their convergence so that he/ she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I MATRICES 9+3

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II INFINITE SERIES 9+3

Sequences – Convergence of series – General properties – Series of positive terms – Tests of convergence (Comparison test, Integral test, Comparison of ratios and D'Alembert's ratio test) – Alternating series – Series of positive and negative terms – Absolute and conditional convergence – Power Series – Convergence of exponential, logarithmic and Binomial Series.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9+3

Limits and Continuity – Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables –Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Errors and approximations – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV IMPROPER INTEGRALS 9+3

Improper integrals of the first and second kind and their convergence – Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions – Properties – Evaluation of integrals using Beta and Gamma functions – Error functions.

UNIT V MULTIPLE INTEGRALS 9+3

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of variables in double and triple integrals – Area of a curved surface.

TOTAL : 60 PERIODS

OUTCOMES:

- This course equips students to have basic knowledge and understanding in one fields of materials, integral and differential calculus.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2010.

REFERENCES:

1. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
2. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
3. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education, New Delhi, 2nd Edition, 5th Reprint, 2009.
4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

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PH8151 **ENGINEERING PHYSICS** **L T P C**
(Common to ALL Branches of B.E./B.Tech. Programmes) **3 0 0 3**

OBJECTIVES:

To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I PROPERTIES OF MATTER **9**

Elasticity - Poisson's ratio and relationship between moduli (qualitative) - Stress-strain diagram - factors affecting elasticity - bending of beams - cantilever - bending moment - theory and experiment of Young's modulus determination - Uniform and non-uniform bending - I shaped girders - twisting couple - hollow cylinder - shaft - torsion pendulum - determination of rigidity modulus- moment of inertia of a body (regular and irregular).

UNIT II ACOUSTICS AND ULTRASONICS **9**

Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - rate of growth and decay of sound intensity - derivation of Sabine's formula - absorption coefficient and its determination - factors affecting acoustics of buildings : focussing, interference, echo, Echelon effect, resonance - noise and their remedies. Ultrasonics - production - magnetostriction and piezoelectric methods - detection of ultrasound - acoustic grating - industrial applications - NDT - Ultrasonic method: scan modes and practice.

UNIT III THERMAL PHYSICS **9**

Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity - conductions in solids - Forbe's and Lees' disc methods - Rectilinear flow of heat through a rod - flow of heat through a compound materials - radical flow of heat through a spherical shell - thermal insulation of buildings – Laws of blackbody radiation: Kirchoffs law, Stephens law, Wiens law, Raleigh-Jean law and Planks law (derivation). Laws of thermodynamics - Otto and diesel engines and their efficiency - entropy - entropy of Carnot's cycle - reverse Carnot's cycle - refrigerator.

UNIT IV APPLIED OPTICS **9**

Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its application - Lasers - Einstein's coefficients - CO_2, Nd:YAG and semiconductor lasers - homo junction and hetro junction - construction and working - applications - Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.

UNIT V SOLID STATE PHYSICS **9**

Nature of bonding - growth of single crystals (qualitative) - crystal systems - crystal planes and directions - expressions for interplanar distance - coordination number and packing factor for simple structures: SC, BCC, FCC and HCP - structure and significance of NaCl, ZnS, diamond and graphite - crystal imperfections: point defects, dislocations and stacking faults - unit cell, Bravais space lattices - miller indices.

TOTAL : 45 PERIODS

OUTCOMES:

The students will have knowledge on the basics of physics related to properties of matter, Optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications

TEXT BOOKS:

1. Gaur R.K., and Gupta, S.L., Engineering Physics, Dhanpat Raj Publications, 2003
2. Palanisamy, P.K., Engineering Physics, Scitech Publications (P) Ltd, 2006.
3. Arumugam, M., Engineering Physics, Anuradha Publications, 2000.

REFERENCES:

1. Sankar, B.N., Pillai.S.O., Engineering Physics, New Age International (P) Ltd., 2007.
2. Rajendran.V Engineering Physics, Tata McGraw-Hill, 2009.

CY8151	ENGINEERING CHEMISTRY	L	T	P	C
	(Common to all branches of Engineering and Technology)	**3**	**0**	**0**	**3**

OBJECTIVES:

- To make the students acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines.
- To make the students conversant with basics of polymer chemistry.
- To make the students understand the concepts of **Kinetics and Catalysis**
- To acquaint the student with concepts of important photophysical and photochemical processes and spectroscopy.
- To acquaint the students with the basics of nano materials, their properties and applications.

UNIT I CHEMICAL THERMODYNAMICS **9**

Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius- Clapeyron equation; Maxwell relations – Van't Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation – variation of chemical potential with temperature and pressure.

UNIT II POLYMER CHEMISTRY 9

Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.

UNIT III KINETICS AND CATALYSIS 9

Introduction – reaction velocity, factors affecting reaction velocity, rate constant, order of reaction, molecularity, pseudo molecular reactions, zero, first, second and third order reactions, reactions of fractional orders, determination of order of reactions. Catalysis: Auto catalysis - Enzyme Catalysis: Michaelis-Menton equation; factors affecting enzyme catalysis. Heterogeneous Catalysis: Types of adsorption isotherms: Langmuir–Hinselwood and Rideal– Eley Mechanism.

UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Photoprocesses - Internal Conversion, Inter-system crossing,Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitisation. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. Width and intensities of spectral lines. Spectrophotometric estimation of iron. UV- visible and IR spectroscopy – principles, instrumentation (Block diagram) and applications.

UNIT V NANOCHEMISTRY 9

Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties.Nanoparticles:Nanocluster,nanorod,nanotubeandnanowire. Synthesis:Precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and Applications. Risk discussion and Future perspectives.

OUTCOMES:

- The knowledge gained on polymer chemistry, thermodynamics. spectroscopy, **Kinetics and Catalysis** and nano materials will provide a strong platform to understand the concepts on these subjects for further learning.

TEXT BOOKS:

1. P. Kannan and A. Ravikrishnan, “Engineering Chemistry”, Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2009.
2. S. Vairam, P. Kalyani and Suba Ramesh, “Engineering Chemistry”, Wiley India, 2011

REFERENCE BOOKS:

1. P.W. Atkins and de Paula Julio, “Physical Chemistry”, Oxford University Press, 8th Ed., (Indian Student Edition) (2009).
2. K. K. Rohatgi-Mukherjee, “Fundamental of Photochemistry” New Age International (P) Ltd., New Delhi, 1986.

3. G.A. Ozin and A.C. Arsenault, “Nanochemistry: A Chemical Approach to Nanomaterials”, RSC Publishing, 2005.
4. V.R.Gowariker, N.V.Viswanathan and Jayadev Sreedhar, “Polymer Science”, New Age International P (Ltd.,), Chennai, 2006

GE8151 COMPUTING TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:
The students should be made to:

- Learn the organization of a digital computer.
- Be exposed to the number systems.
- Learn to think logically and write pseudo code or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I INTRODUCTION 8

Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.

UNIT II C PROGRAMMING BASICS 10

Problem formulation – Problem Solving - Introduction to ‘ C’ programming –fundamentals – structure of a ‘C’ program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in ‘C’ – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

UNIT IV FUNCTIONS AND POINTERS 9

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems.

UNIT V STRUCTURES AND UNIONS 9

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL :45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Design C Programs for problems.
- Write and execute C programs for simple applications

TEXTBOOKS:

1. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009
2. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
3. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.

REFERENCES:

1. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2006
2. Byron S Gottfried, "Programming with C", Schaum's Outlines, Second Edition, Tata Mc Graw - Hill, 2006.
3. R.G. Dromey, "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007

GE8152 ENGINEERING GRAPHICS L T P C

2 0 3 4

OBJECTIVES:

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

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) 1

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

UNIT I PLANE CURVES AND FREE HAND SKETCHING 14

Basic Geometrical constructions, Curves used in engineering practices

Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves, **Scales:** Construction of Diagonal and Vernier scales.

Visualization concepts and Free Hand sketching

Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 14

Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces

Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 14

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 14

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 15

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) 3

Introduction to drafting packages and demonstration of their use.

TOTAL: 75 PERIODS

OUTCOMES:

On Completion of the course the student will be able to:

- Perform free hand sketching of basic geometrical constructions and multiple views of objects.
- Do orthographic projection of lines and plane surfaces.
- Draw projections and solids and development of surfaces.
- Prepare isometric and perspective sections of simple solids.
- Demonstrate computer aided drafting

TEXT BOOK:

1. N.D.Bhatt and V.M.Panchal, “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010

REFERENCES:

1. K. R. Gopalakrishna., “Engineering Drawing” (Vol I&II combined) Subhas Stores, Bangalore, 2007
2. Luzzader, Warren.J., and Duff,John M.,,’’ Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production”, Eastern Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005
3. M.B.Shah and B.C.Rana, “Engineering Drawing”, Pearson, 2nd Edition, 2009
4. K.Venugopal and V. Prabhu Raja, “Engineering Graphics”, New Age International (P) Limited ,2008.

5. K. V.Natrajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
6. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

PUBLICATION OF BUREAU OF INDIAN STANDARDS:

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

SPECIAL POINTS APPLICABLE TO UNIVERSITY EXAMINATIONS ON ENGINEERING GRAPHICS:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

PH8161 PHYSICS LABORATORY L T P C

(common to all branches of B.E./B.Tech. Programmes) 0 0 2 1

OBJECTIVES:

To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

1. Torsional pendulum – Determination of rigidity modulus of wire and moment of inertia of disc
2. Non – uniform bending – Determination of young’s modulus
3. Lee’s disc – Determination of thermal conductivity of a bad conductor
4. Potentiometer – Determination of thermo e.m.f. of thermocouple
5. Air wedge – Determination of thickness of a thin sheet of paper
6. i. Optical fibre – Determination of Numerical Aperture and acceptance angle
   ii. Compact disc – Determination of width of the groove using laser
7. Acoustic grating – Determination of velocity of ultrasonic waves in liquids
8. Post office box – Determination of Band gap of a semiconductor
9. Spectrometer – Determination of wavelength using grating
10. Viscosity of liquids – Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow

TOTAL : 30 PERIODS

OUTCOMES:

The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials

CY8161	CHEMISTRY LABORATORY	L	T	P	C
	(Common to all branches of Engineering and Technology)	0	0	2	1

OBJECTIVES:

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by vacometry.

1. Estimation of HCl using Na COas primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1,10- phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of poly vinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics – ester hydrolysis.
13. Corrosion experiment – weight loss method.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 30 PERIODS

OUTCOMES:

The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters

REFERENCE BOOKS:

1. A text of quantitative inorganic analysis, A. L. Vogel , ELBS London. 1995.
2. Experiments in physical chemistry, D.P. Shoemarker and C.W. Gardad, McGraw Hill, London, 2001.
3. American Public Health Association.

GE8161 COMPUTER PRACTICES LABORATORY L T P C
0 0 3 2

OBJECTIVES:
The student should be made to:
- Be familiar with the use of Office software.
- Be exposed to presentation and visualization tools.
- Be exposed to problem solving techniques and flow charts.
- Be familiar with programming in C.
- Learn to use Arrays, strings, functions, structures and unions.

LIST OF EXPERIMENTS:
1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function and conversion from given program to flow chart.
10. Program using structures and unions.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Apply good programming design methods for program development.
- Design and implement C programs for simple applications.
- Develop recursive programs.

GE 8162 ENGINEERING PRACTIES LABORATORY L T P C

(Common to all Branches of B.E. / B.Tech. Programmes) 0 0 3 2

OBJECTIVES:

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

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICE **12**

PLUMBING

- Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.
- Laying pipe connection to the suction side of a pump – inlet.
- Laying pipe connection to the delivery side of a pump – out let.
- Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK

- Sawing, planning and making common joints: T-Joint, Mortise and Tennon joint, Dovetail joint.

STUDY

- Study of joints in door panels, wooden furniture
- Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICE

- Basic household wiring using switches, fuse, indicator – lamp etc., Preparation of wiring diagrams **9**
- Stair case light wiring
- Tube – light wiring
- Study of iron-box, fan with regulator, emergency lamp

GROUP – B (MECHANICAL AND ELECTRONICS) **15**

3. MECHANICAL ENGINEERING PRACTICE

WELDING

- Arc welding of butt joints, lap joints, tee joints
- Gas welding Practice.
- Basic Machining
- Simple turning, drilling and tapping operations.
- Machine assembly Practice.
- Study and assembling the following:
- Centrifugal pump, mixies and air conditioners.
- Demonstration on
  (a) Smithy operations like the production of hexagonal bolt.
  (b) Foundry operation like mould preparation for grooved pulley.

4. ELECTRONIC ENGINEERING PRACTICE **9**

- Soldering simple electronic circuits and checking continuity.
- Assembling electronic components on a small PCB and testing.
- Study of Telephone, FM radio, low-voltage power supplies.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to fabricate carpentry components and pipe connections including plumbing works.
- Ability to use welding equipments to join the structures.
- Ability to fabricate electrical and electronics circuits.

HS8251 TECHNICAL ENGLISH II L T P C

(For all branches of B.E / B.Tech programmes) 3 1 0 4

OBJECTIVES

- To make the students acquire listening and speaking skills meant for both formal and informal contexts
- To help them develop their reading skills by exposing them to different types of reading strategies
- To equip them with writing skills needed for academic as well as workplace situations
- To make them acquire language skills at their own pace by using e-materials and language lab component

UNIT I

Listening - Listening to informal conversations and participating**; Speaking -** Opening a conversation (greetings, comments on something, weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); **Reading -** Developing analytical skills, Deductive and inductive reasoning - Extensive reading**; Writing -** Effective use of SMS for sending short notes and messages - Using 'emoticons' as symbols in email messages; **Grammar -** Regular & irregular verbs - Active and passive voice**; Vocabulary -** Homonyms (e.g. 'can') - Homophones (e.g. 'some', 'sum'); **E-materials -** Interactive exercise on Grammar and vocabulary – blogging; **Language Lab -** Listening to different types of conversation and answering questions.

UNIT II

Listening - Listening to situation based dialogues**; Speaking -** Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); **Reading -** Reading a short story or an article from newspaper, Critical reading, Comprehension skills**; Writing -** Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his success, thanking one's friend / relatives); **Grammar -** modal verbs, Purpose expressions**; Vocabulary -** Phrasal verbs and their meanings, Using phrasal verbs in sentences**; E-materials -** Interactive exercise on Grammar and vocabulary, Extensive reading activity (reading stories / novels from links), Posting reviews in blogs - **Language Lab -** Dialogues (Fill up exercises), Recording students' dialogues.

UNIT III

Listening - Listening to the conversation - Understanding the structure of conversations**; Speaking -** Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret etc.); **Reading -** Speed reading – reading passages with the time limit - Skimming**; Writing -** Minutes of meeting – format and practice in the preparation of minutes - Writing summary after reading the articles from the journals - Format for the journal articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) - Writing strategies; **Grammar -** Conditional clauses - Cause and effect expressions; **Vocabulary -** Words used as nouns and verbs without any change in the spelling (e.g. 'rock', 'train', 'ring'); **E-materials -** Interactive exercise on Grammar & vocabulary - Speed Reading practice exercises; **Language Lab -** Intonation practice using EFLU materials – Attending a meeting and writing minutes.

UNIT IV

Listening - Listening to a telephone conversation, Viewing a model interview (face-to-face, telephonic and video conferencing) and observing the practices**; Speaking -** Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping the interview skills; **Reading -** Reading the job advertisements and the profile of the company concerned – scanning**; Writing -** Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate**; Grammar -** Numerical expressions - Connectives (discourse markers); **Vocabulary -** Idioms and their meanings – using idioms in sentences**; E-materials -** Interactive exercises on Grammar & Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; **Language Lab -** Telephonic interview – recording the responses - e-résumé writing.

UNIT V

Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener**; Speaking -** Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/ agreement – assertiveness in expressing opinions – mind mapping technique**; Reading -** Note making skills – making notes from books, or any form of written materials - Intensive reading **Writing -** Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); **Grammar -** Use of clauses**; Vocabulary –** Collocation**; E-materials -** Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises - Pictures for discussion; **Language Lab -** Different models of group discussion

TOTAL :60 PERIODS

OUTCOMES:

Learners should be able to

- Speak convincingly, express their opinions clearly, initiate a discussion, negotiate, argue using appropriate communicative strategies.
- Write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- Read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.

- Listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.

TEXT BOOKS:

1. Mindscapes: English for Technologists and Engineers, Department of English, Anna University, Chennai, 2012 .
2. S.P. Dhanavel, English and Communication Skills for students of Science and Engineering. Oriented Black Swan, Chennai, 2011

REFERENCES:

1. Laws, Anne. **Presentations.** Hyderabad: Orient BlackSwan, 2000.
2. Lewis, Hedwig. **Body Language: A Guide for Professionals.** New Delhi: Sage Publications, 1998.
3. Naterop, Jean B. and Rod Revell. **Telephoning in English.** Cambridge: Cambridge University Press, 1987.
4. Rutherford, Andrea J. **Basic Communication Skills for Technology**. New Delhi: Pearson Education, 2001.
5. Ur, Penny. **Teaching Listening Comprehension**. Cambridge: Cambridge University Press, 1984.

EXTENSIVE READERS:

1. Abdul Kalam, A P J. **Ignited Minds: Unleashing the Power within India.** New Delhi: Penguin Books India, 2002.
2. Parameswaran, Uma. **C.V.Raman: A Biography.** New Delhi: Penguin Books India, 2011.

WEB RESOURCES

- www.esl-lab.com
- www.englishgrammar.org
- www.englishclub.com
- www.mindtools.com
- www.esl.about.com

MA8251 MATHEMATICS II L T P C

(Common to all branches of B.E. / B.Tech. Programmes in II Semester) 3 1 0 4

OBJECTIVES:

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.

- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I DIFFERENTIAL EQUATIONS 9+3

Method of variation of parameters – Method of undetermined coefficients –Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

UNIT II VECTOR CALCULUS 9+3

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral and volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION 9+3

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w= z+ c$, az, $1/z$, z^2- Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 9+3

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis

UNIT V LAPLACE TRANSFORMS 9+3

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems –Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem —– Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL : 60 PERIODS

OUTCOMES:

The subject helps the students to develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana, B.V. "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 2010

REFERENCES:

1. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2007.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa

Publications, Delhi, 3rd Edition, 2007.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
4. Peter V.O'Neil, Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd, New Delhi, 2007.

BM8201 ANATOMY AND PHYSIOLOGY L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Know basic structural and functional elements of human body.
- Learn organs and structures involving in system formation and functions.
- Understand all systems in the human body.

UNIT I BASIC ELEMENTS OF HUMAN BODY 8
Cell: Structure and organelles - Functions of each component in the cell. Cell membrane – transport across membrane – origin of cell membrane potential – Action potential. **Tissue**: Types – Specialized tissues – functions.

UNIT II SKELETAL AND RESPIRATORY SYSTEM 9
Skeletal system: Bone types and functions – Joint - Types of Joint - Cartilage and functions. Respiratory System: Components of respiratory system – Respiratory Mechanism. Types of respiration - Oxygen and carbon dioxide transport and acid base regulation.

UNIT III CIRCULATORY SYSTEM 10
Blood composition - functions of blood – functions of RBC. WBC types and their functions. Blood groups – importance of blood groups – identification of blood groups. Blood vessels - Structure of heart – Properties of Cardiac muscle – Conducting system of heart - Cardiac cycle – ECG - Heart sound - Volume and pressure changes and regulation of heart rate – Coronary Circulation. Factors regulating Blood flow.

UNIT IV URINARY AND SPECIAL SENSORY SYSTEM 9
Urinary system: Structure of Kidney and Nephron. Mechanism of Urine formation and acid base regulation – Urinary reflex – Homeostasis and blood pressure regulation by urinary system. Special senses: Eye and Ear.

UNIT V NERVOUS SYSTEM 9
Structure of a Neuron – Types of Neuron. Synapses and types. Conduction of action potential in neuron. Brain – Divisions of brain lobes - Cortical localizations and functions - EEG. Spinal cord – Tracts of spinal cord - Reflex mechanism – Types of reflex. Autonomic nervous system and its functions.

TOTAL: 45 PERIODS

OUTCOMES:

The student will have knowledge to:

- Describe basic structural and functional elements of human body.
- Explain organs and structures involving in system formation and functions.
- Identify all systems in the human body.

TEXT BOOKS:

1. Elaine.N. Marieb , " Essential of human Anatomy and Physiology", Eight edition, Pearson Education New Delhi ,2007.
2. Gillian Pocock, Christopher D. Richards, The human Body – An introduction for Biomedical and Health Sciences, Oxford University Press, USA, 2009

REFERENCE BOOKS:

1. Review of Medical Physiology, 22nd edition,William F.Ganong Mc Graw Hill New Delhi,
2. Introduction to Human Anatomy and Physiology, Eldra Pearl Solomon. W.B. Saunders Company, Harcourt Brace Jovanovich, inc.
3. Text book of Medical Physiology, Guyton & Hall. 11th Edition, Elsevier Saunders

BM8202 ELECTRON DEVICES AND CIRCUITS L T P C
3 1 0 4

OBJECTIVES:

The student should be made to:

- Be familiar with the structure of basic electronic devices.
- Be exposed to the operation and applications of electronic devices

UNIT I PN JUNCTION DEVICES 9+3

PN junction diode –structure, operation and V-I characteristics, diffusion and transient capacitance - Rectifiers – Half Wave and Full Wave Rectifier,– Display devices- LED, Laser diodes, Zener diode-characteristics-Zener Reverse characteristics – Zener as regulator

UNIT II TRANSISTORS 9+3

BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristor and IGBT -Structure and characteristics.

UNIT III AMPLIFIERS 9+3

BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER 9+3

BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis

– FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis).

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS 9+3

Advantages of negative feedback – voltage / current, series , Shunt feedback –positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

L :45 T: 15 TOTAL: 60 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to:

- Explain the structure of basic electronic devices.
- Design applications using basic *electronic devices

TEXT BOOKS:

1. David A. Bell ,"Electronic devices and circuits", Prentice Hall of India, 2004.
2. Sedra and smith, "Microelectronic circuits "Oxford University Press, 2004.

REFERENCES:

1. Rashid, "Micro electronic circuits" Thomson publications, 1999.
2. Floyd, "Electron devices" Pearson Asia 5th Edition, 2001.
3. Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGrawHill, 3rd Edition, 2003.
4. Robert L.Boylestad, "Electronic devices and circuit theory", 2002.
5. Robert B. Northrop, "Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation", CRC Press, 2004.

BM8203 MEDICAL PHYSICS L T P C

3 0 0 3

OBJECTIVES:

- To Study effects of sound and light in human body
- To study effects of radiation in matter and how isotopes are produced

UNIT I NON IONIZING RADIATION AND ITS MEDICAL APPLICATION 9

Non-ionizing Electromagnetic Radiation: Overview of non-ionizing radiation effects-Low Frequency Effects- Higher frequency effects. Physics of light, Measurement of light and its unit- limits of vision and color vision an overview, Thermography– Application

UNIT II SOUND IN MEDICINE 9

Physics of sound, Normal sound levels –ultrasound fundamentals – Generation of ultrasound (Ultrasound Transducer) - Interaction of Ultrasound with matter; Cavitations, Reflection, Transmission-Scanning systems – Artefacts- Ultrasound- Doppler-Double Doppler shift-Clinical Applications

UNIT III PRINCIPLES OF RADIOACTIVE NUCLIDES 9

Radioactive Decay – Spontaneous Emission – Isometric Transition – Gamma ray emission, alpha, beta, Positron decay, electron capture,Sources of Radioisotopes Natural and Artificial radioactivity, Radionuclide used in Medicine and Technology ,Decay series,Production of radionuclides – Cyclotron produced Radionuclide- Reactor produced Radio- nuclide-fission and electron Capture reaction, radionuclide Generator-Milking process (Technetium generator)

UNIT IV INTERACTION OF RADIATION WITH MATTER 9

Interaction of charged particles with matter –Specific ionization, Linear energy transfer range, Bremsstrahlung, Annihilation,Interaction of X and Gamma radiation with matter- Photoelectric effect, Compton Scattering , Pair production, Attenuation of Gamma Radiation ,Interaction of neutron with matter and their clinical significance.

UNIT V BASIC RADIATION QUANTITIES 9

Introduction -exposure- Inverse square law-KERMA-Kerma and absorbed dose -stopping power - relationship between the dosimetric quantities - Bremsstrahlung radiation, Bragg's curve- concept of LD 50- Stochastic and Non-stochastic effects, Different radiation Unit, Roentgen, gray, Sievert.

TOTAL: 45 PERIODS.

OUTCOMES:

At the end of the course, the student should be able to:

- Analyze mechanics involved with various physiological systems.
- Perform derivation of mathematical models related to blood vessels

TEXT BOOKS:

1. John R Cameran, James G Skofronick "Medical Physics" John-Wiley & Sons.1978
2. W.J.Meredith and J.B. Massey " Fundamental Physics of Radiology" Varghese Publishing house.1992

REFERENCES:

1. P. Uma Devi, A. Nagarathnam , B S SatishRao , "Intorduction to Radiation Biology" B.I Chur Chill Livingstone pvt Ltd, 2000
2. S.Webb "The Physics of Medical Imaging", Taylor and Francis,1988
3. J.P.Woodcock,Ultrasonic,Medical Physics Handbook series 1,Adam Hilger,Bristol,2002
4. Hylton B.Meire and Pat Farrant "Basic Ultrasound" John Wiley& Sons, 1995

EC8251 CIRCUIT THEORY L T P C

3 1 0 4

OBJECTIVES:

- To introduce the basic concepts of DC and AC circuits behavior
- To study the transient and steady state response of the circuits subjected to step and sinusoidal excitations.
- To introduce different methods of circuit analysis using Network theorems, duality and topology.

- To introduce the phenomenon of resonance in coupled circuits.

UNIT I DC CIRCUIT ANALYSIS 9

Basic Components and electric Circuits, Charge, current, Voltage and Power, Voltage and Current Sources, Ohms Laws, Voltage and Current laws, Kirchoff's Current Law, Kirchoff's voltage law, The single Node – Pair Circuit, series and Parallel Connected Independent Sources, Resistors in Series and Parallel, voltage and current division, Basic Nodal and Mesh analysis, Nodal analysis, Mesh analysis.

UNIT II NETWORK THEOREM AND DUALITY 8

Useful Circuit Analysis techniques, Linearity and superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Delta-Wye Conversion. Duals, Dual circuits.

UNIT III SINUSOIDAL STEADY STATE ANALYSIS 10

Sinusoidal Steady – State analysis , Characteristics of Sinusoids, The Complex Forcing Function, The Phasor, Phasor relationship for R, L, and C, impedance and Admittance, Nodal and Mesh Analysis, Phasor Diagrams, AC Circuit Power Analysis, Instantaneous Power, Average Power, apparent Power and Power Factor, Complex Power.

UNIT IV TRANSIENTSAND RESONANCE IN RLC CIRCUITS 9

Basic RL and RC Circuits, The Source- Free RL Circuit, The Source-Free RC Circuit, The Unit-Step Function, Driven RL Circuits, Driven RC Circuits, RLC Circuits, Frequency Response, Parallel Resonance, Series Resonance, Quality Factor.

UNIT V COUPLED CIRCUITS AND TOPOLOGY 9

Magnetically Coupled Circuits, mutual Inductance, the Linear Transformer, the Ideal Transformer, An introduction to Network Topology, Trees and General Nodal analysis, Links and Loop analysis.

TOTAL : L:45, T:15 : 60 PERIODS

OUTCOMES:

- Ability to analyze electrical circuits
- Ability to apply circuit theorems
- Ability to analyze AC and DC Circuits

TEXT BOOKS:

1. William Hayt, Jr.Jack E. Kemmerly, Steven M.Durbin, "Engineering Circuit Analysis", Sixth Edition, Tata McGraw-Hill Edition, 2006.
2. David A Bell, "Electric Circuits", PHI,2006

REFERENCES:

1. Charles K. Alexander & Mathew N.O.Sadiku, Fundamentals of Electric Circuits", Second Edition, McGraw- Hill 2003.
2. Sudhakar. A and Shyammohan S. Palli, Tata Mc Graw –Hill, Third Edition, 2007.
3. D.R.Cunningham, J.A.Stuller, "Basic Circuit Analysis", Jaico Publishing House, 1996.
4. David E.Johnson, Johny R. Johnson, John L.Hilburn, "Electric Circuit Analysis", Second Edition, Prentice-Hall international Editions, 1997
5. K.V.V.Murthy, M.S.Kamath, "Basic Circuit Analysis", Jaico Publishing House, 1999

Attested

DIRECTOR
Centre For Academic Courses
Anna University, Chennai-600 025.

6. Norman Balabanian, “Electric Circuits”, International Edition,1994.

BM8211 CIRCUIT ANALYSIS LABORATORY L T P C
0 0 3 2

OBJECTIVES:
The student should be made to:

- Be familiar with Thevinin & Norton theorem KVL & KCL, and Super Position Theorems
- Be exposed to series and parallel resonance circuits.

LIST OF EXPERIMENTS:

1. Verification of ohm’s law.
2. Verification of kirchoff’s laws.
3. Verification of thevenin’s theorem.
4. Verification of reciprocity theorem.
5. Verification of superposition theorem.
6. Verification of maximum power transfer theorem.
7. Frequency Response of series resonance circuit.
8. Frequency Response of parallel resonance circuit.
9. Transient analysis of RL and RC circuits.
10. Frequency Response of single tuned coupled circuits.

TOTAL:45 PERIODS

LABORATORY REQUIREMENTS

Resistors, Capacitors, Inductors	– sufficient quantities
Bread Boards	– 15 Nos
CRO (30MHz)	– 10 Nos.
Function Generators (3MHz)	– 10 Nos.
Dual Regulated Power Supplies (0 – 30V)	– 10 Nos.
Ammeter	– 10 Nos.
Voltmeters	– 10 Nos.

OUTCOMES:
At the end of the course, the student should be able to:

- Design RL and RC circuits
- Verify Thevinin & Norton theorem KVL & KCL, and Super Position Theorems
- Learn the characteristics of series and parallel resonance circuits.

BM8212 ELECTRON DEVICES AND CIRCUITS LABORATORY L T P C
0 0 3 2

OBJECTIVES:

The student should be made to:

- Be exposed to the characteristics of basic electronic devices
- Be exposed to the characteristics of Amplifiers.

LIST OF EXPERIMENTS:

1. PN Junction Diode Characteristics
2. Zener Diode Characteristics
3. Half Wave and Full Wave Rectifier
4. Zener Regulator
5. CE Transistor Characteristics
6. UJT Characteristics
7. FET Characteristics
8. Characteristics of Thyristor.
9. Frequency Response of CE Amplifier
10. Design and Analysis of Feedback Amplifiers
11. Design and Analysis of Differential Amplifier
12. Design of RC Oscillators
13. Design of LC Oscillators

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Learn the characteristics of basic electronic devices
- Learn the characteristics of Amplifiers.

LABORATORY REQUIREMENTS

BC 107, BC 148,2N2646,BFW10	–	25 each
1N4007, Zener diodes	–	25 each
Resistors, Capacitors, Inductors	–	sufficient quantities
Bread Boards	–	15 Nos
CRO (30MHz)	–	10 Nos.
Function Generators (3MHz)	–	10 Nos.
Dual Regulated Power Supplies (0 – 30V)	–	10 Nos.

MA8357 TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATION L T P C
3 1 0 4

OBJECTIVES:

• To introduce the effective mathematical tools for the solutions of partial differential

equations that model physical processes;

- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems;
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic;
- To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange's Linear equation – Integral surface passing through a given curve – Classification of Partial Differential Equations – Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous PDE.

UNIT II FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier series – Parseval's identity – Harmonic Analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION 9+3

Method of separation of Variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

UNIT IV FOURIER TRANSFORM 9+3

Fourier integral theorem – Fourier transform pair-Sine and Cosine transforms –Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS 9+3

Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and Final value theorems – Formation of difference equation – Solution of difference equation using Z-transform.

TOTAL : 60 PERIODS

OUTCOMES:

- The understanding of the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

TEXT BOOK:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2007.

REFERENCES:

1. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2007.

2. Ramana, B.V. “Higher Engineering Mathematics”, Tata McGraw Hill, New Delhi, 11th Reprint , 2010.
3. Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
4. Peter V.O’Neil, Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd, New Delhi, 2007.

GE8351 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

To the study of nature and the facts about environment.

- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth’s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

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

Field study of common plants, insects, birds

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

UNIT II ENVIRONMENTAL POLLUTION 8

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

floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

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

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

UNIT-IV SOCIAL ISSUES AND THE ENVIRONMENT 7

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

UNIT-V HUMAN POPULATION AND THE ENVIRONMENT 6

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.

TOTAL : 45 PERIODS

OUTCOMES:

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environment at infant stage.

- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in standard of living has lead to serious environmental disasters.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005)

BM8301 FUNDAMENTALS OF BIOCHEMISTRY L T P C
3 0 0 3

OBJECTIVES:

- To get a clear idea of biomolecules and their functions.
- To know the significance of biomolecules in biological systems.
- To understand the metabolic pathways in normal and pathological conditions.
- To broaden students perspectives in Biochemistry.

UNIT I INTRODUCTION TO BIOCHEMISTRY 9

Introduction to Biochemistry, water as a biological solvent, weak acid and bases, pH, buffers, Handerson-Hasselbalch equation, physiological buffers, fitness of the aqueous environment for living organism . Principle of viscosity, surface tension, adsorption, diffusion, osmosis and their applications in biological systems.

UNIT II CARBOHYDRATES 9

Classification of carbohydrates f- mono, di, oligo and polysaccharides. Isomerism, racemisation and mutarotation .Structure, physical and chemical properties of carbohydrates. Metabolic pathways and bioenergetics – Glycolysis, glycogenesis, glycogenolysis and its hormonal regulation. TCA cycle and electron transport chain.Oxidative phosphorylation

UNIT III LIPIDS 9

Classification of lipids- simple, compound and derived lipids. Nomenclature of fatty acid, physical and chemical properties of fat. Saponification number, Reichert- Meissl number and iodine number.Metabolic pathways: synthesis and degradation of fatty acid (beta oxidation),

hormonal regulation of fatty acid metabolism, ketogenesis, structural architecture and significance of biological membrane.

UNIT IV NUCLEIC ACID & PROTEIN 9

Structure of purines and pyrimidines, nucleoside , nucleotide , DNA act as a genetic material , chargoffs rule. Watson and crick model of DNA. Structure of RNA and its type. Classification, structure and properties of proteins, structural organization of proteins, classification and properties of aminoacids.Separation of protein: gel filtration, electrophoresis and ultracentrifugation.

UNIT V ENZYME AND ITS KINETICS 9

Classification of enzymes, apoenzyme, coenzyme, holoenzyme and cofactors. Kinetics of enzymes - Michaelis-Menten equation.Factors affecting enzymatic activity: temperature, pH, substrate concentration and enzyme concentration. Inhibitors of enzyme action: Competitive, non- competitive, irreversible. Enzyme: Mode of action, allosteric and covalent regulation.. Clinical significance of enzymes. Measurement of enzyme activity and interpretation of units.

TOTAL: 45 PERIODS

Outcomes:

At the end of the course the student is able to

- Know about biomolecules such as Carbohydrates, Lipids, Nucleic Acid & Protein and its functions
- Understand the significance of biomolecules in biological systems

TEXT BOOKS:

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

REFERENCES:

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

BM8302 SENSORS AND MEASUREMENTS L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the purpose of measurement, the methods of measurements, errors associated with measurements.

- Know the principle of transduction, classifications and the characteristics of different transducers and study its Biomedical applications.
- Know the different display and recording devices.

UNIT I SCIENCE OF MEASUREMENT **7**

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

UNIT II DISPLACEMENT, PRESSURE, TEMPERATURE SENSORS 11

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

UNIT III PHOTOELECTRIC AND PIEZO ELECTRIC SENSORS 9

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

UNIT IV SIGNAL CONDITIONING & SIGNAL ANALYSER 9

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

UNIT V DISPLAY AND RECORDING DEVICES 9

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

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to:

- Describe the purpose and methods of measurements
- Explain different display and recording devices for various applications.

TEXT BOOKS:

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

REFERRENCES:

1. A.K.Sawhney,"Electrical & Electronics Measurement and Instrumentation", 10th edition,Dhanpat Rai&Co,New Delhi,2000.
2. Ernest o Doebelin and dhanesh N manik, Measuremet systems, Application and design, 5th edition ,McGraw-Hill, 2007.
3. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.
4. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.
5. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004.

EC8353 **SIGNALS AND SYSTEMS** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the basic properties of signal & systems and the various methods of classification
- To learn Laplace Transform &Fourier transform and their properties
- To know Z transform & DTFT and their properties
- To characterize LTI systems in the Time domain and various Transform domains

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS **9**

Continuous time signals (CT signals)- Discrete time signals (DT signals) – Step, Ramp, Pulse, Impulse, Exponential - classification of CT and DT signals –periodic and aperiodic signals, random signals, Energy & Power signals - CT systems and DT systems, Classification of systems.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS **9**

Fourier series analysis- Spectrum of Continuous Time (CT) signals- Fourier and Laplace transforms in Signal Analysis.

UNIT III LINEAR TIME INVARIANT –CONTINUOUS TIME SYSTEMS **9**

Differential Equation-Block diagram representation-impulse response, Convolution integrals-Fourier and Laplace transforms in Analysis.

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS **9**

Baseband Sampling of CT signals- Aliasing, DTFT and properties, Z-transform & proper ties.

UNIT V LINEAR TIME INVARIANT –DISCRETE TIME SYSTEMS **9**

Difference Equations-Block diagram representation-Impulse response-Convolution sum-DTFT and Z Transform analysis of Recursive & Non-Recursive systems.

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of the course, students will be able to:

- Analyze the properties of signals & systems
- Apply Laplace transform, Fourier transform, Z transform and DTFT in signal analysis
- Analyze continuous time LTI systems using Fourier and Laplace Transforms
- Analyze discrete time LTI systems using Z transform and DTFT

TEXT BOOKS:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, Pearson,Indian Reprint, 2007.
2. P.Ramakrishna Rao, “Signals and Systems”, Tata Mc Graw Hill Publications, 2008.
3. B. P. Lathi, “Principles of Linear Systems and Signals”, Oxford, Second Edition, 2009.

REFERENCES:

1. H P Hsu, “ Signals and Systems”, Schaum’s Outlines, Tata McGraw Hill,2006
2. Edward W. Kamen, Bonnie S. Heck, “Fundamentals of Signals and Systems Using the Web and MATLAB”, Pearson, Indian Reprint, 2007
3. John Alan Stuller, “An Introduction to Signals and Systems”, Thomson, 2007
4. M.J.Roberts, “Signals & Systems, Analysis using Transform methods & MATLAB”, Tata McGraw Hill (India), 2007.

EE8306 BASICS OF ELECTRICAL ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

The student should be made to Understand:

- Magnetic circuits, principle and application of transformers
- Principle of operation of DC motors and AC Machines
- Principle of fractional-kW motors and their applications.

UNIT I INDUCTION THEORY 9

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

UNIT II TRANSFORMER 9

Introduction – Single phase transformer construction and principle of operation – EMF equation of transformer-Transformer no–load phasor diagram –– Transformer on–load phasor diagram –– Equivalent circuit of transformer – Regulation of transformer –Transformer losses and efficiency-All day efficiency –auto transformers.

UNIT III DC MACHINES 9

Construction of DC machines – theory of operation of DC generators – characteristics of DC generators-Applications. Operating principle of DC motors – types of DC motors and their characteristics – speed control of DC motors-Applications, Stepper motor and Applications.

UNIT IV INDUCTION MACHINES AND SYNCHRONOUS MACHINES 9

Principle of operation of three-phase induction motors – Construction –Types – Equivalent circuit –Construction of single-phase induction motors – Types of single phase induction motors – Double revolving field theory – starting methods

Principles of alternator – Construction details – Types – Equation of induced EMF – Voltage regulation. Methods of starting of synchronous motors – Torque equation – V curves – Synchronous motors.

UNIT V FRACTIONAL KILOWATT MOTORS 9

Single phase induction motor, principle of operation, torque-speed characteristics - Types of single phase motors- Split phase motors; Split Phase Resistance Start Induction motor, Split phase capacitor start induction motor, Permanent –split capacitor induction motor-Single phase Commutator Motors- Repulsion motor, Repulsion start Induction run motor - AC Series Motor

OUTCOMES:

At the end of the course, the student should be able to:

- Describe principles and applications of transformers.
- Explain the working of DC Motors, fractional kW motors, AC machines.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. D P Kothari and I J Nagrath, “Basic Electrical Engineering”, TMH, 2ed, 2002
2. P. C Sen, “Principles of Electric machines and power electronics”, John- Wiley & Sons, 2ed, 2001

REFERENCE:

1. R.K. Rajput, “Basic Electrical &Electronics Engineering”, Lakshmi Publishers Reprint 2008

BM8311 BIOCHEMISTRY AND HUMAN PHYSIOLOGY LABORATORY L T P C
0 0 3 2

OBJECTIVES:

To provide practice on:

- Estimation and quantification of biomolecules.
- Separation of macromolecules.

LIST OF EXPERIMENTS:

1. General tests for carbohydrates, proteins and lipids.
2. Preparation of serum and plasma from blood.
3. Estimation of blood glucose.
4. Estimation of creatinine
5. Estimation of urea

6. Estimation of cholesterol
7. Assay of SGOT/SGPT
8. Separation of proteins by SDS electrophoresis
9. Separation of amino acids by thin layer chromatography
10. Separation of DNA by agarose gel electrophoresis
11. ESR, PCV, MCH, MCV ,MCHC , total count of RBCs and hemoglobin estimation
12. Differential count of different WBCs and blood group identification.
13. Measurement of pH of solutions using pH meter.
14. Ishihara chart for color blindness and snellen"s chart for myopia and hyperopia - by letters reading and ophthalmoscope to view retina
15. Weber's and Rinne "s test for auditory conduction.

TOTAL: 45 PERIODS

LABORATORY REQUIREMENTS FOR 30 STUDENTS

Spectrophotometer	1 No
Colorimeter	2 Nos.
pH meter	1 No
Weighing balance	1 No
Refrigerator	1 No
Vortex Shaker	2 Nos.
SDS gel electrophoresis	1 No
TLC, ready TLC plates	1 No
Wintrobe's tube	2 Nos.
Centrifuge Normal	1 No
Centrifuge Cooling	1 No
Microslides	2 packets
Lancet	5 boxes
Microscope	1 No
Neubaur's Chamber	2 Nos.
Heparinized Syringe	1box
Haemoglobinometer	1 No
Capillary tubes	1box
Ophthalmoscope (direct & Indirect)	1 No
Tuning fork (256Hz to 512Hz)	5 Nos.
Blood grouping kit	1 No

OUTCOMES:

Upon completion of the course, students will be able to:

- Do estimation and interpret the changes in biomolecules.
- Separate and analyze the importance of macromolecules.

BM8312 SENSORS AND MEASUREMENTS LABORATORY L T P C

0 0 3 2

OBJECTIVES:

- To study the characteristics of sensors signal conditioning circuits and display devices

LIST OF EXPERIMENTS:

1. Characteristics of strain guages.
2. Displacement measurement using LVDT.
3. Characteristics of temperature sensors – thermistor and RTD.
4. Characteristics of thermocouple
5. Characteristics of Light sensors-LDR, PhotoDiode, Photo Transistor
6. Characteristics of Piezoelectric Transducer.
7. Wheatstone Bridge and Kelvin's Bridge for Measurement of Resistance.
8. Measurement of capacitance and inductance using bridge circuits.
9. Study of Medical Oscilloscope.
10. Study of Input / Output characteristics using X – Y oscilloscope.

TOTAL: 45 PERIODS

LABORATORY REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Strain guage Trainer Kit	1 No
Loads for measurement	1 set
LVDT trainer kit	1 No
LVDT sensor	1 No
Thermocouple trainer kit	1 No
Thermocouple	1 No
Thermistor Trainer kit	1 No
Thermistor	1 No
RTD Trainer Kit	1 No
RTD	1 No
Thermometer	3 No
Heater with water bath	3 No
LDR, Photo Diode, Photo Transistor trainer kit	1 No
Light Source with Variable power supply	1 No
Piezoelectric Trainer Kit	1 No
Piezoelectric transducer	1 No
Vibration excitor	1 No
Wheatstone Bridge	1 No
Kelvin's Bridge	1 No
Schering Bridge	1 No
Maxwell Bridge trainer Kit	1 No
Decade resistance Box	3 nos
Decade Inductance Box	3 Nos
Decade Capacitance Box	3 Nos
Medical oscilloscope	1 No
X-Y oscilloscope	1 No
X-Y Recorder	1 No
Voltmeter	10 Nos
Multi meter	10 Nos

Requlated power supply	10 Nos
CRO	10 Nos
Connecting wires	
Pathcards	

OUTCOMES:

- Students is able to design a measurement system for various applications.

MA8355 PROBABILITY AND RANDOM PROCESSES L T P C
3 1 0 4

OBJECTIVES:

- To provide the necessary basic concepts in probability and random processes and apply them in random signals, linear systems etc. in communications engineering.
- The students will have an exposure of various distributions.

UNIT I RANDOM VARIABLES 9+3

Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III RANDOM PROCESSES 9+3

Classification – Stationary process – Markov process - Poisson process – Random telegraph process.

UNIT IV CORRELATION AND SPECTRAL DENSITIES 9+3

Auto-correlation functions – Cross-correlation functions – Properties – Power spectral density – Cross-spectral density – Properties.

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 9+3

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

TOTAL: 60 PERIODS

OUTCOMES:

The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable. Able to analyze the response of random inputs to linear time invariant systems.

TEXT BOOKS:

1. Ibe, O.C. “Fundamentals of Applied Probability and Random Processes”, Elsevier, U.P., 1st Indian Reprint, 2007.
2. Peebles, P.Z., “Probability, Random Variables and Random Signal Principles”, Tata McGraw Hill, New Delhi, 4 th Edition, 2002.

REFERENCES:

1. Yates, R.D. and Goodman, D.J., “Probability and Stochastic Processes”, John Wiley and Sons, 2nd Edition, 2005.
2. Miller, S. L. and Childers, D. G., “Probability and Random Processes with Applications to Signal Processing and Communications”, Academic Press, 2004.
3. Hwei Hsu, “Schaum’s Outline of Theory and Problems of Probability, Random
4. Variables and Random Processes”, Tata McGraw Hill, New Delhi, 9th reprint,2010.

BM8401 BIOMEDICAL INSTRUMENTATION AND MEASUREMENTS L T P C
3 0 0 3

OBJECTIVES:

- The students will be exposed to electrical and non-electrical physiological measurements and bioamplifiers.

UNITI BIOPOTENTIAL ELECTRODES 9

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

UNIT II BIOPOTENTIAL MEASUREMENT 9

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

UNIT III BIOPOTENTIAL AMPLIFIER 8

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

UNIT IV BIOMECHANICAL MEASUREMENT 10

Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - auscultatory method, oscillometric method, direct methods: electronic manometer, Pressure amplifiers - systolic, diastolic, mean detector circuit. Blood flow and cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method, Electromagnetic and ultrasound blood flow measurement.

UNIT V BIOCHEMICAL MEASUREMENT 9

Biochemical sensors - pH, Po_2 and Pco_2, Ion selective Field Effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors - Blood gas analyzers,colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Perform electrical and non-electrical physiological measurements
- Explain the function of bio amplifiers.

TEXT BOOKS:

1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2004.
2. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2006

REFERENCES:

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

BM8402 PATHOLOGY AND MICROBIOLOGY L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Gain a knowledge on the structural and functional aspects of living organisms.
- Know the etiology and remedy in treating the pathological diseases.
- Empower the importance of public health.

UNIT I CELL DEGENERATION, REPAIR AND NEOPLASIA 9

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

UNIT II FLUID AND HEMODYNAMIC DERRANGEMENTS 9

Edema, normal hemostasis, thrombosis, disseminated intravascular coagulation, embolism, infarction, shock. Hematological disorders-Bleeding disorders, Leukaemias, Lymphomas.

UNIT III MICROSCOPES 9

Light microscope – bright field, dark field, phase contrast, fluorescence, Electron microscope (TEM& SEM). Preparation of samples for electron microscope. Staining methods – simple, gram staining and AFB staining.

UNIT IV MICROBIAL CULTURES 9

Morphological features and structural organization of bacteria, growth curve, identification of bacteria, culture media and its types , culture techniques and observation of culture.

UNIT V IMMUNOLOGY 9

Natural and artificial immunity, opsonization, phagocytosis, inflammation, Immune deficiency syndrome, antibodies and its types, antigen and antibody reactions, immunological techniques: immunodiffusion, immuno electrophoresis, RIA and ELISA, monoclonal antibodies. Disease caused by bacteria, fungi, protozoal, virus and helminthes.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Analyze structural and functional aspects of living organisms.
- Explain the function of microscope
- Discuss the importance of public health.
- Describe methods involved in treating the pathological diseases.

TEXT BOOKS:

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

REFERENCES:

1. Underwood JCE: General and Systematic Pathology Churchill Livingstone 3edn. 2000.
2. Microbiology by Ananthanarayanan & Panicker
3. Microbiology .Dubey RC and Maheswari DK.
4. A textbook of Microbiology. by S Chand 2007.
5. Prescott, Harley,Klein.Microbiology.Mc Graw Hill 5th ed. 2002.

EC8351 DIGITAL ELECTRONICS AND SYSTEM DESIGN L T P C

3 0 0 3

OBJECTIVES

- To introduce Boolean algebra and its applications in digital systems
- To introduce design of various combinational digital circuits using logic gates
- To bring out the analysis and design procedures for synchronous and asynchronous sequential circuits
- To introduce the electronic circuits involved in the making of logic gates
- To introduce semiconductor memories and related technology

UNIT I BASIC CONCEPTS AND COMBINATIONAL CIRCUITS 9

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1s and 2s complements, Codes – Binary, BCD, 84-2-1, 2421, Excess 3, Biquinary, Gray, Alphanumeric codes, Boolean theorems, Logic gates , Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map and Tabulation methods, Problem formulation and design of combinational circuits, Code-Converters

Attested

DIRECTOR
Centre For Academic Courses
Anna University, Chennai-600 025.

UNIT II MSI CIRCUITS 9

Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder, Carry Look Ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, Implementation of combinational logic using standard ICs, ROM, EPROM and EEPROM, PLA and PAL.

UNIT III SYNCRONOUS SEQUENTIAL CIRCUITS 9

Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FFs, Analysis and design of clocked sequential circuits Moore and Mealy Circuits and their design, state minimization, state assignment, circuit implementation, Counters, Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT IV ASYNHRONOUS SEQUENTIAL CIRCUITS 9

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Pulse mode sequential circuits, Design of Hazard free circuits

UNIT V LOGIC FAMILIES AND SEMICONDUCTOR MEMORIES 9

Logic families- TTL, MOS, CMOS, Comparison of Logic families, Basic memory cell, RAM, Memory decoding, Static and Dynamic memories.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course the students will be able to

- Use Boolean algebra and applied to digital systems.
- Design various combinational digital circuits using logic gates.
- Bring out the analysis and design procedures for synchronous and asynchronous sequential circuits.
- Understand electronic circuits involved in the design of logic gates.
- Understand the semiconductor memories and related technology.

TEXT BOOKS:

1. Morris Mano, " Digital logic ", Pearson, 2009
2. Charles H. Roth, Jr, "Fundamentals of Logic Design", Fourth edition, Jaico Books, 2002

REFERENCES:

1. William I. Fletcher, "An Engineering Approach to Digital Design", Prentice- Hall of India, 1980
2. Floyd T.L., "Digital Fundamentals", Charles E. Merril publishing company,1982
3. John. F. Wakerly, "Digital design principles and practices", Pearson Education, Fourth Edition, 2007.

EC8452 OPERATIONAL AMPLIFIERS AND ANALOG INTEGRATED CIRCUITS **L T P C 3 0 0 3**

OBJECTIVES:

- To study the circuit configuration of linear integrated circuits
- To introduce practical applications of linear integrated circuits
- To introduce the concept of analog multiplier and Phase Locked Loop with applications
- To study ADC and DAC
- To introduce special function ICs and its construction

UNIT I CIRCUIT CONFIGURATION FOR LINEAR ICS **9**

Current sources, Analysis of difference amplifiers with active loads, supply and temperature independent biasing, Band gap references, Monolithic IC operational amplifiers, specifications, frequency compensation, slew rate and methods of improving slew rate.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS **9**

Linear and Nonlinear Circuits using operational amplifiers and their analysis, Inverting and Non inverting Amplifiers, Differentiator, Integrator Voltage to Current converter, Instrumentation amplifier, Sine wave Oscillators, Low pass and band pass filters, comparator, Multivibrator and Schmitt trigger, Triangle wave generator, Precision rectifier, Log and Antilog amplifiers, Non-linear function generator.

UNIT III ANALOG MULTIPLIER AND PLL **9**

Analysis of four quadrant and variable Tran conductance multipliers, Voltage controlled Oscillator, Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators. Frequency synthesizers, Compander ICs

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTORS **9**

Analog switches, High speed sample and hold circuits and sample and hold IC's, Types of D/A converter Current driven DAC, Switches for DAC, A/D converter, Flash, Single slope, Dual slope, Successive approximation, DM and ADM, Voltage to Time and Voltage to frequency converters.

UNIT V SPECIAL FUNCTION ICS **9**

Timers, Voltage regulators - linear and switched mode types, Switched capacitor filter, Frequency to Voltage converters, Tuned amplifiers, Power amplifiers and Isolation Amplifiers, Video amplifiers, Fiber optics ICs and Opto couplers, Sources for Noises, Op Amp noise analysis and Low noise OP-Amps.

OUTCOMES:

At the end of the course the students will be able to

- Describe practical applications of linear integrated circuits.
- Apply the concept of analog multiplier and Phase Locked Loop with applications.
- Analyze Analog to Digital Converter and Digital to Analog Converter
- Identify special function ICs and its construction

TOTAL : 45 PERIODS

TEXT BOOK:

1. Sergio Franco, " Design with operational amplifiers and analog integrated circuits", McGraw Hill, 1997.

REFERENCES:

1. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits ", Wiley International, 1995.
2. Michael Jacob J., " Applications and Design with Analog Integrated Circuits " , Prentice Hall of Inida,1996.
3. Ramakant A. Gayakwad, " OP - AMP and Linear IC's ", Prentice Hall, 1994.
4. Botkar K.R., " Integrated Circuits ", Khanna Publishers, 1996.
5. Taub and Schilling, " Digital Integrated Electronics ", McGraw Hill, 1977.
6. Caughlier and Driscoll, " Operational amplifiers and Linear Integrated circuits ", Prentice Hall, 1989.
7. Millman J. and Halkias C.C., " Integrated Electronics ", McGraw Hill, 2001.

BM8411 BIO MEDICAL INSTRUMENTATION LABORATORY L T P C

0 0 3 2

OBJECTIVES:

- To provide hands on training on Measurement of physiological parameters, biochemical parameters measurement and biosignal analysis.

LIST OF EXPERIMENTS:

1. Design of low noise pre-amplifier for ECG.
2. Study of effect of offset potential in Bio potential recording.
3. Study of effect of contact impedance in Bio potential recording.
4. Measurement of pulse-rate using Photo transducer.
5. Measurement of respiration rate.
6. Measurement of blood flow velocity using ultrasound transducer.
7. Measurement of heart rate using F-V converter.
8. Measurement of blood pressure.
9. Analysis of bio signals using spectrum analyzer.
10. Study of characteristics of optical Isolation amplifiers.

TOTAL: 45 PERIODS.

LABORATORY REQUIREMENTS FOR A BATCH OF 30 STUDENTS

- Pulse rate measurement system using Photo transducer
- Respiration measurement system.
- Blood flow measurement system using ultrasound transducer
- Heart rate measurement system with F-V converter
- Blood pressure measurement system
- Isolation amplifier with optical isolation setup
- Spectrum Analyzer
- Function Generators
- DSOs
- Regulated Power supplies
- Bread boards
- IC 741

OUTCOMES:

Student is able to:

• Design the amplifier for Bio signal measurements

• Do recording and analysis of bio signals

BM8412 INTEGRATED CIRCUIT LABORATORY L T P C
0 0 3 2

OBJECTIVES:

The student should be made to:

- Design digital logic and circuits
- Learn the function of different ICs
- Understand the applications of operation amplifier.
- Learn the working of multivibrators
- Design circuits for generating waveforms using ICs.

LIST OF EXPERIMENTS:

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

Attested

TOTAL: 45 PERIODS

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OUTCOMES:

At the end of the course, the student should be able to:

- Design Circuits using logic gates
- Build Circuits for different application using opamp
- Differentiate between oscillator and wave form generator

LAB REQUIREMENTS

1.	Digital Trainer Kit (with 5 V, Variable and fixed frequency Clock, Bread Board, Four Seven Segment displays, LEDs for output display, Logic 1 and 0 Input switches)	- 15 Nos.
2 .	Logic ICs (7400, 7402, 7404, 7408, 7410, 7420, 7432, 7447, 7448, 7474, 7476, 7483, , 7485, 7486, 7490, 7495, 74151, 741 Common Anode and cathode 7-segment displays, LEDs)	- 50Nos each
3.	Resistors	- 50 nos
4.	capacitors	- 50 nos
5.	IC Power supply (5 V fixed)	- 15 Nos
6.	Bread Boards	- 15 Nos

BM8413 PATHOLOGY AND MICROBIOLOGY LABORATORY L T P C
0 0 3 2

OBJECTIVES:

The student should be made to:

- Use Compound microscope
- Practice on chemical examinations, Cryoprocessing, Histopathological examinations etc

LIST OF EXPERIMENTS:

1. Urine physical and chemical examination (protein, reducing substances, ketones, bilirubin and blood)
2. Study of parts of compound microscope
3. Histopathological slides of benign and malignant tumours.
4. Manual paraffin tissue processing and section cutting (demonstration)
5. Cryo processing of tissue and cryosectioning (demonstration)
6. Basic staining – Hematoxylin and eosin staining.
7. Special stains – cresyl fast Blue (CFV)- Trichrome – oil red O – PAS
8. Simple stain.

9. Gram stain.
10. AFB stain.
11. Slides of malarial parasites, micro filaria and leishmania donovani.
12. Haematology slides of anemia and leukemia. Study of bone marrow charts.
13. Bleeding time and clotting time.

TOTAL : 45 PERIODS.

LABORATORY REQUIREMENTS FOR 30 STUDENTS

Wax dispenser 1 No Slide
warming 1 No
Microtome 1 No
Microscope
Microphotographic unit- 1No
Slides
1box Coverslip
1box Distillation Unit
1 No Water bath normal
1 No Incubator
1 No Autoclave
1 No Oven
1 No

OUTCOMES:

- Student can perform practical experiments on tissue processing, cryoprocessing, staining processes etc.

BM8501 ANALOG AND DIGITAL COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:

- To study the various analog and digital modulation techniques
- To study the principles behind information theory and coding
- To study the various digital communication techniques

UNIT - I ANALOG MODULATION 9

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

UNIT - II PULSE MODULATION 9

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

UNIT - III DIGITAL MODULATION AND TRANSMISSION 9

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

UNIT - IV INFORMATION THEORY AND CODING 9

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

UNIT – V SPREAD SPECTRUM AND MULTIPLE ACCESS 9

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

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Apply analog and digital communication techniques.
- Use data and pulse communication techniques.
- Analyze Source and Error control coding.

TEXT BOOKS:

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

REFERENCES:

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

BM8502 CONTROL SYSTEMS FOR BIO MEDICAL ENGINEERING L T P C
3 1 0 4

OBJECTIVES:

- To study the concept and different mathematical techniques applied in analyzing any given system
- To learn the analysis of given system in time domain and frequency domain
- To study the stability analysis of the given system
- To study the concept of physiological control system

UNIT I CONTROL SYSTEM MODELING 9+3

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

UNIT II TIME RESPONSE ANALYSIS 9+3

Step and impulse responses of first order and second order systems, determination of time domain specifications of first and second order systems from its output responses, definition of steady state error constants and its computations.

UNIT III STABILITY ANALYSIS 9+3

Definition of stability, Routh- Hurwitz criteria of stability, root locus technique, construction of root locus and study of stability, definition of dominant poles and relative stability.

UNIT IV FREQUENCY RESPONSE ANALYSIS 9+3

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

UNIT V PHYSIOLOGICAL CONTROL SYSTEM 9+3

Example of physiological control system, difference between engineering and physiological control systems, generalized system properties, models with combination of system elements, linear models of physiological systems-Examples, introduction to simulation.

L : 45, T: 15, TOTAL : 60 PERIODS.

OUTCOMES:

The students will be able to:

- Analyze the time and frequency domains of the given system using different mathematical techniques

TEXT BOOKS:

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

REFERENCES:

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

BM8503 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT-I L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:

- Understand the medical devices applied in measurement of parameters related to cardiology, neurology and the methods of continuous monitoring and transmitting them
- Learn some of the cardiac assist devices
- Learn to measure the signals generated by muscles
- Understand the need and use of some of the extracorporeal devices

UNIT I CARDIAC EQUIPMENT 9

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

UNIT II NEUROLOGICAL EQUIPMENT 9

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

UNIT III SKELETAL MUSCULAR EQUIPMENT 9

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

UNIT IV PATIENT MONITORING AND BIOTELEMETRY 9

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

UNIT V EXTRA CORPOREAL DEVICES AND SPECIAL DIAGNOSTIC TECHNIQUES 9

Need for heart lung machine, functioning of bubble, disc type and membrane type oxygenerators, finger pump, roller pump, electronic monitoring of functional parameter. Hemo Dialyser unit, Lithotripsy, Principles of Cryogenic technique and application, Endoscopy, Laproscopy. Thermography – Recording and clinical application, ophthalmic instruments.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:

- Use different medical devices applied in measurement of parameters related to cardiology, neurology
- Explain about cardiac assist devices, its continuous monitoring and transmission
- Measure signals generated by muscles

TEXT BOOKS:

1. Joseph J. Carr and John M. Brown, “Introduction to Biomedical equipment technology”, Pearson education, 2004.
2. John G.Webster, Medical Instrumentation Application and Design, third edition, John Wiley and Sons, Newyork, 2006.

REFERENCES:

1. Myer Kutz, “Standard Handbook of Biomedical Engineering & Design”, McGraw Hill, 2003.
2. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw Hill, New Delhi, 2003.
3. L.A Geddes and L.E.Baker, “Principles of Applied Biomedical Instrumentation”,
4. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Pearson Education, New Delhi, 2007.
5. Antony Y.K.Chan,’ Biomedical Device technology, Principles and design’, Charles Thomas Publisher Ltd, Illinois, USA, 2008

EC8503 MICROPROCESSOR AND MICROCONTROLLERS L T P C
3 0 0 3

OBJECTIVES:

- To study the architecture of 8085 and 8086, 8051
- To study the addressing modes and instruction set of 8085 and 8086, 8051
- To introduce the need and use of interrupt structure in 8085 and 8051.
- To develop skill in simple program writing for 8085 and 8051 applications.
- To introduce commonly used peripheral / interfacing ICs.

UNIT I ARCHITECTURE OF 8085 /8086 9

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

UNIT II ASSEMBLY LANGUAGE PROGRAMMING 9

8085: Assembly Language Programming, programming techniques, Subroutines, serial I/O and data communication, Interrupts, Interrupt programming, 8086:Simple Assembly Language Programming, Assembler Directives- Interrupts and Interrupt Applications.

UNIT III PERIPHERAL INTERFACING & APPLICATION 9

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

UNIT IV MICROCONTROLLER 9

8051 – Architecture, Special Function Registers(SFRs), I/o Pins Ports and Circuits, Instruction set, Addressing modes, Assembly language programming,

UNIT V INTERFACING 8051: MEMORY, I/O, INTERRUPTS 9

Programming 8051 Timers- Serial Port Programming- Interrupts Programming LCD & Keyboard Interfacing- ADC, DAC & Sensor Interfacing, External Memory Interface- RTC Interfacing using I2C Standard- Motor Control- Relay, PWM, DC & Stepper Motor.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course the students will be able to

- Describe the architecture of 8085 and 8086, 8051.
- Identify the addressing modes and instruction set of 8085 , 8086 and 8051.
- Analyze the need and use of interrupt function.
- Write simple program writing for 8085 and 8051 based applications and Interfaces

TEXTBOOKS:

1. Ramesh S. Gaonkar, Microprocessor Architecture Programming and Applications with 8085. Fifthh edition, Penram International Publishing 2010.
2. Douglas V.Hall, Microprocessor and Interfacing, Programming and Hardware. Revised second Edition 2006, Eleventh Reprint 2010. Tata McGraw Hill
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay The 8051 Microcontroller and Embedded Systems, Second Edition 2008, Fifth Impression 2010, Pearson Education 2008.

REFERENCES:

1. Krishna Kant, " Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051 and 8096, PHI, 2007, Seventh Reprint 2011
2. Kenneth J.Ayala., "The 8051 Microcontroller, 3rd Edition, Thompson Delmar Learning, 2007, New Delhi.
3. A.K. Ray , K.M .Bhurchandi "Advanced Microprocessor and Peripherals" ,Second edition, Tata McGraw-Hill, 2007.
4. Barry B.Brey, "The Intel Microprocessors Architecture, Programming and Interfacing" Pearson Education, 2007. New Delhi.
5. Nilesh B Bahadure, " Microprocessors The 8086 to Pentium Family, PHI, 2010.

EC8551 DISCRETE TIME SIGNAL PROCESSING L T P C

3 1 0 4

OBJECTIVES:

- To introduce discrete fourier transform and its applications
- To teach the design of infinite and finite impulse response filters for filtering undesired signals
- To introduce signal processing concepts in systems having more than one sampling frequency

UNIT I DISCRETE FOURIER TRANSFORM 9+3

Review of discrete-time signals & systems - DFT and its properties, FFT algorithms & its application to convolution, Overlap-add & overlap-save methods.

UNIT II DESIGN OF INFINITE IMPULSE RESPONSE FILTERS 9+3

Analog filters – Butterworth filters, Chebyshev Type I filters (upto 3rd order), Analog Transformation of prototype LPF to BPF /BSF/ HPF. Transformation of analog filters into equivalent digital filters using Impulse invariant method and Bilinear Z transform method-Realization structures for IIR filters – direct, cascade, parallel forms.

UNIT III DESIGN OF FINITE IMPULSE RESPONSE FILTERS 9+3

Design of Linear Phase FIR filters - windowing and Frequency sampling method - Realization structures for FIR filters – Transversal and Linear phase structures- Comparison of FIR & IIR.

UNIT IV FINITE WORDLENGTH EFFECTS 9+3

Representation of numbers-ADC Quantization noise-Coefficient Quantization error-Product Quantization error-truncation & rounding errors -Limit cycle due to product round-off error-Round-off noise power-limit cycle oscillation due to overflow in digital filters- Principle of scaling.

UNIT V MULTIRATE SIGNAL PROCESSING 9+3

Introduction to Multirate signal processing-Decimation-Interpolation-Polyphase Decomposition of FIR filter-Multistage implementation of sampling rate conversion- Design of narrow band filters - Applications of Multirate signal processing.

TOTAL: L:45, T:15, 60 : PERIODS

OUTCOMES:

At the end of the course the students will be able to

- Understand discrete Fourier transform and its applications.
- Design of infinite and finite impulse response filters for various applications.
- Apply signal processing concepts in systems having more than one sampling frequency

TEXT BOOKS:

1. A.V.Oppenheim, R.W. Schafer and J.R. Buck, Discrete-Time Signal Processing, 8th Indian Reprint, Pearson, 2004.
2. John G Proakis and Manolakis, " Digital Signal Processing Principles, Algorithms and Applications", Pearson, Fourth Edition, 2007

REFERENCES:

1. I.C.Ifeachor and B.W. Jervis, Digital Signal Processing- A practical approach, Pearson, 2002.
2. M.H.Hayes, Digital Signal Processing, Schaum's outlines, Tata McGraw Hill, 2007.
3. S.K. Mitra, Digital Signal Processing, A Computer Based approach, Tata McGraw-Hill, 1998.
4. D.J. De Fatta, J.G.Lucas and W.S. Hodgkiss, Digital Signal Processing- A system Design Approach, John Wiley & sons, Singapore, 1988.
5. P.P. Vaidyanathan, "Multirate Systems and Filter Banks", Prentice Hall, Englewood cliffs, NJ, 1993.

HS8561 **EMPLOYABILITY SKILLS** **L T P C**

(Lab / Practical Course) **0 0 2 1**

(Common to all branches of Fifth or Sixth Semester B.E / B.Tech programmes)

OBJECTIVES:

- To enhance the employability skills of students with a special focus on Presentation skills, Group discussion skills and Interview skills
- To help them improve their soft skills, including report writing, necessary for the workplace situations

1. Making presentations – introducing oneself – introducing a topic – answering questions – individual presentation practice
2. Creating effective PPTs – presenting the visuals effectively
3. Using appropriate body language in professional contexts – gestures, facial expressions, etc.
4. Preparing job applications - writing covering letter and résumé
5. Applying for jobs online - email etiquette
6. Participating in group discussions – understanding group dynamics - brainstorming the topic
7. Training in soft skills - persuasive skills – People skills - questioning and clarifying skills – mock GD
8. Writing Project proposals – collecting, analyzing and interpreting data / drafting the final report
9. Attending job interviews – answering questions confidently
10. Interview etiquette – dress code – body language – mock interview

TOTAL: 30 PERIODS

REQUIREMENTS FOR A CLASS OF 30 STUDENTS:

1. A PC or a lap top with one or two speakers
2. A Collar mike and a speaker
3. An LCD projector and a screen
4. CD's and DVD's on relevant topics

OUTCOMES:

At the end of the course, learners should be able to

- Take international examination such as IELTS and TOEFL
- Make presentations and Participate in Group Discussions.
- Successfully answer questions in interviews**.**

REFERENCES:

1. Dhanavel, S.P. 2010. *English and Soft Skills*. Hyderabad: Orient BlackSwan Ltd.
2. Corneilssen, Joep. *How to Prepare for Group Discussion and Interview*. New Delhi: Tata-McGraw-Hill, 2009.
3. D'Abreo, Desmond A. *Group Discussion and Team Building*. Mumbai: Better Yourself Books, 2004.
4. Ramesh, Gopalswamy, and Mahadevan Ramesh. *The ACE of Soft Skills*. New Delhi: Pearson, 2010.
5. Gulati, Sarvesh. *Corporate Soft Skills*. New Delhi: Rupa and Co. 2006.
6. Van Emden, Joan, and Lucinda Becker. *Presentation Skills for Students*. New York:

Attested

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Palgrave Macmillan, 2004.

EXTENSIVE READERS

1. Covey, Stephen R. The 7 Habits of Highly Effective People. New York: Free Press, 1989.
2. Bagchi, Subroto. The Professional. New Delhi: Penguin Books India, 2009.

WEB RESOURCES

1. www.humanresources.about.com
2. www.careerride.com

EC8511 MICROCONTROLLER AND INTERFACING LABORATORY L T P C
0 0 3 2

OBJECTIVES:

The student should be made to:

- Understand and write assembly language programs
- Learn about various interfacing methods

8085 BASED EXPERIMENTS

1. Assembly Language Programming of 8085

8086 BASED EXPERIMENTS

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

8051 BASED EXPERIMENTS

8. Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.
9. Programming and verifying Timer, Interrupts and UART operations in 8051 microcontroller.
10. Interfacing – DAC and ADC and 8051 based temperature measurement
11. Interfacing – LED and LCD
12. Interfacing – stepper motor traffic light control
13. Communication between 8051 Microcontroller kit and PC.
14. R8C based applications

TOTAL: 45 PERIODS

OUTCOMES

At the end of the course the students will be able to

- Write assembly language programs for 8085,8086 and 8051.
- Identify various interfacing methods using the 8085,8086 and 8051.

LAB REQUIREMENTS:

1. 8085 trainer kit 15 Nos.
2. 8051 trainer kit 15 Nos.
3. 8086 trainer kit 10 Nos.
4. Macro assembler MASM (Simulator) - 10 Users.
5. 8279 Interfacing card compatible with 8085, 8051 and 8086 trainers – 2 Nos.
6. 8251 Interfacing card compatible with 8085, 8051 and 8086 trainers – 2 Nos.
7. ADC and DAC Interfacing card compatible with 8085, 8051 and 8086 trainers – 2 Nos.
8. Traffic Light - Interfacing card compatible with 8085, 8051 and 8086 trainers – 2 Nos.
9. Stepper motor Interfacing - Interfacing card compatible with 8085, 8051 and 8086 trainers – 2 Nos.
10. (16X2) LCD Display - Interfacing card compatible with 8085, 8051 and 8086 trainers. – 2 Nos
11. Temperature measurement card - Interfacing card compatible with 8085, 8051 and 8086 trainers – 2 Nos
12. DC motor speed control card- Interfacing card compatible with 8085, 8051 and 8086 trainers – 2 Nos

EC8561 DIGITAL SIGNAL PROCESSING LABORATORY L T P C
0 0 3 2

OBJECTIVES:

The student should be made to:

- To implement Linear and Circular Convolution
- To implement FIR and IIR filters
- To study the architecture of DSP processor
- To demonstrate Finite word length effect

DSP PROCESSOR IMPLEMENTATION

1. Study of architecture of Digital Signal Processor
2. MAC operation using various addressing modes
3. Implementation of difference equations
4. Linear Convolution
5. Circular Convolution
6. Waveform generation

MATLAB / EQUIVALENT SOFTWARE PACKAGE

1. Generation of sequences
2. Linear and Circular Convolutions

3. DFT
4. FIR filter design
5. IIR filter design
6. Finite wordlength effects
7. Decimation and Interpolation

TOTAL: 45 PERIODS

LAB REQUIREMENTS:

TMS 320C5x / TMS 320C6x kits – 15 Nos.

MATLAB or Equivalent S/w – 15 User License

OUTCOMES:

Students will be able to

- Carry out simulation of DSP systems
- Demonstrate their abilities towards DSP processor based implementation of DSP systems
- Analyze Finite word length effect on DSP systems
- Demonstrate the applications of FFT to DSP
- Implement adaptive filters for various applications of DSP

BM8601 BIOMECHANICS L T P C
3 0 0 3

OBJECTIVES:

- To study about the mechanics involved with various physiological systems.
- To gain knowledge in deriving the mathematical models related to blood vessels.

UNIT I INTRODUCTION 9

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

UNIT II MECHANICS OF PHYSIOLOGICAL SYSTEMS 9

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

UNIT III ORTHOPAEDIC MECHANICS 9

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

UNIT IV MATHEMATICAL MODELS 9

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

UNIT V ORTHOPAEDIC APPLICATIONS 9

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

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Explain the mechanics of physiological systems.
- Analyze the biomechanical systems.
- Design orthopaedic applications.

TEXT BOOKS:

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

REFERENCES:

1. Y.C. Fung, “Bio-Mechanics- Mechanical Properties of Tissues”, Springer-Verlag, 1998.
2. Dhanjoo N. Ghista, “Orthopaedic Mechanics”, Academic Press, 1990.
3. Joseph d.Bronzino, “Biomedical Engineering Fundamentals” ,Taylor& Francis,2006
4. John Enderle,Susanblanchard,Joseph Bronzino, “Introduction to Biomedical Engineering” Elsevier,2005
5. B.H.Brown, PV Lawford, RH Small wood,DR Hose, Dc Barber, Medical Physics and Biomedical Engineering – CRC Press, 1999.

BM8602 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT - II L T P C

3 0 0 3

OBJECTIVES:

The student should be made to:

• Gather basic knowledge about measurements of parameters related to respiratory system
• Learn measurement techniques of sensory responses
• Understand different types and uses of diathermy units.
• Know ultrasound imaging technique and its use in diagnosis
• Know the importance of patient safety against electrical hazard

UNIT I RESPIRATORY MEASUREMENT STSTEM 9

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

UNIT II SENSORY MEASUREMENT 9

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

UNIT III DIATHERMY 9

IR and UV lamp and its application. Short wave diathermy, ultrasonic diathermy, Microwave diathermy, Electro surgery machine - Current waveforms, Tissue Responses, Electro surgical current level, Hazards and safety procedures.

UNIT IV ULTRASONIC TECHNIQUE **9**

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

UNIT V PATIENT SAFETY **9**

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

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Explain about measurements of parameters related to respiratory system
- Describe the measurement techniques of sensory responses
- Analyze different types and uses of diathermy units
- Discuss ultrasound imaging techniques and its usefulness in diagnosis
- Outline the importance of patient safety against electrical hazard

TEXT BOOKS:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007
2. John G. Webster, "Medical Instrumentation Application and Design", John Willey and sons, 2006.
3. Joseph J. Carr and John M. Brown, "Introduction to Biomedical equipment technology", Pearson education, 2004.

REFERENCES:

1. Richard Aston "Principles of Biomedical Instrumentation and Measurement" – Merril Publishing Company, 1990.
2. L.A Geddas and L.E.Baker "Principles of Applied Biomedical Instrumentation" – 2004.
3. John G. Webster,'Bioinstrumentation", John Willey and sons, New York, 2004.
4. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw- Hill, New Delhi, 2003.
5. Myer Kutz "Standard Handbook of Biomedical Engineering & Design" – McGraw-Hill Publisher, 2003
6. Antony Y.K.Chan,' Biomedical Device technology, Principles and design', Charles Thomas Publisher Ltd, Illinois, USA, 2008

BM8603 HOSPITAL MANAGEMENT **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

Understand the principles, practices and areas of application in Hospital management.

UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION 7

Distinction between Hospital and Industry, Challenges in Hospital Administration –Hospital Planning – Equipment Planning – Functional Planning - Current Issues in Hospital Management - Telemedicine - Bio-Medical Waste Management

UNIT II HUMAN RESOURCE MANAGEMENT ON HOSPITAL 9

Principles of HRM – Functions of HRM – Profile of HRD Manager – Tools of HRD –Human Resource Inventory – Manpower Planning. Different Departments of Hospital, Recruitment, Selection, Training Guidelines –Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer.

UNIT III MARKETING RESEARCH & CONSUMER BEHAVIOUR 10

Marketing information systems - assessing information needs, developing & disseminating information - Market Research process - Other market research considerations - Consumer Markets & Consumer Buyer Behaviour - Model of consumer behaviour - Types of buying decision behaviour - The buyer decision process - Model of business buyer behaviour - Major types of buying situations - global marketing in the medical sector - WTO and its implications

UNIT IV HOSPITAL INFORMATION SYSTEMS & SUPPORTIVE SERVICES 10

Management Decisions and Related Information Requirement - Clinical Information Systems - Administrative Information Systems - Support Service Technical Information Systems – Medical Transcription, Medical Records Department – Central Sterilization and Supply Department – Pharmacy– Food Services - Laundry Services.

UNIT V QUALITY AND SAFETY ASPECTS IN HOSPITAL 9

Quality system – Elements, implementation of quality system, Documentation, Quality auditing,International Standards ISO 9000 – 9004 – Features of ISO 9001 – ISO 14000 – Environment Management Systems. NABA, JCI, NABL. Security – Loss Prevention – Fire Safety – Alarm System – Safety Rules. Health Insurance & Managing Health Care - Medical Audit – Hazard and Safety in a hospital Setup.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Explain the principles, practices and areas of application in Hospital Management

TEXT BOOKS:

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

REFERENCES:

1. Cesar A.Caceres and Albert Zara, “The Practice of Clinical Engineering, Academic Press, New York, 1977.
2. Norman Metzger “Handbook of Health Care Human Resources Management”,2nd

edition (1990) - Aspen Publication Inc. Rockville, Maryland, USA
3. Peter Berman “Health Sector Reform in Developing Countries” - Harvard University Press, 1995.
4. William A. Reinke “Health Planning For Effective Management” - Oxford University Press.
5. Health and Social organization: Towards a health policy for the 21st century – Blane, David, Brunner, Eric – Calrendon Press
6. Health Care Management - Arnold D. Kalcizony & Stephen M. Shortell

BM8604 RADIOLOGICAL EQUIPMENT L T P C
3 0 0 3

OBJECTIVES:

- Understand generation of x-rays and its uses in imaging.
- Learn different types of radio diagnostic techniques.
- Know techniques used for visualizing different sections of the body
- Learn radiation therapy methodologies and the radiation safety.

UNIT I MEDICAL X-RAY EQUIPMENT 9

Nature of X-rays- X-Ray absorption – Tissue contrast. X- Ray Equipment (Block Diagram) – X-Ray Tube, the collimator, Bucky Grid, power supply, Digital Radiography- discrete digital detectors, storage phosphor and film scanning, X-ray Image Intensifier tubes – Fluoroscopy – Digital Fluoroscopy. Angiography, cine Angiography. Digital subtraction Angiography. Mammography.

UNIT II COMPUTED TOMOGRAPHY 9

Principles of tomography, CT Generations, X- Ray sources- collimation- X- Ray detectors- Viewing systems- spiral CT scanning – Ultra fast CT scanners. Image reconstruction techniques- back projection and iterative method.

UNIT III MAGNETIC RESONANCE IMAGING 9

Fundamentals of magnetic resonance- Interaction of Nuclei with static magnetic field and Radio frequency wave- rotation and precession – Induction of magnetic resonance signals – bulk Magnetization – Relaxation processes T1 and T2. Block Diagram approach of MRI system- system Magnet (Permanent, Electromagnet and Super conductors), generations of gradient magnetic fields, Radio Frequency coils (sending and receiving), shim coils, Electronic components, fMRI.

UNIT IV NUCLEAR MEDICINE SYSTEM 9

Radio Isotopes- alpha, beta, and gamma radiations. Radio Pharmaceuticals. Radiation detectors – gas filled, ionization chambers, proportional counter, GM counter and scintillation Detectors, Gamma camera- Principle of operation, collimator, photo multiplier tube, X-Y positioning circuit, pulse height Analyzer. Principles of SPECT and PET.

UNIT V RADIATION THERAPY AND RADIATION SAFETY 9

Radiation therapy – linear accelerator, Telegamma Machine. SRS –SRT,-Recent Techiniques in radiation therapy - 3DCRT – IMRT – IGRT and Cyberknife- radiation measuring instruments-

Dosimeter, film Badges, Thermo Luminescent dosimeters- electronic dosimeter- Radiation protection in medicine- radiation protection principles.

TOTAL: 45 PERIODS.

OUTCOMES:

At the end of the course, the student should be able to:

- Explain the different radio diagnostic and therapeutic techniques.

TEXT BOOKS:

1. Steve Webb, The Physics of Medical Imaging, Adam Hilger, Philadelpia,1988.
2. R. Hendee and Russell Ritenour "Medical Imaging Physics", Fourth Edition William, Wiley-Liss, 2002.

REFERENCES:

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

BM8611 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT LABORATORY L T P C

0 0 3 2

OBJECTIVES:

- To provide practice on recording and analysis of different Bio potentials
- Study the function of different Therapeutic equipments.

LIST OF EXPERIMENTS:

1. Recording and analysis of ECG signals
2. Recording and analysis of EEG signals.
3. Recording - Fatigue test of EMG signals.
4. Simulation of ECG – detection of QRS complex and heart rate
5. Study of shortwave and ultrasonic diathermy
6. Study of Patient Monitoring System
7. Study of biotelemetry
8. Electrical **safety measurements.**
9. Analysis of characteristics of surgical diathermy.
10. Measurement of Respiratory parameters using spirometry.
11. Measurement of GSR.

12. Recording of Audiogram.

TOTAL: 45 PERIODS

LAB REQUIREMENTS FOR 30 STUDENTS

Multioutput power supply (+15v, -15v, +30V variable , +5V , 2A)	2 Nos.
ECG recorder with facility for analysis	1 No.
EEG recorder with facility for analysis	1 No.
EMG recorder with facility for analysis	1 No.
Short wave Diathermy	1 No.
Ultrasound diathermy	1 No.
Patient Monitoring system	1 No.
Single parameter biotelemetry system	1 No.
Electrical Safety Analyser	1 No.
Surgical Diathermy	1 No.
Spirometry with associated analysis system	1 No.
GSR measurement system	1 No.
Audiometer (With facility to carry out Air Conduction, Bone conduction, SISI test)	1 No.
ECG Simulator	1 No.

OUTCOMES:

- The learner is able to analyze the Bio medical signals, to check the safety of any medical equipments and to have the knowledge about therapeutic equipments.

BM8612 MEDICAL ELECTRONICS SYSTEM DESIGN LAB L T P C

0 0 3 2

This laboratory would focus on training and honing technical skills of the students with regard to design and development of basic prototypes leading to low cost systems applied in the field of Biomedical Engineering. These prototypes will be used either to develop basic level rehabilitation tools and aids or to have decision making or control by the introduction of intelligence in the system. This laboratory is thus to provide a platform for the students to gain knowledge in the development of socially relevant projects in the field of Medical Electronics

TOTAL: 45 PERIODS

BM 8701 MEDICAL INFORMATICS L T P C

3 0 0 3

OBJECTIVES:

The student should be made to:

- Learn ICT applications in medicine with an introduction to health informatics.
- Understand the theories and practices adopted in Hospital Information Systems in the light of medical standards, medical data formats and recent trends in Hospital Information Systems

UNIT I MEDICAL INFORMATICS 9

Introduction – Medical Informatics – Bioinformatics – Health Informatics - Structure of Medical Informatics –Functional capabilities of Hospital Information System - On-line services and Off – line services - History taking by computer, Dialogue with the computer

UNIT II MEDICAL STANDARDS 9

Evolution of Medical Standards – IEEE 11073 - HL7 – DICOM – IRMA - LOINC – HIPPA – Electronics Patient Records –Healthcare Standard Organizatios – JCAHO (Join Commission on Accreditation of Healthcare Organization) - JCIA (Joint Commission International Accreditation) - Evidence Based Medicine - Bioethics.

UNIT III MEDICAL DATA STORAGE AND AUTOMATION 9

Plug-in Data Acquisition and Control Boards – Data Acquisition using Serial Interface - Medical Data formats – Signal, Image and Video Formats – Medical Databases - Automation in clinical laboratories - Intelligent Laboratory Information System - PACS

UNIT IV HEALTH INFORMATICS 9

Bioinformatics Databases, Bio-information technologies, Semantic web and Bioinformatics, Genome projects, Clinical informatics, Nursing informatics, Public health informatics, Education and Training

UNIT V RECENT TRENDS IN MEDICAL INFORMATICS 9

Medical Expert Systems, Virtual reality applications in medicine, Virtual Environment - Surgical simulation - Radiation therapy and planning – Telemedicine – virtual Hospitals - Smart Medical Homes – Personalized e-health services – Biometrics - GRID and Cloud Computing in Medicine

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Discuss about health informatics and different ICT applications in medicine.
- Explain the function of Hospital Information Systems
- Analyze medical standards

TEXT BOOKS:

1. R.D.Lele, “Computers in medicine progress in medical informatics”, Tata Mcgraw Hill Publishing computers Ltd,2005, New Delhi.
2. Mohan Bansal, “Medicl informatics”, Tata Mcgraw Hill Publishing computers Ltd, 2003 New Delhi.
3. N.Mathivanan, “PC-Based Instrumentation”, Prentice Hall of India Pvt Ltd – New Delhi – 2007.
4. Orpita Bosu and Simminder Kaur Thukral, “Bioinformatics Databases, Tools and Algorithms”, Oxford University press, 2007, New Delhi.
5. Yi – Ping Phoebe Chen, “Bioinformatics Technolgies”, Springer International Edition, 2007, New Delhi

BM8702 PATTERN RECOGNITION AND NEURAL NETWORKS L T P C

3 0 0 3

Attested

OBJECTIVES:

- The course will introduce the student to the fundamentals of pattern recognition and its

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application.

- The course will discuss several supervised and unsupervised algorithms suitable for pattern classification. Particular emphasis will be given to computational methods such as linear discriminant functions and nearest neighbor rule.
- The course also covers basic neural network architectures and learning algorithms, for applications in pattern recognition, image processing, and computer vision.
- The major focus of this course will be on the use of Pattern and Neural Classifiers for classification applications.

UNIT I INTRODUCTION AND SUPERVISED LEARNING 9

Overview of Pattern recognition, Types of Pattern recognition, Parametric and Nonparametric approach, Bayesian classifier, Discriminant function, non parametric density estimation, histograms, kernels, window estimators, k- nearest neighbor classifier, estimation of error rates.

UNIT II UNSUPERVISED LEARNING AND CLUSTERING ANALYSIS 9

Unsupervised learning- Hierarchial clustering- Single-linkage Algorithm, Complete –linkage Algorithm, Average-linkage algorithm and Ward's method. Partitional clustering- Forgy's Algorithm, k-means algorithm and Isodata Algorithm

UNIT III INTRODUCTION AND SIMPLE NEURAL NET 9

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

UNIT IV BACK PROPAGATION AND ASSOCIATIVE MEMORY 9

Back propagation network, generalized delta rule, Bidirectional Associative memory Hopfield Network

UNIT V NEURAL NETWORKS BASED ON COMPETITION 9

Kohonen Self organizing map, Learning Vector Quantisation, Counter Propagation network.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Explain the fundamentals of pattern recognition and neural networks.
- Design and apply different pattern recognition techniques to the applications of interest.

TEXT BOOKS:

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

REFERENCES:

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

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BM8751 PRINCIPLES OF DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Learn digital image fundamentals.
- Be exposed to simple image processing techniques.
- Be familiar with image compression and segmentation techniques.
- Learn to represent image in terms of features

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Elements of digital image processing systems, Vidicon and Digital Camera working principles, - Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

UNIT II IMAGE ENHANCEMENT 9

Point processing, Histograms, Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphic filtering, Color image enhancement.

UNIT III IMAGE RESTORATION 9

Image Restoration - degradation model, Unconstrained and Constrained restoration, Inverse filtering, Wiener filtering, Geometric transformations-spatial transformations.

UNIT IV IMAGE SEGMENTATION 9

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – Hybrid methods

UNIT V IMAGE COMPRESSION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

TOTAL: 45 PERIODS

OUTCOMES:

Upon successful completion of this course, students will be able to:

- Discuss digital image fundamentals.
- Apply image enhancement and restoration techniques.
- Use image compression and segmentation Techniques.
- Represent features of images.

TEXT BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson, Education, Inc., Second Edition, 2004.
2. Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson Education, Inc.,

2002.

REFERENCES:

1. Kenneth R. Castleman, “Digital Image Processing”, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, ”Digital Image Processing using MATLAB”, Pearson Education, Inc., 2004.
3. D,E. Dudgeon and RM. Mersereau, “Multidimensional Digital Signal Processing”, Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, “Digital Image Processing” , John Wiley, New York, 2002
5. Milan Sonka et al, “Image Processing, Analysis and Machine vision”, Brookes/Cole, Vikas Publishing House, 2nd edition, 1999
6. Alan C. Bovik, “Handbook of image and video processing” Elsevier Academic press, 2005
7. S.Sridhar, “ Digital Image processing” Oxford University press, Edition 2011

BM8712 MEDICAL IMAGE PROCESSING LABORATORY L T P C
0 0 3 2

OBJECTIVES:

- To study the various aspects of acquisition and analysis of bio medical images

LIST OF EXPERIMENTS:

1. Display of Grayscale Images.
2. Histogram Equalization.
3. Non-linear Filtering.
4. Edge detection using Operators.
5. 2-D DFT and DCT.
6. Filtering in frequency domain.
7. Display of color images.
8. Conversion between color spaces.
9. DWT of images.
10. Segmentation using watershed transform.
11. Study of DICOM standards.
12. Stegnography
13. Medical Image Compression techniques.

TOTAL:45 PERIODS

OUTCOMES:

Apply the techniques of medical image analysis and providing security

REFERENCE:

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

BM8001 ADVANCED BIO ANALYTICAL AND THERAPEUTIC TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To know the basic principle of techniques
- To implement the engineering aspects in medical sciences

UNIT I ANALYTICAL TECHNIQUES 9

Principle, instrumentation and application of electrophoresis- SDS, native gel. UV and IR spectroscopy and its application. Spectrophotometry, flame photometry and flourimetry. NMR – principle, instrumentation and application in medical sciences.

UNIT II ENZYMES AS A DIAGNOSTIC TOOL 9

Isoenzymes and their significance in diagnosis, enzyme pattern in health and diseased condition –lipase, amylase, ALP, ACP,SGOT,SGPT, LDH& CPK. Techniques in screening isoenzymes. Biosensors- enzyme based, antibody based, DNA based and optical biosensor. Blotting techniques. Automation in clinical laboratory.

UNIT III RADIOISOTOPIC TECHNIQUES 9

Types of radioisotopes, units of measurements, methods in measuring radioactivity – G.M liquid scintillation counter application in diagnosis (RIA & ELISA) , autoradiography, biological hazards, safety measures in handling isotopes, disposal of labeled compounds and radiodosimetry

UNIT IV GENE THERAPY 9

Central concept of gene therapy, basic molecular mechanism of gene transfer, human genome project, prerequisite of human gene therapy, biological basis of gene therapy strategies, vehicles for gene transfer, gene transfer methods, clinical gene therapy studies, gene therapy for hereditary disease, gene therapy for cancer, gene therapy for HIV. Ethical issues in human gene therapy.

UNIT V NANOTHERAPEUTICS 9

Nanoparticles as carriers in drug delivery- design, manufacture and Physiochemical properties, transport across biological barriers, nanotechnology in Cancer therapy, bone treatment, nano particles for oral vaccination and skin disease.

TOTAL : 45 PERIODS.

OUTCOMES

- Students can function effectively in a laboratory environment using complex machinery and protocols.
- Can work independently and find out innovations in the rapidly changing field of nanotechnology.
- Able to report and discuss on chemical analytical aspects relevant for the selection of proper analytical techniques for real-life problem situations.
- Gain knowledge in experimental design, data analysis and interpretation, scientific reports and presentations, and exposure to the research literature

TEXT BOOKS:

- Principles of Instrumental Analysis. By D.A. Skoog
- Keith Wilson & John Walker, “ Practical Biochemistry – Principles and Techniques.”
- Oxford University press.
- Trevor Palmer, “ Understanding Enzymes”, Ellis Horwood.
- Molecular Cell Biology by Lodish et al
- Fundamentals of Nanotechnology December 2008, G. Louis Hornyak, John J. Moore,
- Harry F. Tibbals and Joydeep Dutta
- Introduction to NanoScience, G. Louis Hornyak, Joydeep Dutta, Harry F. Tibbals and Anil K. Rao

BM8002 ADVANCED MICROPROCESSORS L T P C
3 0 0 3

OBJECTIVES:

- To study the microprocessor architecture.
- To study the addressing modes and instruction set of 8086.
- To impart knowledge on 80186,80286,80386 and 80486 microprocessors.
- To introduce the high performance CISC architecture - PENTIUM
- To introduce the high performance CISC architecture - ARM

UNIT I MICROPROCESSOR ARCHITECTURE 9

Instruction Set – Data formats –Addressing modes – Memory hierarchy –register file – Cache – Virtual memory and paging – Segmentation- pipelining –the instruction pipeline – pipeline hazards – instruction level parallelism – reduced instruction set –Computer principles – RISC versus CISC.

UNIT II 8086 MICROPROCESSOR 9

8086- Architecture, Instruction set, Addressing Modes , Assembly Language Programming, minimum and maximum mode configuration, Strings, Procedures, Macros, Assembler Directives, Interrupts and Interrupt Applications.

UNIT III HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM 9

CPU Architecture- Bus Operations – Pipelining – Brach predication – floating point unit- Operating Modes –Paging – Multitasking – Exception and Interrupts – Instruction set – addressing modes – Programming the Pentium processor.

UNIT IV HIGH PERFORMANCE RISC ARCHITECTURE – ARM 9

Organization of CPU – Bus architecture –Memory management unit - ARM instruction set- Thumb Instruction set- addressing modes – Programming the ARM processor.

UNIT V ARM INSTRUCTION AND ASSEMBLY LANGUAGE PROGRAMMING 9

Arm instruction set – Exceptions – Conditional Execution – Branch and Branch with link exchange – software interrupt – Data processing instructions – Signed and unsigned byte data transfer instructions – Multiple register transfer instructions – Swap instructions – Architectural support for high level languages – Thumb instruction set – Thumb implementation – applications – writing assembly language programs.

TOTAL : 45 PERIODS

OUTCOMES:

- The student will be able to work with suitable microprocessor for a specific real world application.

TEXTBOOKS:

1. B.B.Brey, " The Intel Microprocessor 8086/8088, 80186/80188, 80286, 80386,80486 PENTIUM, PENTIUM Pro, PII, PIII & IV Architecture, Programming & Interfacing", Prentice-Hall of India, 7th Edition, 2006.
2. Andrew N. Sloss, Dominic Symes, Chris Wright "ARM System Developers Guide- Designing and Optimizing System" Elsevier, 2004.

REFERENCES:

1 Douglas V.Hall, “Microprocessors and Interfacing”, Tata McGraw Hill, II Edition 1999.
2 Mohamed Rafiquzzaman, “Microprocessors and Microcomputer Based System Design”, II Edition, CRC Press, 2007.
3 A.K.Ray, K.M. Bhurchandi, “Advanced microprocessors and peripherals”, II Edition, Tata McGraw Hill 2006.
4 Nilesh B.Bahadure “Microprocessors –The 8086/8088, 80186/80286, 80386/80486 and the Pentium family”,PHI, 2010.

BM8003 BIO MATERIALS AND ARTIFICIAL ORGANS L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Learn characteristics and classification of Biomaterials
- Understand different metals and ceramics used as biomaterials
- Learn polymeric materials and combinations that could be used as a tissue replacement implants
- Know artificial organ developed using these materials

UNIT I STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY 9

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

UNIT II IMPLANT MATERIALS 9

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

UNIT III POLYMERIC IMPLANT MATERIALS 9

Polymerization, polyamides, Acryrilic polymers, rubbers, high strength Thermoplastics, medical applications. Bio polymers: Collagen and Elastin. Medical Textiles: Silica, Chitosan, PLA composites, Sutures, wound dressings. Materials for ophthalmology: contact lens, Intraocular lens. Membranes for plasma separation and Blood oxygenation.

UNIT IV TISSUE REPLACEMENT IMPLANTS 9

Small intestinal submucosa and other decullarized matrix biomaterials for tissue repair. Soft-tissue replacements, sutures, surgical tapes, adhesive, Percutaneous and skin implants, maxillofacial augmentation, Vascular grafts, hard tissue replacement Implants, joint replacements, Pancreas replacement.

UNIT V ARTIFICIAL ORGANS 9

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

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Analyze different types of Biomaterials and its classification**.**
- Perform combinations of materials that could be used as a tissue replacement implant.

TEXT BOOKS:

1. Sujata V. Bhatt, Biomaterials Second Edition, Narosa Publishing House,2005.
2. Joon B.Park Joseph D. Bronzino, Biomaterials - Principles and Applications – CRC Press, 2003
3. H.H.Willard, D.L.Merrit,Instrumental Methods of Analysis, CBS Publishers 1992

REFERENCES:

1. Park J.B., “Biomaterials Science and Engineering”, Plenum Press, 1984.
2. Standard Handbook of Biomedical Engineering & Design – Myer Kutz, McGraw-Hill, 2003
3. Introduction to Biomedical Engineering – John Enderle, Joseph D. Bronzino, Susan M. Blanchard, Elsevier, 2005.
4. Medical Textiles and Biomaterials for Healthcare- Edited by AC ANAND, J F Kennedy, M.Miraftab, S.Rajendran, Woodhead Publishing Limited 2006
5. Materials Science and Technology: Volume 14, Medical and Dental Materials: A comprehensive Treatment Volume Editor D F Williams, VCH Publishers 1992
6. An introduction to Materials in Medicine:BD Ratner, AS Hoffmann,FJ Schoen, JE Lemmons, Academic Press 1996

BM8004 BIOMEMS L T P C

3 0 0 3

OBJECTIVES:

The student should be made to:

- Learn various MEMS fabrication techniques.
- Understand different types of sensors and actuators and their principles of operation at the micro scale level.
- Know the application of MEMS in different field of medicine

UNIT I MEMS MATERIALS AND FABRICATION 9

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

UNIT II MECHANICAL AND THERMAL SENSORS AND ACTUATORS 9

Mechanics for MEMs design- static bending of thin plates, mechanical vibration, thermomechanics, fracture and thin film mechanics. Mechanical sensors and actuators – beam and cantilever – microplates, strain, pressure and flow measurements, Thermal sensors and actuators- actuator based on thermal expansion, thermal couples, thermal resistor, Shape memory alloys- Inertia sensor, flow sensor

UNIT III ELECTROSTATIC AND PIEZOELECTRIC SENSORS AND ACTUATORS 9

Parallel plate capacitor, pull in effect, Electrostatic sensors and actuators- Inertia sensor, Pressure sensor, flow sensor, tactile sensor, comb drive. Properties of piezoelectric materials, Piezoelectric sensor and actuator – inchworm motor, inertia sensor, flow sensor.

UNIT IV MICROFLUIDIC SYSTEMS 9

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

UNIT V APPLICATIONS OF BIOMEMS 9

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

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Discuss various MEMS fabrication techniques.
- Explain different types of sensors and actuators and their principles of operation at the micro Scale level.
- Apply MEMS in different field of medicine.

TEXT BOOKS:

1. Chang Liu,' Foundations of MEMS', Pearson Education International, New Jersey, USA, 2006
2. Nitaigour Premchand Mahalik, " MEMS", Tata McGraw Hill Publishing Company, New Delhi, 2007
3. Tai Ran Hsu , "MEMS and Microsystems design and manufacture", Tata McGraw Hill Publishing Company, New Delhi, 2002

REFERENCES:

1. Wanjun Wang, Stephen A.Soper,"BioMEMs: Technologies and applications", CRC Press, New York, 2007
2. Marc J. Madou ' Fundamentals of microfabrication: the science of miniaturization', CRC Press, 2002 -
3. Nadim Maluf, Kirt Williams. " An introduction to Microelectromechancial Systems Engineering", Second Edition, Artech House Inc, MA, 2004

BM8005 **BIO SIGNAL PROCESSING** **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the characteristics of different biosignals
- To discuss linear and non-linear filtering techniques to extract desired information
- To introduce techniques for automated classification and decision making to aid diagnosis

UNIT I BIOSIGNAL AND SPECTRAL CHARACTERISTICS 9

Characteristics of some dynamic biomedical signals, Noises- random, structured and physiological noises. Filters- IIR and FIR filters. Spectrum – power spectral density function, cross-spectral density and coherence function, cepstrum and homomorphic filtering. Estimation of mean of finite time signals.

UNIT II TIME SERIES ANALYSIS AND SPECTRAL ESTIMATION 9

Time series analysis – linear prediction models, process order estimation, lattice representation, non stationary process, fixed segmentation, adaptive segmentation, application in EEG, PCG signals, Time varying analysis of Heart-rate variability, model based ECG simulator. Spectral estimation – Blackman Tukey method, periodogram, and model based estimation. Application in Heart rate variability, PCG signals.

UNIT III ADAPTIVE FILTERING AND WAVELET DETECTION 9

Filtering – LMS adaptive filter, adaptive noise canceling in ECG, improved adaptive filtering in FECG, Wavelet detection in ECG – structural features, matched filtering, adaptive wavelet detection, detection of overlapping wavelets.

UNIT IV BIOSIGNAL CLASSIFICATION AND RECOGNITION 9

Signal classification and recognition – Statistical signal classification, linear discriminant function, direct feature selection and ordering, Back propagation neural network based classification. Application in Normal versus Ectopic ECG beats.

UNIT V TIME FREQUENCY AND MULTIVARIATE ANALYSIS 9

Time frequency representation, spectrogram, Wigner distribution, Time-scale representation, scalogram, wavelet analysis – Data reduction techniques, ECG data compression, ECG characterization, Feature extraction- Wavelet packets, Multivariate component analysis- PCA,ICA

TOTAL: 45 PERIODS

OUTCOMES:

Upon the completion of this course, the students are able

- To come across the different types of signals & systems
- To analyse signals in time series domain & estimate the spectrum
- To understand the significance of wavelet detection applied in biosignal processing.
- To extract the features using multivariate component analysis.

REFERENCES:

1. Arnon Cohen, Bio-Medical Signal Processing Vol I and Vol II, CRC Press Inc., Boca Rato, Florida 1999.
2. Rangaraj M. Rangayyan, ‘Biomedical Signal Analysis-A case study approach’, Wiley-

Interscience/IEEE Press, 2002
3. Willis J. Tompkins, Biomedical Digital Signal Processing, Prentice Hall of India, New Delhi, 2003.
4. Emmanuel C. Ifeachor, Barrie W.Jervis, 'Digital Signal processing- A Practical Approach' Pearson education Ltd., 2002
5. Raghuveer M. Rao and Ajith S.Bopardikar, Wavelets transform – Introduction to theory and its applications, Pearson Education, India 2000.
6. K.P.Soman,K.I Ramachandran,"Insight into wavelet from theory to practice", PHI, New Delhi,2004
7. John L.Semmlow," Biosignal and Biomedical Image Processing Matlab Based applications" Marcel Dekker Inc.,New York,2004
8. Kavyan Najarian and Robert Splerstor," Biomedical signals and Image processing", CRC – Taylor and Francis,New York,2006
9. D.C.Reddy,"Biomedical Signal Processing – Principles and Techniques",TMH,New Delhi,2005
10. Gari D.Clifford,Francisco Azuaje and Patrick E.McSharry," Advanced Methods and Tech for ECG Data Analysis", ARTECH House,Boston,2006.

BM8006 BIOMATERIALS AND CHARACTERIZATION L T P C
3 0 0 3

OBJECTIVES:
- To focus on the importance of biomaterials in medicine
- To study the application of materials in solving the problems in medicine
- To highlight the characteristic features of biomaterial

UNIT I BIOMATERIALS AND PROPERTIES 7

Biomaterials: Introduction to biomaterials and requirements of biomaterials, Classification of biomaterials: Metallic, Ceramic, Polymeric and biological biomaterials. Properties of biomaterials: Bulk properties and Surface properties.

UNIT II BIOMATERIALS IN MEDICINE 10

Materials for Bone and Joint Replacement: Metals in Joint Replacement: Stainless Steels, Titanium based Materials and Porous metals. Ceramics: Alumina, Zirconia, Calcium phosphate and bioactive glass, bone cement. Polymers: PMMA and Polyethylene, Rubber and Flourocarbon polymers. Materials for Oral and Maxillofacial Surgery, Drug Delivery, Ophthalmology and Overview of intelligent textiles for medical application.

UNIT III PHYSIO-CHEMICAL CHARACTERIZATION 10

Material Characterization: X-ray Diffraction Analysis (XRD), X-ray absorption, FT- Raman and micro Raman analysis, Electron Spectroscopy for Chemical Analysis (ESCA) and X-ray Photo electron Spectroscopy (XPS), Mechanical testing: tensile, compression, wears, fatigue, corrosion studies and fracture toughness. Thermal and Viscoelastic Properties, Acoustic and Ultrasonic properties.

UNIT IV SURFACE CHARACTERIZATION 9

Surface properties and Adhesion, Contact angle Measurement, Scanning Electron Microscopy (SEM), Transmission Electron Microcopy (TEM) and Atomic Force Microscopy (AFM). Secondary Ion Mass Spectrometry, Confocal Laser Scanning Microscopy

UNIT V BIOMATERIAL TESTING 9

Biofunctionality and Biocompatibility, Preservation techniques for Biomaterials, In vitro and In vivo Assessment of Tissue compatibility, Testing of Blood –Materials, Interactions and Animal Models.

OUTCOMES:

- Gain a scientific knowledge in analysing physical and physico-chemical characterisation techniques in materials science and polymer chemistry.
- Achieve an extensive outline standards and methods for assessing the safety, sterility and biocompatibility of biomaterials.
- Able to apply instrumental methods of chemical analysis to natural material.

TEXT BOOKS:

1. Sujata V. Bhatt, “Biomaterials” Second Edition, Narosa Publishing House,2005.
2. Joon B.Park Joseph D. Bronzino, “Biomaterials - Principles and Applications” – CRC Press, 2003
3. H.H.Willard, “Instrumental Methods of Analysis”, CBS Publishers 1992

REFERENCES:

1. Park J.B., “Biomaterials Science and Engineering”, Plenum Press, 1984.
2. Myer Kutz “Standard Handbook of Biomedical Engineering & Design” – McGraw-Hill, 2003
3. John Enderle, Joseph D. Bronzino, Susan M. Blanchard, “Introduction to Biomedical Engineering”, Elsevier, 2005.
4. Medical Textiles and Biomaterials for Healthcare- Edited by AC ANAND, J F Kennedy, M.Miraftab, S.Rajendran, Woodhead Publishing Limited 2006
5. Materials Science and Technology: Volume 14, Medical and Dental Materials: A comprehensive Treatment: Volume Editor D F Williams, VCH Publishers 1992
6. BD Ratner, AS Hoffmann, FJ Schoen, JE Lemmons, “An introduction to Materials in Medicine”, Academic Press, 1996.

BM8007 BIOMETRIC SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To understand the technologies of fingerprint, iris, face and speech recognition
- To understand the general principles of design of biometric systems and the underlying trade-offs.
- To recognize personal privacy and security implications of biometrics based identification technology.
- To identify issues in the realistic evaluation of biometrics based systems.

UNIT I INTRODUCTION TO BIOMETRICS 9

Introduction and back ground – biometric technologies – passive biometrics – active biometrics - Biometric systems – Enrollment – templates – algorithm – verification - Biometric applications – biometric characteristics- Authentication technologies –Need for strong authentication - Protecting privacy and biometrics and policy – Biometric applications – biometric characteristics

UNIT II FINGERPRINT TECHNOLOGY 9

History of fingerprint pattern recognition - General description of fingerprints - Finger print feature processing techniques - fingerprint sensors using RF imaging techniques - fingerprint quality assessment – computer enhancement and modeling of fingerprint images – fingerprint enhancement – Feature extraction – fingerprint classification – fingerprint matching -

UNIT III FACE RECOGNITION AND HAND GEOMETRY 9

Introduction to face recognition, Neural networks for face recognition – face recognition from correspondence maps – Hand geometry – scanning – Feature Extraction - Adaptive Classifiers - Visual-Based Feature Extraction and Pattern Classification - feature extraction – types of algorithm – Biometric fusion

UNIT IV MULTIMODAL BIOMETRICS AND PERFORMANCE EVALUATION 9

Voice Scan – physiological biometrics –Behavioral Biometrics - Introduction to multimodal biometric system – Integration strategies – Architecture – level of fusion – combination strategy – training and adaptability – examples of multimodal biometric systems – Performance evaluation - Statistical Measures of Biometrics – FAR – FRR – FTE – EER – Memory requirement and allocation

UNIT V BIOMETRIC AUTHENTICATION 9

Introduction - Biometric Authentication Methods - Biometric Authentication Systems - Biometric authentication by fingerprint -Biometric Authentication by Face Recognition. -. Expectation-Maximization theory - . Support Vector Machines. Biometric authentication by fingerprint – biometric authentication by hand geometry- Securing and trusting a biometric transaction – matching location – local host - authentication server – match on card (MOC) - Multibiometrics and Two-Factor Authentication

TOTAL: 45PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Demonstrate knowledge engineering principles underlying biometric systems.
- Analyze design basic biometric system applications.

REFERENCES :

1. Paul Reid," Biometrics for Network Security, Pearson Education, 2004
2. Nalini K Ratha, Ruud Bolle, "Automatic fingerprint recognition system, Springer" 2003
3. L C Jain, I Hayashi, S B Lee, U Halici, "Intelligent Biometric Techniques in Fingerprint and Face Recognition"
4. S.Y. Kung, S.H. Lin, M.W., "MakBiometric Authentication: A Machine Learning Approach"
5. John Chirillo, Scott Blaul, "**Implementing Biometric Security",** John Wiley, 2003

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BM8008 BRAIN COMPUTER INTERFACE AND APPLICATIONS L T P C
3 0 0 3

OBJECTIVES:
- To introduce the basic concepts of brain computer interface
- To study the various signal acquisition methods
- To study the signal processing methods used in BCI

UNIT I INTRODUCTION TO BCI 9
Fundamentals of BCI – Structure of BCI system – Classification of BCI – Invasive, Non-invasive and Partially invasive BCI – EEG signal acquisition - Signal Preprocessing – Artifacts removal

UNIT II ELECTROPHYSIOLOGICAL SOURCES 9
Sensorimotor activity – Mu rhythm, Movement Related Potentials – Slow Cortical Potentials - P300 - Visual Evoked Potential - Activity of Neural Cells - Multiple Neuromechanisms

UNIT III FEATURE EXTRACTION METHODS 9
Time/Space Methods – Fourier Transform, PSD – Wavelets – Parametric Methods – AR, MA, ARMA models – PCA – Linear and Non-Linear Features

UNIT IV FEATURE TRANSLATION METHODS 9
Linear Discriminant Analysis – Support Vector Machines - Regression – Vector Quantization – Gaussian Mixture Modeling – Hidden Markov Modeling – Neural Networks

UNIT V APPLICATIONS OF BCI 9
Functional restoration using Neuroprosthesis - Functional Electrical Stimulation, Visual Feedback and control - External device controllers, Case study of Brain actuated control of mobile Robot.

TOTAL: 45 PERIODS

OUTCOMES:
- Students will be able to evaluate user interfaces and detect usability problems by doing usability studies (observations) with human subjects
- Be able to assign functions appropriately to the human and to the machine
- Be able to develop high-fidelity prototypes using at least one development tool

TEXT BOOKS:

1. R. Spehlmann, “EEG Primer”, Elsevier Biomedical Press, 1981.
2. Bernhard Graimann, Brendan Allison, Gert Pfurtscheller, “Brain-Computer Interfaces: Revolutionizing Human-Computer Interaction”, Springer, 2010

REFERENCES:

1. Arnon Kohen, “Biomedical Signal Processing”, Vol I and II, CRC Press Inc, Boca Rato, Florida.
2. Bishop C.M., “Neural networks for Pattern Recognition”, Oxford, Clarendon Press, 1995.

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BM8009 COMPUTER HARDWARE AND INTERFACING L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Learn advanced 8086 family of processors, motherboards, PC based data acquisition and troubleshooting of PCs.

UNIT I INTEL ADVANCED PROCESSORS 9

8086, 80186, 80286, 80386, 80486 -Architecture, Memory management.

UNIT II PENTIUM PROCESSORS 9

Pentium Architecture- Memory Management- Pentium Pro microprocessors – Pentiun II, Pentium III , Pentium 4 – Special features and software changes.

UNIT III PC HARDWARE OVERVIEW 9

Functional units & Interconnection, New generation motherboards 286 to Pentium 4 Bus interface – ISA – EISA- VESA- PCI- PCIX, Memory and I/O port addresses, Peripheral interfaces and controller.

UNIT IV PC BASED DATA ACQUISTION 9

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

UNIT V TROUBLESHOOTING, MAINTAINING & REPAIRING 9

Memory troubleshooting, Monitor troubleshooting, Motherboard troubleshooting, Port troubleshooting, Sound Boards and Video adapters troubleshooting, USB troubleshooting.

OUTCOMES:

At the end of the course, the student should be able to:

- Explain 8086 family of processors, motherboards, PC based data acquisition and troubleshooting of PCs

TOTAL : 45 PERIODS

TEXT BOOKS

1. B. Govindarajalu, “IBM PC and clones Hardware, Trouble Shooting and Maintanance”, Second Edition, Tata McGraw Hill, New Delhi, 2005.
2. N.Mathivanan, “ PC –Based Instrumentation Concepts and Practice”, Prentice Hall of india, New Delhi, 2007.
3. Stephen J. Bigelow, “Troubleshooting, Maintaining &Repairing”, Tata McGraw Hill Edition, 5th Edition.

REFERENCES:

1. Douglus v.Hall, “Microprocessors and Interfacing, Programming and Hardware”. Revised second Edition, Indian Edition. Tata McGraw Hill, New Delhi, 2007.
2. A.K.Ray, K.M. Bhurchandi, “ Advanced microprocessors and peripherals”, II Edition, Tata McGraw Hill 2006.

EC8011 EMBEDDED AND REAL - TIME SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To study the architecture and programming of ARM processor.
- To introduce the basic concepts of hard real time multiprocessing.
- To introduce the analysis concepts for effective programming .
- To study about the basics of the buses used for embedded system networking.

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS 9

Complex systems and microprocessors– Embedded system design process – Formalism for system design– Design example: Model train controller- ARM Processor Fundamentals- Instruction Set and Programming using ARM Processor.

UNIT II COMPUTING PLATFORM 9

CPU: Programming input and output – Supervisor mode, exception and traps – Coprocessor – Memory system mechanism – CPU performance – CPU power consumption- CPU buses – Memory devices – I/O devices – Component interfacing- System Level Performance Analysis- Parallelism. Design Example : Data Compressor.

UNIT III PROGRAM DESIGN AND ANALYSIS 9

Program design – Model of programs – Assembly and Linking – Basic compilation techniques – Program Optimization- Analysis and optimization of execution time, power, energy, program size – Program validation and testing- Example : Software Modem.

UNIT IV PROCESS AND OPERATING SYSTEMS 9

Multiple tasks and Multi processes – Processes – Context Switching – Operating Systems –Priority based Scheduling- RMS and EDF - Inter Process Communication mechanisms – Evaluating operating system performance – Power optimization strategies for processes.

UNIT V HARDWARE ACCELERATORS & NETWORKS 9

Multiprocessors- CPUs and Accelerators – Performance Analysis- Distributed Embedded Architecture – Networks for Embedded Systems: - I^2C, CAN Bus, SHARC link supports, Ethernet, Myrinet – Network based design – Internet enabled systems. Design Example: Digital Still Camera – Video Accelerator.

OUTCOMES:

- The students able to understand the concepts of embedded system design for real time applications
- To enable the students to have a programming knowledge on ARM processor

TOTAL: 45 PERIODS

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TEXT BOOKS:

1. Wayne Wolf, “Computers as Components - Principles of Embedded Computing System Design”, Morgan Kaufmann Publisher (An imprint from Elsevier), Second Edition, 2008.
2. Andrew N Sloss, Dominic Symes, Chris Wright, “ARM System Developer’s Guide- Designing and Optimizing System Software”, Elsevier/Morgan Kaufmann Publisher, 2008.

REFERENCES:

1. David E-Simon, “An Embedded Software Primer”, Pearson Education, 2007.
2. K.V.K.K.Prasad, “Embedded Real-Time Systems: Concepts, Design & Programming”, Dreamtech press, 2005.
3. Jane.W.S. Liu, “Real-Time systems”, Pearson Education Asia.
4. Sriram V Iyer, Pankaj Gupta, “Embedded Real Time Systems Programming”, Tata Mc-Graw Hill, 2004.
5. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier,2006.

BM8011 MEDICAL OPTICS L T P C

3 0 0 3

OBJECTIVES:

To Study about:

- The optical properties of the tissues and the applications of laser in diagnosis and therapy.

UNIT I OPTICAL PROPERTIES OF THE TISSUES 9

Refraction, Scattering, Absorption, Light transport inside the tissue, Tissue properties, Laser Characteristics as applied to medicine and biology-Laser tissue Interaction-Chemical-Thermal-Electromechanical – Photoabalative processes.

UNIT II INSTRUMENTATION IN PHOTONICS 9

Instrumentation for absorption, Scattering and emission measurements, excitation light sources – high pressure arc lamp, LEDs, Lasers, Optical filters, - optical detectors - Time resolved and phase resolved detectors.

UNIT III SURGICAL APPLICATIONS OF LASERS 9

Lasers in ophthalmology- Dermatology –Dentistry-Urology-Otolaryngology- Tissue welding.

UNIT IV NON THERMAL DIAGNOSTIC APPLICATIONS 9

Optical coherence tomography, Elastography, Laser Induced Fluorescence (LIF)-Imaging, FLIM Raman Spectroscopy and Imaging, FLIM – Holographic and speckle application of lasers in biology and medicine.

UNIT V THERAPEUTIC APPLICATIONS 9

Phototherapy, Photodynamic therapy (PDT) - Principle and mechanism - Oncological and non-oncological applications of PDT - Biostimulation effect – applications-Laser Safety Procedures.

TOTAL: 45 PERIODS

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OUTCOMES:

At the end of the course, the student should be able to:

- Demonstrate knowledge of the fundamentals of optical properties of tissues
- Describe surgical applications of laser.
- Describe photonics and its therapeutic applications.

TEXT BOOKS:

1. Markolf H.Niemz, “Laser-Tissue Interaction Fundamentals and Applications”, Springer, 2007.
2. Paras N. Prasad, “Introduction to Biophotonics”, A. John Wiley and sons, Inc. Publications, 2003.

REFERENCES:

1. Tuan Vo Dinh, “Biomedical photonics – Handbook”, CRC Press LLC, 2003.
2. Mark E. Brezinski, “Optical Coherence Tomography: Principles and Applications”, Academic Press, 2006.
3. R. Splinter and B.A. Hooper, “An Introduction to Biomedical Optics”, Taylor and Francis, 2007.

BM8012 NEURAL ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

The student should be made to:

- Be familiar with the nervous system development
- Be exposed to neuronal diseases and disorders
- Be familiar with nerve reconstruction and repairing

UNIT I BASICS OF NEURON STRUCTURE AND FUNCTIONS 9

Nervous system development. Trophic factors, extra cellular matrix components in nervous system development. Neuron: structure – function – classification. Glial cells – myelination - Neurotransmitter – types and functions. Synapses - Transport of materials and impulse in neurons; Blood Brain barrier.

UNIT II BRAIN, BRAIN STEM AND SPINAL CORD 9

Brain: structures – lobes – functional areas. Brain stem: structures – functional areas. Spinal cord: structure – functions. Concepts of nuclei – Tracts - Reticular formation. Blood supply of Brain and spinal cord**.**

UNIT III NEUROPHYSIOLOGY & NEURORADIOLOGY 9

Physiology of nerve conduction. Peripheral nerves – structure & Functions. Synaptic transmission and cellular signaling of Neurons. Electrical activity of the Brain and recording of brain waves. Evoked potentials. Visualization of nervous system.

UNIT IV NEURONAL DISEASES AND DISORDERS 9

Neuro degeneration: Degenerative, Demyelinated and injury related disorders associated with nervous system. Wallerian Degeneration. Neuronal plasticity –CNS acting drugs and their pharmacokinetics. Alzheimer's, Parkinson's and Prion diseases.

UNIT V NERVE RECONSTRUCTION AND REPAIRING 9

Regeneration of the nervous system. Nerve graft; Neural tissue engineering; Drug delivery system in CNS. Cognitive & neurobehavioral rehabilitation.

TOTAL : 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to

- Explain the structure of human nervous system
- Apply neural tissue engineering for rehabilitation
- Regenerate nervous system

TEXT BOOKS:

- Mathews G.G. Neurobiology, 2nd edition, Blackwell Science, UK, 2000.
- Textbook of Neuroanatomy, Malcom Carpenter, Mc.Grawhill Edition.

REFERENCES:

1. W. Mark Saltzman Tissue Engineering – Engineering principles for design of replacement organs and tissue –- Oxford University Press Inc New York 2004.
2. Park J.B., "Biomaterials Science and Engineering", Plenum Press, 1984.

BM8013 PHYSIOLOGICAL MODELING L T P C

3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand and appreciate the value and application of Physiological models and Vital organs.
- Model dynamically varying physiological system
- Understand methods and techniques for analysis and synthesis of dynamic models
- Develop differential equations to describe the dynamic models, simulate and visualize, dynamic responses of physiological models using software.

UNIT I SYSTEM CONCEPT 9

Review of physiological system modeling- system properties- different configurations of tracheal network, static and dynamic resistance, Thermal resistance in human systems, System with volume storage capacity with electrical analog , Simplified model of respiratiory system , Simulation of aortic segments ,Comparison of muscle and model isotonic response, Step response of resistance / compliant systems –Dye dilution study of circulation, pulse response of first order system.

UNIT II TRANSFER FUNCTION 7

System as an operator and use of Transfer function, Bio Engineering of a coupled system, Example of transformed signals and circuits for the transfer function with impedance concept-Development of lung model , Impedance of a two stage ladder network, Measurement of airway resistance .

UNIT III PERIODIC SIGNALS 11

Sinusoidal Functions, Analysis of Instrumentation to measure air flow system, second order system – representation of a respiratory system Evaluation of Transfer function from frequency response for muscle response mode Relationship between Phase lag and Time Delay-closed loop aspects of pupillary control system , Transient Response of an Undamped Second order system, General Description of Natural Frequency Damping, Physical Significance of under damped responses of post systolic operations in aortic arch.

UNIT IV FEEDBACK 11

Characterization of Physiological Feedback systems- Hypophysis adrenal systems, pupillary hippus, Uses and Testing of System Stability, Simulation-Hodgkin-Huxley model, Model of cardiovascular variability.

UNIT V SIMULATION OF BIOLOGICAL SYSTEMS 7

Simulation of thermal regulation, pressure and flow control in circulation, occulo motor system, Endocrinal system, functioning of receptors, introduction to digital control system.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Explain application of Physiological models.
- Model dynamically varying physiological system
- Discuss methods and techniques to analyze and synthesis dynamic models
- Develop differential equations to describe the dynamic models, simulate and visualize
- Implement physiological models using software to get dynamic responses

REFERENCES:

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

BM8014 PRINCIPLES OF TISSUE ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
- Introduction of Tissue Engineering
- Cell cycle and differentiation
- Basics about stem cells and its applications
- Different synthetic and biomaterials in tissue replacements
- Application of Tissue Engineering

UNIT I FUNDAMENTALS OF TISSUE ENGINEERING 9
Tissue exchange and tissue development - Objectives of tissue engineering - Laboratory set up for tissue engineering. Cell cycle and differentiation - cell adhesion - cell adhesion molecules - cell migration - cell aggregation and tissue equivalent.

UNIT II STEM CELLS 9
Definition of stem cells – types of stem cells – differentiation, dedifferentiation maturation, proliferation, pleuripotency and immortalization. Sources of stem cells: haematopoetic – fetal - cord blood – placenta - bone marrow - primordial germ cells - cancer stem cells - induced pleuripotent stem cells.

UNIT III COMPONENTS OF TISSUE ENGINEERING 9
Cell and Drug delivery systems - Transplantation – Implantation - Synthetic components – nanotechnology in tissue engineering – Imaging methods: SEM, TEM, Fluorescent and Confocal microscopy.

UNIT IV MATERIALS IN TISSUE ENGINEERING 9
Biological materials – degradable and non degradable – extra cellular matrix – decellularization - Polymers: synthetic and natural – cell interaction with polymers – applications of polymer.

UNIT V APPLICATION OF TISSUE ENGINEERING 9
Replacement Engineering: Artificial organs – cartilage, skin blood, pancreas, kidney and liver. Regenerative engineering: Nerve regeneration – cardiac tissue regeneration – muscle regeneration.

TOTAL : 45 PERIODS

OUTCOMES:
After the completion of these course students able to:
- Acquire ability to function on multi-disciplinary teams
- Understands professional and ethical responsibility in use of stem cells and gene therapy in creating tissue engineered therapies.
- Gain knowledge in research or clinical application on tissue repair/ engineering.

TEXT BOOKS:
1. W. Mark Saltzman, Tissue Engineering – Engineering principles for design of replacement organs and tissue – Oxford University Press Inc New York, 2004.

2. Stem cells – Elsevier: CS Potten, 1997.

REFERENCES:

1. Gray E. Wnek, Gray L Browlin – Encyclopedia of Biomaterials and Biomedical Engineering – Marcel Dekker Inc New York 2004.
2. R. Lanza, J. Gearhart et al (Eds), Essential of Stem Cell Biology, 2006, Elsevier Academic press.
3. R. Lanza, I. Weissman, J. Thomson, and R. Pedersen, Handbook of Stem Cells, TwoVolume, Volume 12: Volume 1.Embryonic Stem Cells; Volume 2. Adult & Fetal Stem Cells, 2004, Academic Press.

BM8015 REHABILITATION ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

On completion of the course the student will be able to

1. Explain the need for medical aids.
2. Devise new concepts for future development and applications.
3. Have a understanding of the sensory rehabilitation systems.
4. Have a understanding of the orthopedic prosthetics and orthotics in rehabilitation.
5. Have a understanding of rehabilitation medicine and advocacy.

UNIT I INTRODUCTION 9

Definition of rehabilitation Engineering, Impairments, disabilities and handicaps, Measurement and assessment. Rehabilitation Engineering : Fundamental principles, structure, function; performance and behavior. Subjective and objective measurement methods.

UNIT II ENGINEERING CONCEPTS IN SENSORY REHABILITATION ENGINEERING 9

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, and Tactual system: Tactual augmentation,Tactualsubstitution.

UNIT III ORTHOPEDIC PROSTHETICS AND ORTHOTICS IN REHABILITATION 9

Engineering concepts in motor rehabilitation, applications. Artificial limb & hands,Externally powered & controlled orthotics & prosthetics, Myoelectric hand & arm prostheses. Functional Electrical Stimulation systems-Restoration of hand function, restoration of standing and walking, Hybrid Assistive Systems (HAS)

UNIT IV VIRTUAL REALITY IN REHABILITATION 9

Virtual reality based rehabilitation, Hand motor recovery systems with Phantom haptics, Robotics and Virtual Reality Applications in Mobility Rehabilitation

UNIT V REHABILITATION MEDICINE AND ADVOCACY 9

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

day-to-day life.

TOTAL: 45 PERIODS

OUTCOMES:

- Explain the need for medical aids.
- Devise new concepts for future development and applications.
- Design and develop different sensory rehabilitation systems.
- Design and develop orthopedic prosthetics and orthotics in rehabilitation.
- Have an understanding of rehabilitation medicine and advocacy

TEXT BOOKS:

1. Bronzino, Joseph; Handbook of biomedical engineering. 2nd edition,CRC Press,2000.
2. Robinson C.J; Rehabilitation engineering. CRC press 1995
3. Sashi S Kommu; Rehabilitation Robotics,1 edition,CRC Press,2007

REFERENCES:

1. Horia- Nocholai Teodorecu, L.C.Jain ,Intelligent systems and technologies inrehabilitation engineering; CRC; December 2000.
2. Etienne Grandjean, Harold Oldroyd, Fitting the task to the man, Taylor & Francis,1988.
3. Keswick. J., What is Rehabilitation Engineering, Annual Reviews of Rehabilitation-Springer-Verlag,New York, 1982.
4. Warren E. Finn ,Peter G. LoPresti; Handbook of Neuroprosthetic Methods CRC; edition 2002.

GE8751 ENGINEERING ETHICS AND HUMAN VALUE

L	T	P	C
3	0	0	3

OBJECTIVES:

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES **10**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS **9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION **9**

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

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – The Three Mile Island and Chernobyl Case Studies Collegiality and Loyalty – Respect for

Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

UNIT V GLOBAL ISSUES **8**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample Code of Conduct

TOTAL: 45 PERIODS

OUTCOMES :

Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

TEXT BOOK:

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

REFERENCES:

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Thompson Wadsworth, A Division of Thomson Learning Inc., United States, 2000
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

MG8654 TOTAL QUALITY MANAGEMENT **L T P C**
3 0 0 3

AIM

- To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES:

- To understand the various principles, practices of TQM to achieve quality.
- To learn the various statistical approaches for Quality control.
- To understand the TQM tools for continuous process improvement.
- To learn the importance of ISO and Quality systems

UNIT I INTRODUCTION **9**

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality - Basic concepts of TQM – TQM Framework - Contributions of Quality Gurus – Barriers to TQM – Cost of Quality.

UNIT II TQM PRINCIPLES **9**

Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I **9**

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

UNIT IV TQM TOOLS & TECHNIQUES II **9**

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

UNIT V QUALITY SYSTEMS **9**

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Qualityauditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits –Quality Council – Leadership, Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward.

TOTAL : 45 PERIODS

OUTCOMES :

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

1. Dale H.Besterfiled, et al., “Total Quality Management”, Pearson Education Asia, Third Edition, Indian Reprint , 2006.

REFERENCES:

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

CS8251 DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING IN C++ **L T P C 3 0 0 3**

OBJECTIVES:

- To comprehend the fundamentals of object oriented programming, particularly in C++.
- To use object oriented programming to implement data structures.
- To introduce linear, non-linear data structures and their applications

UNIT – I DATA ABSTRACTION & OVERLOADING **9**

Overview of C++ – Structures – Class Scope and Accessing Class Members – Reference Variables – Initialization – Constructors – Destructors – Member Functions and Classes – Friend Function – Dynamic Memory Allocation – Static Class Members – Container Classes and Integrators – Proxy Classes – Overloading: Function overloading and Operator Overloading.

UNIT – II INHERITANCE & POLYMORPHISM **9**

Base Classes and Derived Classes – Protected Members – Casting Class pointers and Member Functions – Overriding – Public, Protected and Private Inheritance – Constructors and Destructors in derived Classes – Implicit Derived – Class Object To Base – Class Object Conversion – Composition Vs. Inheritance – Virtual functions – This Pointer – Abstract Base Classes and Concrete Classes – Virtual Destructors – Dynamic Binding.

UNIT – III LINEAR DATA STRUCTURES **11**

Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis: Definition and an example – Arrays and its representations – Stacks and Queues – Linked lists – Linked list based implementation of Stacks and Queues – Evaluation of Expressions – Linked list based polynomial addition.

UNIT – IV NON-LINEAR DATA STRUCTURES **9**

Trees – Binary Trees – Binary tree representation and traversals – Threaded binary trees – Binary tree representation of trees – Application of trees: Set representation and Union-Find operations – Graph and its representations – Graph Traversals – Connected components.

UNIT – V SORTING & SEARCHING **7**

Insertion sort – Merge sort – Quick sort – Heap sort – Linear Search – Binary Search.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

- Explain the concepts of Object oriented programming.
- Write simple applications using C++.
- Discuss the different methods of organizing large amount of data.

Attested

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Centre For Academic Courses
Anna University, Chennai-600 025.

TEXTBOOKS:

1. Deitel and Deitel, " C++, How To Program", Fifth Edition, Pearson Education, 2005.
2. Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, Fundamentals of Data Structures in C++, Galgotia, New Delhi, 1995.

REFERENCES:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Third Edition, Addison-Wesley, 2007.
2. Bhushan Trivedi, " Programming with ANSI C++, A Step-By-Step approach", Oxford University Press, 2010.
3. Goodrich, Michael T., Roberto Tamassia, "David Mount. Data Structures and Algorithms in C++", 7th ed, Wiley. 2004.

EC8071 CRYPTOGRAPHY AND NETWORK SECURITY L T P C

3 0 0 3

OBJECTIVES:

- To teach the importance of security for networks
- To teach the basics of number theory and galois field concepts
- To teach symmetric and asymmetric key in crypto systems
- To teach authentication and key management techniques
- To teach security specific to network layer

UNIT I NUMBER THEORETIC AND ALGEBRAIC ALGORITHMS 9

Introduction – Integer Arithmetic Modular Arithmetic – matrices – Linear congruence - Substitution ciphers – Transposition ciphers – Stream cipher - Block ciphers – Algebraic structure – GF(2^n) Fields.

UNIT II MODERN SYMMETRIC KEY CIPHERS 9

Modern block ciphers – Modern stream ciphers – DES – AES – Multiple uses of modern block ciphers and stream cipher.

UNIT III ASYMMETRIC KEY ENCIPHERMENT 9

Mathematics of cryptography – Primality Testing – Factorization – Chinese Remainder Theorem – Quadratic congruence – Exponentiation & Logarithm – RSA Rabin – Elgamal – Elliptic curve

UNIT IV INTEGRITY AUTHENTICATION AND KEY MANAGEMENT 9

Message integrity – random oracle model – message authentication – SHA-512 – WHIRL POOL - Digital signature schemes – Entity authentication password – challenge response – zero knowledge – Biometrics – Kerberos – symmetric key management – public key distribution – stegnography

UNIT V NETWORK SECURITY 9

Security at the Application Layer: E-mail – PGP – S/MIME – Security at the transport layer: SSL and TLS – Security at the network layer: IPsec, Two Security Protocol – Security Association – Internet Key Exchange – ISAKMP.

TOTAL : 45 PERIODS

OUTCOMES:

- The student would be able to demonstrate an understanding of the ways in which communication network security may get compromised and the basic principles of security algorithm design.
- The students should be able to solve various real time security issues by understanding the various security issues and algorithms.
- The student would be able to implement and analyse the different algorithms and compare their performances.
- The student would be in a position to apply his knowledge for designing or modifying existing algorithms and implementing them atleast by simulation.

TEXT BOOKS:

1. Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata McGraw Hill, 2007.
2. W.Stallings, “Cryptography & Network Security: Principles and Practice”, Prentice Hall, Third Edition, 2003.

REFERENCES:

1. Douglas R.Stlinson, “Cryptography Theory and Practice”, CRC Press series on Discrete Mathematics and its application 1995.
2. Charlie Kaufman, Radia Perlman, Mike Speciner, “Network Security Private Communication in a Public World”, Pearson Education, Second Edition, 2003.

EC8072 ELECTRO MAGNETIC INTERFERENCE AND COMPATIBILITY L T P C
3 0 0 3

OBJECTIVES

- To tutor the basics of EMI,EMC
- To instill knowledge on the EMI coupling mechanism and its mitigation techniques
- To impart comprehensive insight about the current EMC standards and about various measurement techniques

UNIT I BASIC CONCEPTS 7

Definition of EMI and EMC; Intra and Inter system EMI; Sources and victims of EMI, Conducted and Radiated EMI emission and susceptibility; Transient & ESD; Case Histories; Radiation Hazards to humans.

UNIT II COUPLING MECHANISM 9

Common made coupling; Differential mode coupling; Common impedance coupling; Ground loop coupling; Field to cable coupling; Cable to cable coupling; Power mains and Power supply coupling.

UNIT III EMI MITIGATION TECHNIQUES 10

Shielding – principle, choice of materials for H, E and free space fields, and thickness; EMI gaskets; Bonding; Grounding – circuits, system and cable grounding; Filtering; Transient EMI control devices and applications; PCB Zoning, Component selection, mounting, trace routing.

UNIT IV STANDARDS AND REGULATION 7

Units of EMI; National and International EMI Standardizing Organizations – IEC, ANSI, FCC, CISPR, BIS, CENELEC; FCC standards; EN Emission and Susceptibility standards and specifications; MIL461E Standards.

UNIT V TEST METHODS AND INSTRUMENTATION 12

EMI test sites - Open area site; TEM cell; Shielded chamber; Shielded Anechoic chamber; EMI test receivers; Spectrum Analyzer; Transient EMI Test wave Simulators; EMI coupling Networks - Line impedance Stabilization Networks; Feed through capacitors; Antennas and factors; Current probes and calibration factor; MIL-STD test methods; Civilian STD Test methods.

TOTAL : 45 PERIODS

OUTCOMES:

- The student would be able to demonstrate an understanding of the different aspects of EMI coupling and EMC in PCB design.
- Given the user requirements the student would be in a position to apply his knowledge for identifying a suitable EMI testing and controlling technique

TEXT BOOKS:

1. V.P. Kodali, “Engineering EMC Principles, Measurements and Technologies”, IEEE Press, Newyork,2001
2. Henry W.Ott., “Noise Reduction Techniques in Electronic Systems”, A Wiley Inter Science Publications, John Wiley and Sons, Newyork, 1988.

REFERENCES:

1. Don R.J.White Consultant Incorporate, “Handbook of EMI/EMC”, Vol I-V, 1988.
2. Bemhard Keiser, “Principles of Electromagnetic Compatibility”, 3rd Ed, Artech house, Norwood, 1987

EC8073 FOUNDATIONS FOR NANO-ELECTRONICS L T P C
3 0 0 3

OBJECTIVES:

The objective of the course is to introduce quantum mechanics concepts, approximations and statistical mechanics for understanding nano systems

UNIT I INTRODUCTION TO QUANTUM MECHANICS 9

Particles, waves, probability amplitudes, schrodinger equation, wavepackets solutions, operators, expectation values, eigenfuntions, piecewise constant potentials.

UNIT II SIMPLE HARMONIC OSCILLATORS AND APPROXIMATIONS 9

SHM Operators, SHM wavepacket solutions, Quantum LC circuit, WKB approximations, variational methods.

UNIT III SYSTEMS WITH TWO AND MANY DEGREES OF FREEDOM 9

Two level systems with static and dynamic coupling, problems in more than one dimensions, electromagnetic field quantization, density of states.

UNIT IV STATISTICAL MECHANICS 9

Basic concepts, microscopic, quantum systems in equilibrium, statistical models applied to metals and semiconductors

UNIT V APPLICATIONS 9

Hydrogen and Helium atoms, electronic states, Atomic force microscope, Nuclear Magnetic Resonance, carbon nanotube properties and applications

TOTAL : 45 PERIODS

OUTCOMES:

The learner is able to:

- Explain quantum mechanics concepts, approximations and statistical mechanics for understanding nano systems

TEXT BOOKS:

1. Hagelstein, Peter L., Stephen D. Senturia, and Terry P. Orlando, "**Introduction to Applied Quantum and Statistical Physics**.", New York, NY: Wiley, 2004.
2. Rainer Waser, "Nanoelectronics and Information Technology", Wiley 2005
3. Michael A. Nielsen and Isaac L. Chuang, "Quantum Computation and Quantum Information", Cambridge University Press, 2000.

REFERENCES:

1. Neil Gershenfeld "The Physics of Information Technology", Cambridge University Press, 2000.
2. Adrian Ionesu and Kaustav Banerjee eds. " Emerging Nanoelectronics: Life with and after CMOS" , Vol I, II, and III, Kluwer Academic, 2005.

EC8074 MULTIMEDIA COMPRESSION AND COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:

- To introduce probability related study of the characteristics of text, voice, image and video data
- To introduce various compression schemes for text, voice, image and video
- To analyse the compression schemes
- To introduce communication protocols for voice over internet and multimedia

networking

UNIT I MULTIMEDIA COMPONENTS 9

Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.

UNIT II AUDIO AND VIDEO COMPRESSION 9

Audio compression–DPCM-Adaptive DPCM – adaptive predictive coding-linear Predictive coding- code excited LPC-perpetual coding - Video compression principles-H.261, H.263, MPEG 1, 2, 4.

UNIT III TEXT AND IMAGE COMPRESSION 9

Compression principles-source encoders and destination encoders-lossless and lossy compression- entropy encoding –source encoding -text compression –static Huffman coding dynamic Huffman coding –arithmetic coding –Lempel Ziv-Welsh Compression-image compression

UNIT IV VOIP TECHNOLOGY 9

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols,Call establishment and release, VoIP and SS7, Quality of Service- CODEC Methods-VOIP applicability

UNIT V MULTIMEDIA NETWORKING 9

Multimedia networking -Applications-streamed stored and audio-making. The best Effort service-protocols for real time interactive Applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services- RSVP.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Fred Halshall, “Multimedia communication - Applications, Networks, Protocols and Standards”, Pearson education, 2007.
2. Tay Vaughan, “Multideai: Making It Work”, 7/e, TMH, 2007.
3. Kurose and W.Ross, “Computer Networking - “A Top Down Approach”, Pearson education, 3rd ed, 2005.

OUTCOMES:

1. The student would be able to demonstrate an understanding of the challenges involved in multimedia signal processing and their transmission.
2. The student would be in a position to apply his knowledge for identifying a suitable strategy for compression and communication based on the signal characterization and its needs.

REFERENCES:
1. Marcus goncalves “Voice over IP Networks”, McGraw Hill,
2. KR. Rao,Z S Bojkovic, D A Milovanovic, “Multimedia Communication Systems: Techniques, Standards, and Networks”, Pearson Education 2007
3. R. Steimnetz, K. Nahrstedt, “Multimedia Computing, Communications and Applications”, Pearson Education, First ed, 1995.
4. Ranjan Parekh, “Principles of Multimedia”, TMH, 2006

EC8075 ROBOTICS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the electronics and software aspects in robots
- To bring out the different languages for programming robot
- To specify robot requirements in the industry
- To introduce latest state of the art robots

UNIT I SCOPE OF ROBOTS 4

The scope of industrial Robots - Definition of an industrial robot - Need for industrial robots –Economic and Social Issues- applications.

UNIT II ROBOT COMPONENTS 9

Fundamentals of Robot Technology - Automation and Robotics - Robot anatomy - Work volume - Precision of movement - End effectors - Sensors.

UNIT III ROBOT PROGRAMMING 9

Robot Programming - Methods - interlocks textual languages. Characteristics of Robot level languages, characteristic of task level languages.

UNIT IV ROBOT WORK CELL 9

Robot Cell Design and Control - Remote Center compliance - Safety in Robotics.

UNIT V FUTURE TRENDS 14

Advanced robotics, Advanced robotics in Space - Specific features of space robotics systems - long-term technical developments, Advanced robotics in under - water operations. Robotics Technology of the Future - Future Applications.

TOTAL : 45 PERIODS

OUTCOMES:

- The Student must be able to design automatic manufacturing cells with robotic control using the principle behind robotic drive system, end effectors, sensor, machine vision robot kinematics and programming

TEXT BOOK:

1. Barry Leatham - Jones, “Elements of industrial Robotics” PITMAN Publishing , 1987.

REFERENCES:

1. Mikell P.Groover, Mitchell Weiss, Roger N.Nagel Nicholas G.Odrey, “Industrial Robotics Technology, Programming and Applications “, McGraw Hill Book Company 1986.
2. Fu K.S. Gonzaleaz R.C. and Lee C.S.G., “Robotics Control Sensing, Vision and Intelligence “ McGraw Hill International Editions, 1987.
3. Bernard Hodges and Paul Hallam, “ Industrial Robotics”, British Library Cataloging in Publication 1990.
4. Deb, S.R. Robotics Technology and flexible automation, Tata Mc Graw Hill, 1994.

EC8076 SOFT COMPUTING AND APPLICATIONS L T P C
3 0 0 3

OBJECTIVES:

- This course gives an idea and principles of various soft computing techniques, which are applicable to core areas such as networks, pattern recognition, image processing
- To introduce fuzzy set theory
- To teach different optimization techniques
- To introduce neural networks and neuro-fuzzy modeling
- To teach various applications of computational intelligence

UNIT I FUZZY SET THEORY 10

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

UNIT II OPTIMIZATION 8

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

UNIT III NEURAL NETWORKS 10

Supervised Learning Neural Networks – Perceptrons - Adaline – Backpropagation Mutilayer Perceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning.

UNIT IV NEURO FUZZY MODELING 9

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

UNIT V APPLICATIONS OF COMPUTATIONAL INTELLIGENCE 8

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

TOTAL : 45 PERIODS

OUTCOMES:

- An understanding of the fundamental Computational Intelligence models
- Understanding the concepts of neural networks, genetic algorithms, fuzzy neural networks, and ant colony optimization algorithms
- Application of computational Intelligence techniques to classification, pattern recognition, prediction, rule extraction, and optimization problems.

TEXT BOOKS:

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

REFERENCES:

1. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
2. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
3. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
4. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.
5. Dr.S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India, 2007.
6. Amit Konar, "Artificial Intelligence and Soft Computing Behaviour and Cognitive model of the human brain", CRC Press, 2008.

EC8451 COMPUTER ARCHITECTURE AND ORGANIZATION L T P C
3 0 0 3

OBJECTIVES:

- To study the general purpose architecture for computer system .
- To study the design of data path unit and control unit for ALU operation.
- Understanding the concept of various memories.
- To introduce the concept of interfacing and organization of multiple processors.

UNIT I INTRODUCTION 9

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

UNIT II DATA PATH DESIGN 9

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

UNIT III CONTROL DESIGN **9**

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

UNIT IV MEMORY ORGANIZATION **9**

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

UNIT V SYSTEM ORGANIZATION **9**

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

TOTAL : 45 PERIODS

OUTCOMES:

- Able to understand the advanced concepts of parallel architecture
- Understand the memory hierarchy for multiprocessor system
- Able to analyze the design structures of pipelined and multiprocessor systems

TEXT BOOKS:

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

REFERENCES:

1. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000.
2. Behrooz Paraami, "Computer Architecture, From Microprocessor to Supercomputers", Oxford University Press, Sixth impression 2010.
3. P.Pal Chaudhuri, , "Computer organization and design", 2nd Ed., Prentice Hall of India, 2007.
4. Miles J. Murdocca and Vincent P. Heuring, Principles of Computer Architecture, Printice Hall, 2000
5. William Stallings,"Computer Organisatin and Architecture, Designing for Performance, Pearson Education, Eighth Edition 2010.

Attested

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EC8651 **DIGITAL VLSI** **L T P C**
3 0 0 3

OBJECTIVES:

- In this course, the MOS circuit realization of the various building blocks that is common to any microprocessor or digital VLSI circuit are studied.
- Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed.
- The main focus in this course is on the transistor circuit level design and realization for digital operation and the issues involved as well as the topics covered are quite distinct from those encountered in courses on CMOS Analog IC design.

UNIT I MOS TRANSISTOR PRINCIPLE 9

NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams

UNIT II COMBINATIONAL LOGIC CIRCUITS 9

Examples of Combinational Logic Design, Elmore's constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles

UNIT III SEQUENTIAL LOGIC CIRCUITS 9

Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design

UNIT IV DESIGNING ARITHEMETIC BUILDING BLOCKS 9

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff

UNIT V IMPLEMENTATION STRATEGIES 9

Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

TOTAL:45 PERIODS

OUTCOMES:

- The student would have gained knowledge in the circuit design aspects at the next transistor and block level abstractions of FPGA and ASIC design. In combination with the course on CAD for VLSI, the student would have gained sufficient theoretical knowledge for carrying out FPGA and ASIC designs.
- Enables the students to design digital circuits satisfying various performance metrics
- Enables the student to design system level arithmetic circuits, memory circuits and design digital circuits in FPGA.

TEXT BOOKS:

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

REFERENCES:

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

CS8075	FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	L T P C 3 0 0 3

OBJECTIVE:

This program can be offered with all Undergraduate programs/courses for all engineering streams. The FSIPD program aims to improve student's awareness and understanding of the basic concepts involved in Integrated product Development (IPD) by providing exposure to the key product development concepts. Students, who complete this program, will stand a better chance to be considered for jobs in the Engineering industry.

OBJECTIVES:

After completing this program, the student will be able to obtain the technical skills needed to effectively play the entry level design engineer role in an engineering organization.

The student will be able to:

- Understand the global trends and development methodologies of various types of products and services
- Conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- Understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- Understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- Gain knowledge of the Innovation & Product Development process in the Business Context

UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT 9

Global Trends Analysis and Product decision - Social Trends - Technical Trends- Economical Trends - Environmental Trends - Political/Policy Trends - Introduction to Product Development Methodologies and Management - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle - Product Development Planning and Management

UNIT II REQUIREMENTS AND SYSTEM DESIGN 9

Requirement Engineering - Types of Requirements - Requirement Engineering - Traceability Matrix and Analysis - Requirement Management - System Design & Modeling - Introduction to System Modeling - System Optimization - System Specification - Sub-System Design - Interface Design

UNIT III DESIGN AND TESTING 9

Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines - Concept Screening & Evaluation - Detailed Design - Component Design and Verification – Mechanical, Electronics and Software Subsystems - High Level Design/Low Level Design of S/W Program - Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – Prototyping - Introduction to Rapid Prototyping and Rapid Manufacturing - System Integration, Testing, Certification and Documentation

UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL)SUPPORT 9

Introduction to Product verification processes and stages - Introduction to Product validation processes and stages - Product Testing standards and Certification - Product Documentation - Sustenance - Maintenance and Repair – Enhancements - Product EoL - Obsolescence Management - Configuration Management - EoL Disposal

UNIT V BUSINESS DYNAMICS ENGINEERING SERVICES INDUSTRY 9

The Industry - Engineering Services Industry - Product development in Industry versus Academia - The IPD Essentials - Introduction to vertical specific product development processes - Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and S/W systems – Product development Trade-offs - Intellectual Property Rights and Confidentiality - Security and configuration management.

TOTAL: 45 PERIODS

OUTCOMES:

The students will be able to

- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer
- Work independently as well as in teams
- Manage a project from start to finish

COURSE MATERIAL AND PEDAGOGY:

- NASSCOM has agreed to prepare / revise the course materials [selected teachers Anna University from major disciplines will be included in the process] as PPT slides for all theUNITS. The PPTs can be printed and given to each student if necessary at a Nominal Fee. This is the best possible material for this special course.
- NASSCOM will train the teachers of Anna University to enable them to teach this course. Atraining programme for nearly 3500 teachers needs to be organized. The team
  is exploring use of technology including the EDUSAT facility at Anna University.
- The course is to be offered as an elective to all UG Students both in the Constituent Colleges and Affiliated colleges of Anna University.

TEXT BOOKS [INDIAN ECONOMY EDITIONS]:

1. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development",
   TataMcGraw Hill, Fifth Edition, New Delhi, 2011
2. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill,Eleventh Edition, New Delhi, 2005.

REFERENCES:

1. Hiriyappa B, “Corporate Strategy – Managing the Business”, Authorhouse, USA, 2013
2. Peter F Drucker, “People and Performance”, Butterworth – Heinemann [Elsevier],Oxford, UK, 2004.
3. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – Conceptsand Practice”, Prentice Hall India, New Delhi, 2003
4. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design",McGraw Hill Education, Seventh Edition, New Delhi, 2013.

GE8072	DISASTER MANAGEMENT	L	T	P	C
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OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

Attested

DIRECTOR
Centre For Academic Courses
Anna University, Chennai-600 025.

OUTCOMES:

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management

TEXT BOOKS:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy, 2009.

GE8073 HUMAN RIGHTS L T P C
3 0 0 3

OBJECTIVES :

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I **9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II **9**

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III **9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV **9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V **9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL : 45 PERIODS

OUTCOMES:

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.