VINAYAKA MISSION'S RESEARCH FOUNDATION

(Deemed to be University)

SALEM, TAMILNADU, INDIA

FACULTY OF ENGINEERING AND TECHNOLOGY

SCHOOL OF ELECTRONIC SCIENCES

B.E- BIOMEDICAL ENGINEERING

FULL TIME

AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY, PAIYANOOR

&

V.M.K.V. ENGINEERING COLLEGE, SALEM

CHOICE BASED CREDIT SYSTEM

REGULATION – 2015

I SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	English for Engineers	ENGLISH	3	0	0	3
2	Physics for Engineers	PHYSICS	3	0	0	3
3	Calculus for Engineers	MATHS	3	1	0	4
4	Essentials of Computer Science Engineering	CSE	3	0	0	3
5	Essentials of Civil and Mechanical Engineering	CIVIL / MECH	3	0	0	3
PRACTICAL						
6	Physics Lab	PHY	2	0	0	2
7	Workshop Lab	MECH	2	0	0	2
8	Computer Lab	CSE	2	0	0	2
9	Yoga & Meditation	GEN	2	0	0	2
TOTAL						**24**

II SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	Business English	ENGLISH	3	0	0	3
2	Chemistry for Engineers	CHEM	3	0	0	3
3	Transforms & Matrices	MATHS	3	1	0	4
4	C Programming	CSE	3	1	0	4
5	Electronic Devices	ECE	3	0	0	3
PRACTICAL						
6	Engineering Chemistry Lab	CHEM	2	0	0	2
7	Engineering Graphics Lab	MECH	2	0	0	2
8	C Programming Lab	CSE	2	0	0	2
9	Electronic Devices Lab	ECE	2	0	0	2
TOTAL						**25**

III SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	Stochastic Process and Numerical Methods	MATHS	3	1	0	4
2	Biomedical Circuits & Networks	BME	3	0	0	3
3	Digital Electronics	ECE	3	1	0	4
4	Electronic Circuits	ECE	3	0	0	3
5	Electrical Technology	EEE	3	0	0	3
6	Signals & Systems	ECE	3	`0	0	3
PRACTICAL						
7	Digital Electronics Lab	ECE	0	0	3	2
8	Electronic Circuits Lab	ECE	0	0	3	2
9	Electrical Technology Lab	EEE	0	0	3	2
10	Personality Skill Development – I	MGMT/ENGLISH	0	0	2	1
TOTAL						**27**

IV SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	Biomedical Control Systems	BME	3	1	0	4
2	Medical Instrumentation-I	BME	3	1	0	4
3	Communication Circuits & Systems	ECE	3	0	0	3
4	Biosensors and transducers	BME	3	0	0	3
5	Microcontroller & Applications	ECE	3	0	0	3
6	Biomaterials & Artificial Organs	BME	3	0	0	3
PRACTICAL						
7	Communication Systems Lab	ECE	0	0	3	2
8	Biotransducers Lab	BME	0	0	3	2
9	Microcontroller Lab	ECE	0	0	3	2
10	Personality Skill Development – II	MGMT/ENGLISH	0	0	2	1
TOTAL						**27**

V SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	Environmental Science and Engineering	CHEM	3	0	0	3
2	Medical Instrumentation-II	BME	3	1	0	4
3	Linear Integrated Circuits	ECE	3	0	0	3
4	Biomedical Signal Processing	BME	3	1	0	4
5	Computers in Medicine	BME	3	0	0	3
6	Elective – I		3	0	0	3
7	Industrial Training I (To be undergone after IV Semester)	BME	0	0	0	1
PRACTICAL						
8	Medical Instrumentation Lab	BME	0	0	3	2
9	Linear Integrated Circuits Lab	ECE	0	0	3	2
10	Biomedical Signal Processing Lab	BME	0	0	3	2
11	Aptitude – I	BME	0	0	2	1
TOTAL						**28**

VI SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	Medical Image Processing	BME	3	0	0	3
2	Radiological Equipments	BME	3	1	0	4
3	Bio –Telemetry	BME	3	0	0	3
4	Nanotechnology in Medicine	BME	3	0	0	3
5	Assist Devices	BME	3	0	0	3
6	Elective -II		3	0	0	3
PRACTICAL						
7	Medical Image Processing Lab	BME	0	0	3	2
8	Biosensors & Signal Conditioning Lab	BME	0	0	3	2
9	Hospital Training – I	BME	0	0	3	2
9	Aptitude – II	BME	0	0	2	1
TOTAL						**26**

VII SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	Professional Ethics and Human Values	GEN	3	0	0	3
2	Disaster Mitigation and Management	CIVIL	3	0	0	3
3	Medical Waste Management	BME	3	0	0	3
4	Hospital Engineering	BME	3	0	0	3
5	Biometric Systems	BME	3	1	0	4
6	Elective – III		3	0	0	3
PRACTICAL						
7	Hospital Training – II	BME	0	0	3	2
8	Mini Project	BME	0	0	3	2
9	Comprehension	BME	0	0	3	2
TOTAL						**25**

VIII SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	Elective –IV		3	0	0	3
2	Elective –V		3	0	0	3
3	Elective –VI		3	0	0	3
PRACTICAL						
4	Project Work & Viva Voce	BME	0	0	12	6
TOTAL						**15**

ELECTIVES LIST

S.No.	Course Title	Offering Department	L	T	P	C
1	Human Anatomy and Physiology	BIOTECH	3	0	0	3
2	Nuclear Medicine	PHYSICS	3	0	0	3
3	Advanced Medical Imaging Systems	BME	3	0	0	3
4	Advanced Microcontrollers	ECE	3	0	0	3
5	Robotics & Automation in Medicine	BME	3	0	0	3
6	Medical Physics	PHYSICS	3	0	0	3
7	Brain Computer Interface	BME	3	0	0	3
8	Bio Medical Micro Devices	BME	3	0	0	3
9	Telemedicine & PACS	BME	3	0	0	3
10	Design of Medical Devices	BME	3	0	0	3
11	Total Quality Management	MGMT	3	0	0	3
12	Managerial Economics & Financial Analysis	MGMT	3	0	0	3
13	Virtual Instrumentation	ECE	3	0	0	3
14	Biomedical Informatics	BME	3	0	0	3
15	Therapeutic & Surgical Equipments	BME	3	0	0	3
16	Embedded & Real Time systems	ECE	3	0	0	3
17	Rehabilitation Engineering	BIOTECH	3	0	0	3
18	Pathology and Microbiology	BIOTECH	3	0	0	3
19	Artificial Intelligence and Pattern Recognition	ECE	3	0	0	3
20	Quality Control in Biomedical Engineering	BME	3	0	0	3
21	Information Security	CSE	3	0	0	3
22	Cyber Security	CSE	3	0	0	3
Industrial Electives						
23	Business Intelligence and its Applications	INFOSYS	3	0	0	3
24	Soft Skills	INFOSYS	3	0	0	3
25	Learning IT Essentials by Doing	INFOSYS	3	0	0	3

SEMESTER I	L	T	P	C
ENGLISH FOR ENGINEERS	3	0	0	3

(For I year BE- common to all branches)
2015-2016 Regulations – First Semester

OBJECTIVES:

- To enable students to develop LSRW skills in English.
- To become effective communicators in English.
- To ensure that learners use Electronic media materials for developing language skills.

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.

Unit – I

Self introduction - Simulations using E Materials - Whatsapp, Face book, Hiker, Twitter- Effective Communication with Minimum Words - Interpretation of Images and Films - Identify the different parts of speech– Common Errors in English – Scientific Vocabulary, (definition and meaning) - Listening Skills- passive and active listening, Listening to native speakers, , guided note taking - Characteristics of a good listener– Telephonic conversation with dialogue.

Unit – II

Articles - Phonetics (Vowels, Consonants and Diphthongs) – Pronunciation Guidelines –Listening to Indian speakers from different regions, intrusion of mother tongue – Homophones – Homonyms, Note taking and Note making - Difference between Spoken and Written English- Use of appropriate language - Listening and Responding to Video Lectures (Green India, environment, social talks) - Extempore.

Unit – III

Tense forms- Verbal & Non verbal communication – Describing objects – Process Description- Speaking Practice – Paragraph Writing on any given topic (My favourite place, games / Hobbies / School life, etc.) – Types of paragraphs- Telephone Etiquettes.

Unit – IV

Impersonal Passive Voice- Conditional Sentences – Technical & Non technical Report Writing (Attend a technical seminar & submit a report) – News Letters & Editing –Skimming & Scanning - How to Improve Reading Speed – Designing Invitations & Poster Preparation.

Unit – V

Sentence Pattern (SVOCA) - Statement of Comparison - Transcoding – Informal letters - SWOT analysis– Resume Writing- Difference –Bio – data, Resume and CV.

References:

1. Practical English Usage- Michael Swan (III edition), Oxford University Press
2. Grammar Builder- I, II, III, and Cambridge University Press.

SEMESTER I	L	T	P	C
PHYSICS FOR ENGINEERS	3	0	0	3

AIM:

To familiarize students with the basic concepts of Physics and their application in Engineering & Technology

OBJECTIVE:

- To understand the elastic properties of materials
- To understand the properties of crystals
- To understand the significance of laser and its applications in technology
- To understand the basic principles of optical fibres and their applications
- To understand the Non-Destructive Testing techniques

OUTCOMES:

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

- The fundamental knowledge in physics will improve the scientific thinking of students

UNIT I – Properties of matter **9**

Elasticity – Hooke's law – Stress-strain diagram - Relationship between three moduli of elasticity (qualitative) - Poisson's ratio – Young's modulus by uniform bending and non-uniform bending – Experimental determination of rigidity modulus – I-shaped girders.

UNIT II – Crystal Physics **9**

Unit cell – Bravais lattice – Miller indices – Calculation of number of atoms per unit cell – atomic radius – coordination number – packing factor for SC, BCC, FCC, HCP structures – Crystal imperfections – point, line, surface and volume defects.

UNIT III – Lasers **9**

Laser characteristics - Stimulated Emission – Population Inversion - Einstein coefficients – Lasing action – Types of Laser – Nd:YAG laser, CO_2 laser, GaAs laser – Applications of Laser – Holography – construction and reconstruction of a hologram

UNIT IV – Fibre Optics **9**

Principle and propagation of light in optical fibres – numerical aperture and acceptance angle – types of optical fibres (material, refractive index, mode) – Applications: Fibre optic communication system – fibre optic displacement sensor and pressure sensor.

UNIT V - Non – Destructive Testing **9**

Introduction – Types of NDT - Liquid penetrant method – characteristics of penetrant and developer - ultrasonic flaw detector – Ultrasonic scanning methods - X-ray Radiography: displacement method – X-ray Fluoroscopy.

Total hours : 45

TEXT BOOK

"Engineering Physics", compiled by Department of Physics, Vinayaka Missions University, Salem.

REFERENCE BOOKS

1. Beiser, Arthur, "Concepts of Modern Physics", 5th Ed., McGraw-Hill, 2009.
2. Halliday.D, Resnick.R, Walker.J, Fundamentals of Physics, Wiley & sons, 2013.
3.Gaur R. K. and Gupta S. L., "Engineering Physics", Dhanpat Rai publishers, New Delhi, 2001.
4. Avanadhanulu.M.N., Arun Murthy.T.V.S, Engineering Physics Vol. I, S.Chand, 2014.
5. Rajendran. V, "Engineering Physics", Tata Mc Graw Hill Publication and Co., New Delhi, 2009.

SEMESTER I	L	T	P	C
CALCULUS FOR ENGINEERS	3	1	0	4

Common to BE First Semester
(MECH, ECE, BME, CSE, CSSE, EEE, EIE, CIVIL, IT, MECHT,
AERO, ETC & AUTO)

AIM:
To provide students with mathematical knowledge and skills needed to support their concurrent and subsequent engineering and science studies

OBJECTIVES:
- To improve their ability in solving geometrical applications of differential calculus problems
- To equip themselves familiar with the functions of several variables.
- To have knowledge in multiple calculus
- To improve their ability in Vector calculus

OUTCOME:
Upon completion of the course, the student should be able to
- To impart analytical ability in solving Mathematical problems as applied as the respective branches of Engineering.

UNIT I : APPLICATION OF DIFFERENTIAL CALCULUS
Curvature – Cartesian and Parametric Co-ordinates – Centre and radius of curvature – Circle of curvature – Evolute

UNIT II: FUNCTIONS OF SEVERAL VARIABLES
Partial Derivatives – Total Differential - Maxima and Minima – constrained Maxima and Minima by Lagrangian Multiplier Method.

UNIT III : INTEGRATION
Concept of integration-Integration of Rational and Trigonometric functions – Using Partial Fractions – Integration by parts.

UNIT IV : MULTIPLE INTEGRAL
Double integration –change of order of integration- Cartesian and polar coordinates –Area as a double integral – Triple integration.

UNIT V : VECTOR CALCULUS
Directional derivatives – Gradient, Divergence and Curl – Irrotational and solenoidal- vector fields – Vector integration – Green‟s theorem, Gauss divergence theorem and Stoke‟s theorem (excluding proof).

TEXT BOOK:

1. **"**Engineering Mathematics**"** by Department of Mathematics, VMU
2. Veerarajan, T., "Engineering Mathematics", Tata McGraw Hill Publishing Co., NewDelhi, 2006.

3. Dr.A .Singaravelu , Engineering Mathematics Volume I & Volume II by Meenakshi Publications.

REFERENCES:

1. Grewal, B.S., “Higher Engineering Mathematics” (36th Edition), Khanna Publishers, Delhi 2001.
2. Kreyszig, E., “Advanced Engineering Mathematics” (8th Edition), John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.
3. Kandasamy .P., Thilagavathy. K., and Gunavathy. K., “Engineering Mathematics”, Volumes I & II (4th edition), S.Chand & Co., New Delhi., 2001.
4. T. Veerarajan, “Engineering Mathematics” (for semester III), Third Edition Tata McGraw- Hill Publishing Company limited.

SEMESTER I	L	T	P	C
ESSENTIALS OF COMPUTER SCIENCE AND ENGINEERING	3	0	0	3

(Common for All Branches)

AIM:

The aim is to introduce the fundamentals of Computer to the students

OBJECTIVES:

- To provide basic knowledge on hardware and software components of computers.
- To introduce and demonstrate various software applications
- To introduce Problem solving methodologies
- To learn about Implementation of Algorithms
- To learn about HTML

OUTCOMES:

Upon completion 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.

UNIT I - Basics of Computer and Information Technology 10

Computer – Generations, Types of Computers, Block diagram of a computer- Components of a computer system - Hardware and software definitions - Categories of software – Booting - Installing and Uninstalling a Software - Software piracy - Software terminologies - Applications of Computer - Role of Information Technology - History of Internet - Internet Services.

UNIT II - Software Applications (Practical Learning) 7

Office Automation: Application Packages - Word processing (MS Word) - Spread sheet (MS Excel) – Presentation (MS PowerPoint).

UNIT III - Problem Solving Methodologies 10

Problems Solving Techniques - Program Development Cycle – Algorithm Development - Flow chart generation – Programming Constructs (Sequential, Decision-Making, Iteration) - Types and generation of programming languages

UNIT IV Implementation of Algorithms 9

Implementation of Algorithms-program verification-The efficiency of algorithms-The analysis of algorithms-Fundamental Algorithms

UNIT V HTML 9

Basics of HTML – Applications of HTML – HTML Fonts – anchor tag and its attributes – Using images in HTML programs – list tag - Table tag – HTML forms

TOTAL HOURS: 45

TEXT BOOKS

1. *Essentials of Computer Science and Engineering – by VMU*

SEMESTER I	L	T	P	C
ESSENTIALS OF CIVIL AND MECHANICAL ENGINEERING	3	0	0	3

OBJECTIVES:

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

OUTCOME:

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

- Ability to fabricate carpentry components and pipe connections including plumbing works.
- Ability to use welding equipment's to join the structures.

A - CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 9

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

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

UNIT II BUILDING COMPONENTS AND STRUCTURES 9

Foundations: Types – Requirement of good foundations. Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Types of Bridges and Dams

B – MECHANICAL ENGINEERING

UNIT III ENERGY SOURCES 9

Introduction, Classification of Power Plants – Working principle of steam, Diesel, Hydro and Nuclear Power plants – Merits and Demerits – Introduction to Renewable Energy Sources

UNIT IV IC ENGINES & REFRIGERATION AND AIR CONDITIONING SYSTEM 9

Internal combustion engines – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines.

Basic Terminology of Refrigeration and Air Conditioning-Principle of vapour compression and absorption system.

UNIT V BASIC MANUFACTURING PROCESSES 9

Casting process-Introduction, Principle, Advantages, casting defects

Forging process-introduction, forging, rolling, drawing, extrusion

Welding process- introduction, principle, types-Gas and arc welding

TOTAL: 45 PERIODS

REFERENCES:

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

PRACTICALS

SEMESTER I	L	T	P	C
PHYSICS LAB (Real & Virtual)	0	0	3	2

AIM

To understand the experiments through online virtual demonstration followed by real hands-on experience

OBJECTIVE

- To understand the working principle of various physics equipments
- To learn about taking reading precisely
- To know about the systematic handling of equipments

OUTCOME:

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

- Students will have the knowledge of taking measurements precisely

List of Experiments

1. Young's modulus of a bar - Non-uniform bending
2. Rigidity modulus of a wire - Torsional Pendulum
3. Viscosity of a liquid - Poiseuille's method
4. Velocity of ultrasonic waves in liquids - Ultrasonic Interferometer
5. Particle size determination using Laser
6. Wavelength of spectral lines – grating - Spectrometer
7. Thickness of a wire - Air wedge Method
8. Thermal conductivity of a bad conductor - Lee's disc
9. Band gap determination of a thermistor - Post Office Box
10. Specific resistance of a wire – Potentiometer

SEMESTER I	L	T	P	C
WORKSHOP PRACTICES	0	0	3	2

(Common to all Branches - Except Bio-Tech & Bio info)

OBJECTIVES:

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

OUTCOME:

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

- Ability to fabricate carpentry components and pipe connections including plumbing works.
- Ability to use welding equipment's to join the structures.

FITTING

1. Square Joint
2. Dove Tail Joint

CARPENTRY

1. Half Lap Joint
2. Dove Tail Joint

WELDING

1. Arc Welding of butt Joint.
2. Arc Welding of Lap Joint

CASTING

1. Foundry – Mould Preparation using single piece pattern

DEMONSTRATION

1. Sheet Metal – Fabrication of cone
2. Black Smithy – Round to square rod

Reference:

1."Basic Workshop Practice", Department of Mechanical Engineering, Vinayaka Missions University

SEMESTER I	L	T	P	C
COMPUTER LAB	0	0	3	2

(Common for all branches)

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.

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.

LIST OF EXPERIMENTS:

1. Implement Mail Merge in MS-Word and send letters to parents regarding the semester fee structure of the student.
2. Using MS-Word, create a leave letter addressed to your faculty advisor
3. A) Using MS-Word, create a table for a list of students with different font sizes and colours
   B) Using MS-Word, create a flow-chart using the basic shapes available. Use page border, a watermark, header and footer
4. Using MS-PowerPoint, create a presentation about the university
5. Using MS-PowerPoint, create a story line with various animations and transition effects.
6. Using MS-Excel, Analyze Students performance using MS-Excel and prepare a chart type report.
7. Using MS-Excel, create a pivot table
8. Using MS-Excel, create look-up tables
9. Using MS-Excel, create graphs for the weather condition in various cities of India
10. Create an HTML page Create an HTML page to
    a) Click on a link and go to the bottom of the page using <a href>
    b) Display an image.
11. Create an HTML page to
    a) Display ordered and unordered lists of your friends names and sports persons
    b) Display a table with 3 columns and 4 rows.

SEMESTER II	L	T	P	C
BUSINESS ENGLISH	3	0	0	3

(For I year BE, Common to all branches)
2015 - 2016 Regulations – Second Semester

OBJECTIVES:

- To impart and enhance corporate Communication
- To enable learners to develop presentation skills.
- To build confidence in learners to use English in Business contexts.

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.

Unit – I

Subject and verb agreement (Concord) – Preposition and Relative Pronoun – Cause and effect- Phrasal Verbs – Idioms and Phrases – Listening comprehension - Listening to Audio Files and Answering Questions – Framing Questions – Negotiation skills, Persuasion Skills and Debating skills.

Unit – II

Stress (Word stress and Sentence stress) – Intonation – Difference between British and American English– Vocabulary – Indianism - Compound Words (including technical terminology).

Unit – III

Reading Skills – Understanding ideas and making inferences – Group Discussion – Types of Interviews, FAQs – e- mail Netiquette, Sample e-mails – Watching Documentary Films and responding to questions.

Unit – IV

Corporate communication – Recommendation - Instruction – Check List- circulars- Inter office memo – Minutes of meeting and Writing agenda – Discourse Markers- Rearranging the jumbled sentences – Technical Articles – Project Proposals, Making Presentations on given topics – Preparing Power Point Presentations.

Unit – V

Critical Reading – Book Review - Finding Key Information and Sifting Facts from Opinions – Business letters (Calling for Quotation, Placing orders and Complaint letters) – Expansion of an Idea. – Creative Writing.

References:

1. Grammar Builder- I, II, III -Cambridge University Press.

Technical English-Writing, Reading and Speaking- Pickett and Lester, Harper and Row publication

SEMESTER II	L	T	P	C
CHEMISTRY FOR ENGINEERS	3	0	0	3

(Common to all branches except Biotechnology)
B.E / B.Tech. - SECOND SEMESTER –CBCS regulations 2015

OBJECTIVE:

- To impart in basic knowledge in chemistry so that the student will understand the engineering concept and they can face the competitive examinations effectively.
- To improve the knowledge in the instrument applications.
- To inculcate the knowledge of advanced material.

OUTCOME:

At the end of the course students will come out with knowledge of basic Engineering chemistry.

UNIT I : ELECTROCHEMISTRY, BATTERIES AND FUEL CELLS 9 Hrs

Ostwald Law and Debye Huckle's law - Electrode potential - Nernst equation – Electrodes (SHE, Calomel and Glass)- cells - EMF measurement-emf and galvanic series.

Primary battery (Daniel and dry cell) – secondary battery (lead Acid storage battery and Nickel-Cadmium battery) – Fuel cell (H_2-O_2 fuel cell)

UNIT II : WATER TECHNOLOGY & CORROSION 9 Hrs

Sources of water – impurities – Hardness and its determination (problems to be avoided) – boiler troubles – water softening (zeolite & Demineralisation) – Domestic water treatment – Desalination (Electrodialysis & Reverse Osmosis).

Corrosion – Types – principles – corrosion control methods (Electroplating,Electroless plating, Sacrificial anode and Impressed current method).

UNIT III: CHEMISTRY OF ADVANCED MATERIALS 9 Hrs

Refractories – properties and uses, Portland cement –manufacturing, setting and hardening –Special cement, ceramics.

Organic electronic material, shape memory alloys, smart materials,polymers(PVC,Teflon, Bakelite)-fibers(optical fibre) & composites (FRP,MMC & PMC)

UNIT IV : PHASE EQUILIBRIA & NUCLEAR CHEMISTRY 9 Hrs

Phase rule: statement and explanation of terms involved – One component system (water) – Condensed phase rule – Two component system (Lead-silver) .

Nuclear Chemistry – Fission – Fusion – working of nuclear reactor – Radiations and harmful effects.

UNIT V : CHROMATOGRAPHY AND SPECTROSCOPY 9 Hrs

Chromatography — classification (Paper, Column, Thin Layer, Gas, HPLC). Principle and applications.

Spectroscopy – Electromagnetic radiation – Beer Lambert's law – UV – Visible – IR – Atomic absorption & flame emission spectroscopy (Principle,Instrumentation, block diagram).

TEXT BOOK: Engineering Chemistry by VMU.

References:

1. A text book of Engineering Chemistry by S.S. Dara, S.Chand & company Ltd., New Delhi
2. Engineering Chemistry by Jain & Jain, 15th edition Dhanpatrai Publishing Company (P) Ltd., New Delhi
3. A text book of Engineering Chemistry by Shashi Chawla,Edition 2012 Dhanpatrai & Co., New Delhi.
4. Engineering Chemistry by Dr.A.Ravikrishnan,Sri Krishna Publications, Chennai

SEMESTER II	L	T	P	C
TRANSFORMS AND MATRICES	3	1	0	4

Common to BE - Second Semester

(MECH, ECE, CSE, CSSE, EEE, EIE, CIVIL, IT, MECHT, AERO, ETC & AUTO)

AIM:

To provide students with mathematical knowledge and skills needed to support their concurrent and subsequent engineering and science studies

OBJECTIVE:

- To apply advanced matrix knowledge to Engineering Problems\
- Transform techniques are very useful in the field of signal and system analysis.
- Z - transform plays an important role in analysis of Discrete signals. This is a prelude to learn higher semester courses.
- To provide the standard methods for solving differential equations as well as methods based on the use of matrices or Laplace transforms

OUTCOME:

To impart analytical ability in solving Mathematical problems as applied as the respective branches of Engineering.

UNIT I

MATRICES

Characteristic equation – Eigen values and eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors (Without proof) – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form.

UNIT II

LAPLACE TRANSFORMS

Laplace transform – transform of elementary functions – basic properties – derivatives and integrals of transforms – transforms of derivatives and integrals – initial and final value theorems – Transform of periodic functions.

UNIT III

INVERSE LAPLACE TRANSFORMS & APPLICATIONS

Inverse Laplace transform – Convolution theorem – Initial and Final value theorem-Solution of linear ODE of second order with constant coefficients and first order simultaneous equation with constant coefficients using Laplace transforms.

UNIT IV
FOURIER TRANSFORMS
Fourier transform pairs - Fourier Sine and Cosine transforms – Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

UNIT V
Z-TRANSFORMS
Z-Transform – Elementary Properties – Inverse Z-Transform – Convolution Theorem – Formation of Difference Equations – Solution of Difference Equations using Z-Transform.

TEXT BOOKS

1. **"**Engineering Mathematics**"** by Department of Mathematics, VMU
2. Veerarajan, T., "Engineering Mathematics", Tata McGraw Hill Publishing Co., NewDelhi, 2006.
3. Dr.A .Singaravelu , Engineering Mathematics Volume I & Volume II by Meenakshi Publications.
4. A.Singaravelu,"Transforms and Partial Differential Equations", Meenakshi Agencies,Chennai

REFERENCE BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics" (36th Edition), Khanna Publishers,Delhi 2001.
2. Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.
3. Kandasamy .P., Thilagavathy. K., and Gunavathy. K., "Engineering Mathematics",Volumes I,II & III (4th edition), S.Chand & Co., New Delhi., 2001

SEMESTER II	L	T	P	C
C PROGRAMMING	3	0	0	3

(Common for All Branches)

AIM:

The aim is to introduce C programming to the students.

OBJECTIVES:

- To introduce Basics of C
- To understand Control Structures & Arrays
- To learn about String concept, Structure and Union in C
- To introduce the concepts of Functions and Pointers
- To introduce Memory and File management concepts in C

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

UNIT I - Basics of C **9**

Identifiers, variables, expression, keywords, data types, constants, scope of variables. Operators: arithmetic, logical, relational, conditional and bitwise operators - Special operators: size of () & comma (,) operator - Precedence and associatively of operators - Type conversion in expressions.

UNIT II - Control Structures & Arrays **9**

Basic input/output and library functions: Single character input/output i.e. getch(), getchar(), getche(), putchar() - Formatted input/output: printf() and scanf() – Library functions (mathematical and character functions). Decision Making and Branching – Looping statements. Arrays – Initialization – Declaration – One dimensional and two dimensional arrays.

UNIT III String, Structure & Union **9**

Strings: Declaration-Initialization and string handling functions. Structure and Union: structure declaration and definition – Accessing a Structure variable – Structure within a structure – Union.

UNIT IV Functions and Pointers **9**

Function –Function Declaration–function definition- Pass by value – Pass by reference – Recursive function – Pointers - Definition – Initialization – & and * operators - Pointer to functions-Function returning pointers – Pointers and arrays

UNIT V Memory and File management **9**

Static and dynamic memory allocation - Storage class specifier - Preprocessor directives. File handling concepts – File read – write- Functions for file manipulation: fopen, fclose, gets, puts, fprintf, fscan, getw, putw, fputs, fgets, fread, fwrite - Random access to files: fseek, ftell, rewind - File name as Command Line Argument.

TOTAL HOURS: 45

TEXT BOOKS:

1. Balaguruswami.E, "Programming in C", TMH Publications,1997

REFERENCE BOOKS:

1. Behrouz A. Forouzan & Richard F. Gilberg, "Computer Science A Structured Programming using C", Cengage Learning, 3rd Edition, 2007

2. Gottfried , "Programming with C", schaums outline series, TMH publications,1997

3. Mahapatra , "Thinking in C", PHI publications, 2nd Edition, 1998.

4. Subbura.R , "Programming in C", Vikas publishing, 1st Edition, 2000

SEMESTER II	L	T	P	C
ELECTRONIC DEVICES	3	0	0	3

OBJECTIVES:

The student should be made to:

- Be exposed to basic electronic devices
- Be familiar with the theory, construction, and operation of Basic electronic devices.

OUTCOMES:

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

- Explain the theory, construction, and operation of basic electronic devices.
- Use the basic electronic devices

UNIT I-SEMICONDUCTOR DIODES AND SPECIAL PURPOSE DIODES (10 hours)

Overview on Physics and Properties of Semiconductors: Intrinsic semiconductor – extrinsic semiconductor – Fermi level in an intrinsic semiconductor – conductivity of a metal, intrinsic semiconductor and extrinsic semiconductor – drift – diffusion – recombination – carrier life time. Semiconductor diodes: Formation of PN junction – working principle – VI characteristics – Zener Diode – VI characteristics.

UNIT II-BIPOLAR TRANSISTORS (6 hours)

Bipolar Transistors: Construction – working – transistor currents – transistor configurations and input-output characteristics – Early effect (basewidth modulation) – Ebers Moll model – transistor as an amplifier – Transistor as a switch

UNIT III-FIELD-EFFECT TRANSISTORS (8 hours)

Field-Effect Transistors : construction, working and VI characteristics of JFET – comparison of BJT and JFET – MOSFET – enhancement MOSFET, depletion MOSFET, their working principle and VI characteristics, comparison of MOSFET with JFET, comparison of D MOSFET with E MOSFET, CMOS, MESFET, CCD.

UNIT IV-DC POWER SUPPLIES (12 hours)

Rectifiers and Filters : Block schematic of a typical DC power supply, single phase HWR, FWR, full-wave bridge rectifier, power supply filters (ripple factor and efficiency analysis), bleeder resistor, voltage dividers
Voltage regulators: voltage regulation, zener diode shunt regulator, transistor series regulator, transistor shunt regulator, switching regulators, design of complete DC power supply circuit.

UNIT V-INTEGRATED CIRCUIT FABRICATION (9 hours)

Integrated circuit – advantages and drawback of ICs – scale of integration – classification of ICs – definition of linear IC and digital IC with examples – manufacturing process of monolithic ICs – fabrication of components (diode, capacitor, bipolar transistor, resistor and field – effect transistor) on monolithic IC – comparison of MOS ICs and bipolar ICs.

TEXT BOOKS

1. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, Pearson Education, 9th Edition, 2009.
2. B. Somanathan Nair, “Electronic Devices and Applications”, PHI, 2006

REFERENCES

1. Jacob Millman, Christos C Halkias, Satyabrata Jit, “Electron Devices and Circuits”, Tata McGraw Hill, 2010.

2. David A Bell, “Fundamentals of Electronic Devices and Circuits”, Oxford Press, 2009. 3. B L Theraja, R S Sedha, “Principles of Electronic Devices and Circuits”, S.Chand, 2004

PRACTICALS

SEMESTER II	L	T	P	C
ENGINEERING CHEMISTRY LAB	0	0	3	2

(REAL & VIRTUAL)
(Common to all branches except Biotechnology)
B.E / B.Tech. - SECOND SEMESTER –CBCS regulations 2015

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.

OUTCOMES:

The students will be conversant with hands-on knowledge in the quantitative chemical analysis of water quality related parameters, corrosion measurement and cement analysis.

LIST OF EXPERIMENTS:

1. Estimation of total hardness of water sample by EDTA method.
2. Estimation of dissolved oxygen by Winkler's method.
3. Estimation of ferrous ion by Potentiometry.
4. Precipitation reaction by Conductometry.
5. Acid base reaction by pH metry.
6. Estimation of copper from its ore.
7. Estimation of iron by spectrophotometer.
8. Estimation of sodium by flame photometer.
9. Separation of mixture of components using thin layer chromatography.
10. Corrosion experiment by weight loss methos.

SEMESTER II	L	T	P	C
ENGINEERING GRAPHICS LAB	0	0	3	2

(Common to ALL BRANCHES EXCEPT BIOTECH,BIO-INFO)

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.

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.

Concepts and conventions (Not for Examination)

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

UNIT I PLANE CURVES AND FREE HAND SKETCHING 9

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

UNIT II PROJECTION OF POINTS, LINES 9

Projection of points, Projection of straight lines located in the first quadrant: inclined to both planes – Determination of true lengths and true inclinations – rotating line method only.

UNIT III PROJECTION OF SOLIDS 9

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

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 9

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones

UNIT V ISOMETRIC VIEW AND PERSPECTIVE PROJECTION 9

Principles of isometric View – isometric scale – isometric view of simple solids- Introduction to Perspective projection

TEXT BOOKS:

1. N.D. Bhatt, “Engineering Drawing” Charotar Publishing House, 46th Edition, (2003).
2. K. V. Natarajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai (2006).

REFERENCES:

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

SEMESTER II	L	T	P	C
C PROGRAMMING LAB	0	0	3	2

(Common for All Branches)

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.

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

LIST OF EXPERIMENTS:

1. Write a C Program to Implementation of Sine and cosine series
2. Write a C Program to calculate Simple Interest
3. Write a C Program to generate Fibonacci Series using for loop
4. Write a C program to calculate factorial using while loop
5. Write a C Program to
   a) Find the greatest of three numbers using if condition.

   b) Find the greatest of three numbers using conditional operator.
6. Write a C program for finding the roots of a given quadratic equation using conditional control statements
7. Write a C program to
   a) Compute matrix multiplication using the concept of arrays.
   b) Illustrate the concept of string handling functions.
8. Write a C program to
   a) Find the largest element in an array using pointers.
   b) Convert a binary number to decimal or decimal to binary using functions.
9. Write a C program to read data from keyboard, write it to a file named student again read the same data from student file and write it into data file.
10. Write a C program to store employee details using the concept of structures.

SEMESTER II	L	T	P	C
ELECTRONIC DEVICES LAB	0	0	3	2

OBJECTIVES:

The student should be made to:

Be exposed to the characteristics of basic electronic devices

Be familiar Rectifiers & Regulators

OUTCOMES:

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

- Learn the characteristics of basic electronic devices
- Design amplifier circuits & power supplies

List of Experiments

1. Characteristics of PN junction Diode.
2. Characteristics of Zener diode.
3. Input, Output characteristics of CE Amplifier.
4. Input, Output characteristics of CC Amplifier.
5. Transfer characteristics of JFET.
6. Input, Output characteristics of UJT
7. Half wave rectifier.
8. Full wave rectifier.
9. Voltage Regulator.
10. Simulation experiments using PSPICE.

SEMESTER III	L	T	P	C
STOCHASTIC PROCESS AND NUMERICAL METHODS	3	1	0	4

OBJECTIVES:

- To find the missing values in a table of data using interpolation
- To study the initial value problems of Ordinary Differential Equation using various numerical methods
- To study the analysis of electrical system, signal processing operation using the concept of Random Processes.
- To apply the concept of correlation in RADAR, fault detection in VLSI circuits.

OUTCOMES:

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

- Solve their engineering problems using interpolation techniques.
- Understand the calculation and interpretation of errors in numerical methods.
- Identify the numerical techniques for their engineering problem
- To develop the skills of the students in the area of Probability and Random Process.
- Have knowledge in Probability theory.

UNIT-I: INTERPOLATION AND APPROXIMATION 12

Interpolation with Newton's divided differences, Lagrange's polynomial, Newton forward and backward differences, central difference Formula (Stirling's and Bessel's)

UNIT-II: INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single Step Methods - Taylor Series, Euler and Modified Euler, Runge-Kutta method of fourth order -first and second order differential equations. Multistep Methods - Milne and Adam's-Bash forth predictor and corrector methods.

UNIT-III: RANDOM VARIABLES 12

Discrete and continuous random variables- Probability mass function – Probability density functions - moments, Moment generating functions and their properties.

UNIT-IV: RANDOM PROCESSES 12

Classification, Stationary and Markov process, Binominal process, Poisson process, Sine-wave process, Ergodic processes.

UNIT-V: CORRELATION FUNCTION AND SPECTRAL DENSITIES 12

Auto correlation for discrete and continuous process, Cross correlation functions - properties, Power spectral density, Cross spectral density – properties

Lecture Hours: 45; Tutorial Hours: 15

Total hours : 60

Text Books:

1. A. Singaravelu ,"Numerical Methods" , Meenakshi Agency, Chennai
2. A. Singaravelu, S. Sivasubramanian and R. Ramaa, "Probability and Random Processes", Revised Edition 2013, Meenakshi Agency, Chennai.

References:

1. T.Veerarajan, T.Ramachandran, “Numerical Methods with Programs in C and C++”, Tata McGraw-Hill (2004).
2. P.Kandasamy, K.Thilagavathy, K.Gunavathy “ Probability, Random Variables and Random Processes” (First Edition 2003) : S.Chand &Company Ltd., New Delhi.
3. Kapur.J.N. and Saxena.H.C.”Mathematical Statistics”,S.Chand & Company Ltd.New Delhi(1997)

SEMESTER III	L	T	P	C
BIOMEDICAL CIRCUITS AND NETWORKS	3	0	0	3

AIM

To enable the students to acquire knowledge about the basics of circuit analysis, network theorems and AC circuits.

OBJECTIVE:

- To understand the basic methods of circuit analysis using Mesh & Nodal Analysis
- To understand the various Network theorem and apply them in biomedical circuits
- To get an insight into solution of RLC circuits as well as Analysis of coupled circuits
- To understand the concept of complex frequency and Total responses of RL, RC & RLC circuits
- To Analyse the two Port network parameters and Stability of Network

OUTCOMES:

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

- Know the basic methods of circuit analysis
- Explain the various network theorem
- Described the concept of complex frequency and RLC circiut

UNIT I - METHODS OF ANALYSING CIRCUITS 9

Introduction: Tree and Co-Tree, Twigs and Links, Incidence Matrix, Link Current, Tie Set Matrix, Cut Set and Tree Branch Voltages, Mesh and Super mesh analysis, Mesh equation by Inspection method, Nodal & Super Nodal Analysis, Nodal Equations by Inspection Method, Source Transformation Technique, Analyzing simple biomedical circuits

UNIT II - NETWORK THEOREMS 9

Star-Delta Transformation, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Superposition Theorem, Compensation Theorem, Reciprocity theorem, Millman's theorem, Tellegen's theorem, Substitution theorem, Duals and Duality, Applying theorems in biomedical related circuits.

UNIT III - AC CIRCUITS AND COUPLED CIRCUITS 9

Power & Power factor, Series resonance-Q factor, Bandwidth, Parallel resonance-Q factor, Bandwidth, Self Inductance- Mutual Inductance - Coefficient of coupling, dot rule- effective inductance of coupled coils in series, Analysis: Coupled, Single-tuned, and Double-tuned circuits.

UNIT IV - TRANSIENT ANALYSIS 9

Concept of complex frequency, Representation of network elements in time-, and frequency domain, Free and forced responses of RL, RC, and RLC circuits with DC and Sinusoidal- excitation

UNIT V - TWO PORT NETWORKS & ELEMENTS OF REALIZABILITY THEORY 9

Network functions of one port and two port networks, Poles and Zeros of network functions, two port Parameters: z, y, Two port Parameters: h, inverse h, ABCD, Conversion between parameters, Causality and Stability analysis of network functions, Hurwitz polynomial, Positive Real Functions.

TEXTBOOKS

1. Hayt, Kemmerley & Durbin, "*Engineering circuit Analysis*", Tata McGraw Hill, 7th Edition 2008

2. Sudhakar.A and Shyammohan.S P, "*Circuits and Networks- Analysis and Synthesis"*, Tata McGraw Hill, 4th Edition 2010

REFERENCES

1. Franklin F. Kuo, "*Network Analysis and Synthesis"*, John Wiley & Sons, 2nd Edition Reprint 2009.
1. Arumugam & Premkumar, "*Electric Circuit Theory"*, Khanna Publishers, First Edition 2002.
2. Mahmood Nahvi & Joseph Edminister, "*Schaum's Outline of Electric circuits"*, McGraw-Hill Education, 5th edition 2011.
3. Aatre V.K, "*Network Theory and Filter Design"*, New Age International Publishers, 2nd Edition Reprint 2003.

SEMESTER III	L	T	P	C
DIGITAL ELECTRONICS	3	1	0	4

(Common to ECE, BME & EEE)

AIM

The Aim of this course is to develop a strong foundation in analysis and design of digital electronics.

OBJECTIVES:

- Understand the basic concepts.
- Understand concepts of logic gates constructional features.
- To understand the concepts of gate-level minimization & combinational logic.
- To analyze synchronous sequential logic.

OUTCOMES:

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

- Know the basic concepts of digital electronic.
- Explain different types of logic gates and their applications.
- Know some of the commonly used circuits in biomedical application.

UNIT – I: NUMBER SYSTEM 9

Digital System, Binary Numbers, Number-Base Conversions, Octal & Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Binary Codes, Binary Storage And Registers, Binary Logic

UNIT – II: BOOLEAN ALGEBRA, LOGIC GATES & GATE –LEVEL MINIMIZATION 9

Introduction, Boolean algebra, basic theorem & properties of Boolean algebra, Boolean functions, canonical & standard forms, logic operations, logic gates, integrated circuits, map method, four variable K-maps, product of sums simplification, don't care conditions, NAND & NOR implementations, Exclusive-OR Function, Hardware Description Language.

UNIT – III: COMBINATIONAL LOGIC 9

Introduction, Combinational Circuits, Analysis Procedure, Design Procedure ,Binary Adder- Subractor , Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders , Multiplexers , HDL Models Of Combinational Circuits.

UNIT – IV: SYNCHRONOUS SEQUENTIAL LOGIC, REGISTER & COUNTERS 9

Sequential circuits, storage elements: latches, flip flops, analysis of closed sequential circuits, synthesizable HDL Models of sequential circuits, state reduction assignment, design procedure, shift registers, ripple counters, synchronous counters, HDL for registers and Counters.

UNIT – V: DESIGN AT THE REGISTER TRANSFER LEVEL 9

Register Transfer Level Notation, Register Transfer Level In HDL, ASM, Sequential Binary Multiplier, Control Logic, HDL Description Of Binary Multiplier, Design With Multiplexers, Race Free Design, Latch Free Design.

TOTAL HOURS: 45

TEXT BOOKS:

1. Morris Mano, “Digital Design(with an introduction to the verilog HDL)", Prentice-Hall of India, (UNITS-I,II,III,IV,V)

REFERENCE BOOKS:

1. William I. Fletcher, “An Engineering Approach to Digital Design ", Prentice-Hall of India, 1980
2. Floyd T.L., “Digital Fundamentals ", Charles E. Merrill publishing Company, 1982.
3. Tokheim R.L., “Digital Electronics - Principles and Applications ", Tata McGraw Hill, 1999.
4. Jain R.P., “Modern Digital Electronics ", Tata McGraw Hill, 1999.

SEMESTER III	L	T	P	C
ELECTRONIC CIRCUITS	3	0	0	3

(COMMON TO ECE & BME)

AIM:

The aim of this course is to introduce to the students the rectifiers, power supplies, basics of biasing transistor circuits, low frequency amplifiers, multi stage amplifiers, power amplifiers, tuned amplifiers, feedback amplifiers and oscillators.

OBJECTIVES:

- To study the biasing circuits and anlayse the small signal BJT amplifiers
- To understand the working and to find the efficiency of different types of large signal amplifiers
- To understand the basic concept and working of various types of feedback amplifiers and oscillators.
- To understand the working of different types of tuned amplifiers and multivibrators and their analysis.

OUTCOMES:

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

- Know the basic operation of rectifiers, filters and power Supplies
- Describe the basic concept and working of various types of feedback amplifiers and oscillators.
- Know the working of different types of tuned amplifiers and multivibrators and their analysis

UNIT I-BIASING CIRCUITS AND SMALL SIGNAL MODELS 9

Biasing circuits: DC load line and bias point – BJT biasing circuits – FET biasing circuits. Small-signal models: AC load line, BJT models and parameters – hybrid equivalent model – hybrid π model, FET small-signal model and parameters.

UNIT II-SMALL-SIGNAL AMPLIFIERS - ANALYSIS AND FREQUENCY RESPONSE 9

BJT amplifiers: CE, CB and CC amplifiers – multistage amplifiers - differential amplifier – designing BJT amplifier networks. (Analysis using hybrid –π model) FET amplifiers: CS, CG and CD amplifiers –designing FET amplifier networks Frequency response: low frequency response of BJT and FET amplifiers – Miller effect capacitance – high frequency response of BJT and FET amplifiers.

UNIT III-FEEDBACK AND OSCILLATOR CIRCUITS 9

Feedback circuits: concept of feedback – effects of negative feedback – feedback connection types – practical feedback circuits – phase and frequency considerations – designing feedback amplifier circuits – Applications of feedback circuits. Oscillator circuits: oscillator principles – LC oscillators – RC oscillators – crystal oscillators – designing oscillator circuits – Applications of oscillators in real time circuits.

UNIT IV-POWER AMPLIFIERS AND TUNED AMPLIFIERS 9

Power amplifiers: definitions and amplifier types – Q point placement – maximum dissipation hyperbola – Class A amplifier – Class B and Class AB push-pull amplifiers – Class C amplifiers – Amplifier distortions – heat sink – designing power amplifier circuits. Tuned amplifiers: need for tuned circuits – single tuned – double tuned – synchronously tuned amplifiers – impedance matching to improve gain – design of basic tuned amplifier – Real Time Applications of amplifiers.

UNITV-SOLID STATE SWITCHING CIRCUITS **9**

Types of waveforms – transistor switching times – multivibrators – astable multivibrator – monostable multivibrator – bistable multivibrator – schmitt trigger – design of multivibrators and Schmitt trigger – Applications of switching circuits.

TOTAL HOURS: 45

TEXT BOOKS:

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, 9th Edition, 2009.
2. David A Bell, "Fundamentals of Electronic Devices and Circuits", Oxford University Press, 2009.
3. David A. Bell, "Solid State Pulse Circuits", Oxford University Press, 2007.

REFERENCES:

1. Jacob Millman, Christos C Halkias, Satyabrata Jit, "Electron Devices and Circuits", Tata McGraw Hill, 2010.
2. Thomas L. Floyd, "Electronic Devices", 9th edition, Pearson Education, 2011.
3. Albert P. Malvino, David J. Bates, "Electronic Principles", 7th edition, Tata McGraw Hill, 2007.

SEMESTER III	L	T	P	C
ELECTRICAL TECHNOLOGY	3	0	0	3

AIM:
To impart basic knowledge on Electrical machines, principles and its behavior.

OBJECTIVES:
At the end of this course, student would have been exposed to:
- Theory of structures, operating principle, characteristics, and applications of D.C and A.C rotating machines and transformers in detail.
- Introductory knowledge on Special Machines.

OUTCOMES:
Upon completion of the course, the student should be able to:
- Explain the different types of AC and DC machines, its applications
- Know the principles of transformers

1. D.C. MACHINES 12
Construction of D.C. Machines - Principle and theory of operation of D.C. generator - EMF equation - Characteristics of D.C. generators - Armature reaction – Commutation - Principle of operation of D.C. motor - Voltage equation - Torque equation - Types of D.C. motors and their characteristics –Starters - Speed control of D.C. motors - Applications.

2. TRANSFORMERS 9
Principle - Theory of ideal transformer - EMF equation - Construction details of shell and core type transformers - Tests on transformers - Equivalent circuit – Phasor diagram - Regulation and efficiency of a transformer - Introduction to three – phase transformer connections.

3. SYNCHRONOUS MACHINES 8
Principle of alternators:- Construction details, Equation of induced EMF and Vector diagram - Synchronous motor:- Starting methods, Torque, V curves, Speed control and Hunting.

4. INDUCTION MACHINES 9
Induction motor:- Construction and principle of operation, Classification of induction motor, Torque equation, Condition for maximum torque, Equivalent Circuit, Starting methods and Speed control of induction motors.

5. SPECIAL MACHINES 7
Types of single phase motor –Double revolving field theory – Cross field theory – Capacitor start capacitor run motors – Shaded pole motor – Repulsion type motor – Universal motor – Hysteresis motor - Permanent magnet synchronous motor – Switched reluctance motor – Brushless D.C motor.

TOTAL : 45

TEXT BOOKS
1. Nagrath, I.J., and Kothari, D.P., " Electrical Machines", Tata McGraw - Hill, 1997.

2. Fitzgerald A.E, Kingsley C., Umans, S. and Umans S.D., “Electric Machinery”, McGraw- Hill, Singapore, 2000.

REFERENCE BOOKS

1. Theraja, B.L., “A Text book of Electrical Technology”, Vol.II, S.C Chand and Co., New Delhi, 2007.
2. Del Toro, V., “Electrical Engineering Fundamentals”, Prentice Hall of India, New Delhi, 1995.
3. Cotton, H., “Advanced Electrical Technology”, Sir Isaac Pitman and Sons Ltd., London, 1999.

SEMESTER III	L	T	P	C
SIGNALS & SYSTEMS	3	0	0	3

(Common to ECE & BME)

AIM:

The main objective of this subject is to help the students to mathematically analyze different types of signals and their associated systems.

OBJECTIVES:

At the end of this course, the students will be able to understand the

- Various classifications of both Continuous time and Discrete time Signals and Systems.
- Spectral analysis of Periodic and Aperiodic Signals using Fourier series.
- Analysis and characterization of the CT system through Laplace transform.
- Analysis and characterization of the DT system through Difference equation.
- Analysis and characterization of the DT system through Z transform.

OUTCOMES:

Upon completion of the course, the student should 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

UNIT I-CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Classification of Signals:

Continuous time signals - Discrete time signals – Periodic and Aperiodic signals – Even and odd signals – Energy and power signals –Deterministic and random signals –Complex exponential and Sinusoidal signals .Unit step, Unit ramp, Unit impulse – Representation of signals in terms of unit impulse .

Classification of Systems: Continuous time systems- Discrete time systems - Linear system – Time Invariant system – causal system – BIBO system – Systems with and without memory – LTI system.

UNIT II-ANALYSIS OF CONTINUOUS TIME SIGNALS 9

Fourier series:

Representation of Continuous time Periodic signals – Trigonometric and exponential-Symmetry conditions- Properties of Continuous time Fourier series – Parseval's relation for power signals – Frequency spectrum.

Fourier transform: Representation of Continuous time signals- Properties of Continuous time Fourier transform – Parseval's relation for energy signals – Frequency spectrum –Analysis of LTI system using Fourier methods.

UNIT III-LTI CONTINUOUS TIME SYSTEM 9

System modeling:

Solution of Differential equation with initial conditions- Zero state response and Zero input response– impulse response – Frequency response – Convolution – Analysis and characterization of LTI system using Laplace transform.

UNIT IV-ANALYSIS OF DISCRETE TIME SIGNALS AND SYSTEMS 9

Representation of sequences – Discrete Time Fourier Transform (DTFT) - Discrete Fourier Transform (DFT) and its properties – Solution of linear constant coefficient difference equations with initial conditions- Zero state response and Zero input response–- impulse response – Convolution sum - Frequency response.

UNIT V-LTI DT SYSTEM CHARACTERIZATION AND REALIZATION 9

Z transforms and its properties - Inverse Z transform: Power series expansion and Partial fraction methods - Analysis and characterization of DT system using Z transform-Realization of structures for DT systems - Direct form-I- Direct form II--Parallel-Cascade forms.

Theory-45, Tutorial-15 - (60 Periods)

TEXT BOOKS

1. Alan V Oppenheim, Ronald W. Schafer "Discreate Time Signal Processing" Pearson education , 2nd edition, 2007
2. Simon Haykin and Barry Van Veen, *"Signals and Systems",*John Wiley & Sons Inc, 2nd Edition, 2007.

REFERENCES

1. John G. Proakis and Manolakis, *"Digital Signal Processing, Principles, Algorithms and Applications",* Pearson Education, 4thEdition, 2007.
2. B.P. Lathi, *"Linear Systems & Signals",* Oxford Press, Second Edition, 2009.
3. Rodger E Ziemer, William H. Tranter, D. Ronald Fannin, *"Signals and Systems – continuous and Discrete",* Pearson Education, 4th Edition, 2009.
4. Douglas K Linder, *"Introduction to Signals and Systems",*Mc-Graw Hill, 1st Edition, 1999.

SEMESTER III	L	T	P	C
DIGITAL ELECTRONICS LAB	0	0	4	2

(Common to ECE, BME, CSE, EEE & MECHATRONICS)

AIM:

To provide the student with the capability to use simulation tools in digital electronic circuit analysis and design

OBJECTIVE:

- To develop necessary skills to design, analyse and construct the digital circuits
- To design and simulate logic circuits using computing tools

OUTCOMES:

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

- Know the basic concepts of digital electronic.
- Explain different types of logic gates and their applications.
- Know some of the commonly used circuits in biomedical application.

LIST OF EXPERIMENTS

1. Design and implementation of Adder and Subtractor using logic gates.
2. Design and implementation of code converters using logic gates
   a. BCD to excess-3 code and vice versa
   b. Binary to gray and vice-versa.
3. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483.
4. Design and implementation of 2 bit Magnitude Comparator using logic gates 8 Bit Magnitude Comparator using IC 7485
5. Design and implementation of 16 bit odd/even parity checker generator using IC74180.
6. Design and implementation of Multiplexer and De-multiplexer using logic gates.
7. Design and implementation of encoder and decoder using logic gates.
8. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters.
9. Design and implementation of 3-bit synchronous up/down counter.
10. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops.
11. Design of experiments 1, 6, 8 and 10 using Verilog Hardware Description Language.

SEMESTER III	L	T	P	C
ELECTRONIC CIRCUITS LAB	0	0	4	2

(Common to ECE, BME, EEE & EIE)

AIM:

To provide the ability to design the electronic circuits using the basic electronic components.

OBJECTIVE:

- To study the characteristics of basic amplifiers and power supply.
- To verify practically, the response of various oscillators.
- To study of different Multivibrator circuits.

OUTCOMES:

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

- Know the basic operation of rectifiers, filters and power Supplies
- Describe the basic concept and working of various types of feedback amplifiers and oscillators.
- Know the working of different types of tuned amplifiers and multivibrators and their analysis

LIST OF EXPERIMENTS:

Design

1. Fixed Bias amplifier circuits using BJT.
2. BJT Amplifier using voltage divider bias (self-bias) with un bypassed emitter resistor.
3. Class B Complementary symmetry power amplifier.
4. Differential amplifier using BJT.
5. Power supply Full wave rectifier with simple capacitor filter.
6. Series and Shunt feedback amplifiers Frequency response, Input and output impedance calculation.
7. Design of RC Phase shift oscillator:
8. Design Wein Bridge Oscillator.
9. Design of Hartley and Colpitts Oscillator.
10. Design of Astable and Monostable and Bistable Multivibrators.

SEMESTER III	L	T	P	C
ELECTRICAL TECHNOLOGY LAB	0	0	4	2

(Common to BME, EEE & SOLAR)

AIM

To impart basic knowledge on Electrical machines, principles and its behavior.

OBJECTIVES:

- Theory of structures, operating principle, characteristics, and applications of D.C and A.C rotating machines and transformers in detail.
- Introductory knowledge on Special Machines.

OUTCOMES:

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

- Explain the different types of AC and DC machines, its applications
- Know the principles of transformers

1. Load test on dc shunt motor
   Aim: To conduct load test on dc shunt motor and plot its performance characteristics.

2. Load test on dc series motor
   Aim: To conduct load test on dc series motor and plot its performance characteristics.

3. Speed control of dc shunt motor
   Aim: To control the speed of a dc shunt motor by (i) armature control and (ii) field control methods.
4. Load test on single phase transformer
   Aim: To conduct load test on single phase transformer and determine its efficiency and regulation.

5. OCC & load test on DC Shunt generator
   Aim: To conduct OCC and load test on dc self and separately excited generators

6. Swinburne's test
   Aim: To conduct Swinburne's test on a dc shunt motor and predetermine its efficiency as a (i) generator and (ii) motor.
7. Load test on 3-phase induction motor.
   Aim: To conduct load test on 3-phase squirrel cage induction motor and determine its performance characteristics.
8. No load and blocked rotor test on 3-phase induction motor.
   Aim: To conduct no load and blocked rotor tests on 3 phase squirrel cage induction motor and obtain the parameters of the equivalent circuit.
9. Load test on 1-phase induction motor
   Aim: To conduct load test on single phase induction motor and determine its performance characteristics

10. V and inverted V curve of synchronous motors.
    Aim: To draw the V and inverted V curves of synchronous motor.
11. Study of induction motor starters.

Aim: To study the various induction motor starters

12. Study of DC Starters.

Aim: To study the different types of DC motor starters.

SEMESTER IV	L	T	P	C
BIOMEDICAL CONTROL SYSTEMS	3	1	0	4

AIM:

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

OBJECTIVES:

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

OUTCOMES:

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

- Provides an insight into and explain the utilization of models, system analysis and analog simulation in the field of bioengineering.

UNIT I - SYSTEM CONCEPTS 9

Types of systems, Open loop systems, Closed Loop systems, Effects of feedback, Mathematical Models of Physical systems: Introduction, Differential equations, Transfer functions, Block Diagram Algebra, Signal Flow Graphs.

UNIT II - TIME RESPONSE ANALYSIS OF CONTROL SYSTEMS 9

Standard test signals, Time response of first order and second order systems with unit step as input, Time Domain specification, Steady state errors and Error constants, Effects of Adding Zero to a system, PD and PID controllers.

UNIT III - THE CONCEPT OF STABILITY & ROOT LOCUS TECHNIQUE 9

The concept of stability, Necessary Conditions for Stability, Hurwitz Stability Criterion, Routh stability criterion, Relative Stability analysis. The Root locus concept, Construction of root loci.

UNIT IV - FREQUENCY RESPONSE ANALYSIS 9

Frequency response of the systems- Correlation between time and frequency responses - Gain and phase margins, Polar Plots, Bode plots, Nyquist stability Criteria.

UNIT V - BIOMEDICAL APPLICATIONS 9

Examples of Biological control Systems: Cardiovascular Control System, Endocrine Control Systems, Pupil Control System, Skeletal Muscle Servomechanism, Oculo - motor system, sugar level Control Mechanism. Temperature control, Blood pressure control.

TOTAL HOURS: 45

TEXT BOOKS:

1. J. Nagrath and Gopal, "Control Systems Engineering", New Age International (P) Limited, Publishers, 5th Edition,2008.
2. Physiological Control Systems: Analysis, Simulation, and Estimation,Michael C. K. Khoo September 1999, Wiley-IEEE Press

SEMESTER IV	L	T	P	C
MEDICAL INSTRUMENTATION – I	3	1	0	4

AIM:

To enable the students to develop knowledge of principles, design and applications of the Biomedical Instruments.

OBJECTIVES:

- To know about bioelectric signals, electrodes and its types
- To know the various Biopotential recording methods
- To study about patient monitoring concept and various Physiological measurements methods
- To study the principle of operation blood flow meter, blood cells counter
- To study about bio chemical measurements and details the concept of biotelemetry and patient safety

OUTCOMES:

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

- Operate and calibrate fundamental biomedical instrumentation used in hospital.
- Classify medical instruments based on principles and application used in hospital.
- To understands different Bio signal/potential.
- To understand the working principles of various instruments such as ECG, EMG, EEG, X-ray and other diagnostic and therapeutic equipments.

UNIT-I: BIOELECTRIC SIGNALS AND ELECTRODES 9

Basic medical instrumentation system, Origin of Bioelectric Potential, Recording electrodes-Electrode Tissue interface, Electrolyte –skin interface, Polarization, Skin contact impedance, motion artifacts. Electrodes- Silver-silver chloride electrodes, electrodes for ECG, electrodes for EEG, electrodes for EMG, Electrical conductivity of electrode jellies and creams, Microelectrodes.

UNIT-II: BIO AMPLIFIER AND BIOMEDICAL RECORDERS 9

Bioamplifier, Need for Bioamplifier, Differential amplifier, Instrumentation amplifier, Chopper amplifier, Isolation Amplifier, ECG, EEG, EMG, PCG, EOG, ERG lead system and recording methods, typical waveform.

UNIT-III : PATIENT MONITORING SYSTEM AND NON ELECTRICAL PARAMETERS MEASUREMENTS 9

System concepts of patient monitoring system, Bedside patient monitoring system, central monitors, Blood pressure measurement, Measurement of temperature, Respiration rate measurement, cardiac output measurement, Measurement of pulse rate, Plethysmography technique.

UNIT-IV: BLOOD FLOW METERS, BLOOD CELL COUNTERS 9

Electromagnetic blood flow meter, ultrasonic blood flow meter, Laser Doppler blood flow meter, Types of blood cells, Methods of cell counting, coulter counters, automatic recognition and differential counting.

UNIT-V: BIO- CHEMICAL MEASUREMENTS AND BIOTELEMETRY AND PATIENT SAFETY 9

Ph, Pc02, p02, Phco3 and electrophoresis, colorimeter, spectrophotometer, flame photometer, autoanalyser. Biotelemetry-wireless telemetry, single channel telemetry, multichannel telemetry, multi patient telemetry, Transmission of analog physiological signals over telephone.

TEXTBOOKS

1. Khandpur R.S, *"Hand-book of Biomedical Instrumentation",* Tata McGraw Hill, 2nd Edition, 2003.

2. Leslie Cromwell, Fred Weibell J, Erich Pfeiffer. A, *"Biomedical Instrumentation and Measurements"*, Prentice-Hall India, 2nd Edition, 1997.

REFERENCES

1. John G. Webster, "Medical *Instrumentation application and design*", John Wiley, 3rd Edition, 1997.

2. Carr, Joseph J, Brown, John.M *"Introduction to Biomedical equipment technology",* John Wiley and sons, New York, 4th Edition, 1997.

SEMESTER IV	L	T	P	C
COMMUNICATION CIRCUITS AND SYSTEMS	3	0	0	3

AIM:

To impart knowledge about transmission of analog and digital information using various modulation techniques and methods of enabling secured communication.

OBJECTIVE:

- To understand the different types of AM Communication systems
- To study in detail about the different types of FM Communication systems
- To familiarize about the base band data Communication systems
- To gain knowledge about the different digital communication techniques
- To know the spread spectrum modulation techniques and error control coding techniques

OUTCOME:

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

- Know the different types of AM Communication systems and its techniques
- Understand the different types of FM Communication systems and its techniques

UNIT I - AMPLITUDE MODULATION (AM) 9

Modulation – Need of modulation, Mathematical representation of AM- DSB SC, AM- SSB SC, AM-VSB AM, Frequency spectrum, Bandwidth, power relation, Generation of AM – square law modulator and balanced modulator, Detection of AM: square law detector, envelope detector, AM transmitter, AM receiver –TRF and super heterodyne receiver.

UNIT II - FREQUENCY MODULATION (FM) 9

Mathematical representation of Frequency modulation, Frequency spectrum, Band Width, Generation of FM- Varactor diode modulator-Armstrong modulator, FM detection- Foster seely discriminator-Ratio detector, FM transmitter, FM receiver, Applications of FM, Advantages and Disadvantages

UNIT III - BASE BAND DATA COMMUNICATION 9

Sampling, Sampling Theorem, Quantization, PCM, ADPCM, DM, ADM, Base band pulse shaping: binary data formats, ISI, Nyquist criterion for distortion less baseband binary transmission, correlative coding.

UNIT IV - DIGITAL MODULATION TECHNIQUES 9

Digital modulation Formats-ASK, FSK, PSK, Analog to Digital Conversion-PAM, PWM, PPM, Coherent binary-, and quadrature- modulations, and Non-coherent binary modulation: I and II types, M-array modulation.

UNIT V - SECUREDCOMMUNICATION AND MULTIPLE ACCESS TECHNIQUES 9

Introduction to spread spectrum, Pseudo-noise sequence, DS spread spectrum, processing gain, FH spread spectrum, multiple access techniques: FDMA, TDMA, CDMA.

Total Hours: 45

TEXTBOOKS

1. Bernard Sklar and Pabitra Kumar Ray, "*Digital Communications: fundamentals and practice*", 2nd edition, pearson edition, 2001.

2. Herbert Taub, Donald L, Schilling & Goutam Saha, "*Principles of Communication Systems",* Third Edition, Tata McGraw Hill Publication, 2008.

REFERENCE BOOKS

1. Simon S, Haykins and Michael Mosher*, "Digital Communication"*, John Wiley & sons, 2001.
2. John G, Proakis, Masoud Salehi, "*Digital Communication"*, fifth edition, McGraw-Hill Higher Education, 2008.

SEMESTER IV	L	T	P	C
BIOSENSORS AND TRANSDUCERS	3	0	0	3

AIM

To provide the students, a basic understanding of the transducers, biosensors and its applications.

OBJECTIVE:

- To understand the concepts of transducers and its classification.
- To study the various types of transducers and use of transducers in biomedical applications.
- To understand about the bio-potential electrodes and its types.
- To study about classification of bio-sensors and various technologies used in bio medical science.
- To know about the applications of bio sensors.

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.
- Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications.
- Remember and understand the concepts, types, working and practical applications of important biosensors.
- Know some of the commonly used biomedical transducers

UNIT I: INTRODUCTION 9

General measurement system – purpose, structure and elements-Transducers - Definition, Classification. Resistance transducers, strain gauges, resistance thermometers, potentiometers. Capacitive transducer, Inductive transducer, LVDT, Biomedical Applications.

UNIT II: TRANSDUCERS 9

Temperature transducers, flow transducer, optical transducer, photoelectric transducers, pressure transducer, Biomedical applications.

UNIT III: BIO POTENTIAL ELECTRODES 9

Half cell potential (or) Electrode potential, Types of Electrodes – Silver-silver chloride electrodes ,limb electrodes, floating electrodes, pregelled disposable electrode, Micro electrodes, Depth and needle electrodes, Surface electrodes, electrode paste, electrode material.

UNIT IV: BIOSENSORS 9

Introduction, biological elements- Enzymes, antibodies, nucleic acids, receptors. Immobilization of biological components- adsorption, micro encapsulation, entrapment, cross linking, covalent bonding. Chemical Biosensor-ISFET, IMFET, electrochemical sensor, chemical fibro sensors.

UNIT V: APPLICATIONS OF BIOSENSORS 9

Bananatrode, blood glucose sensors, non invasive blood gas monitoring, UREASE biosensor, Medical applications, Fermentation process control, Environmental monitoring.

Total Hours: 45

TEXT BOOKS:

1. H.S. Kalsi “Electronic Instrumentation & Measurement” Tata McGraw HILL, 1995.
2. Brain R Eggins, “Biosensors: An Introduction”, John Wiley Publication, 1997
3. Shakthi chatterjee, “Biomedical Instrumentation, 2013, Cengage Learning.
4. John G Webster, “Medical Instrumentation: Application and design”, John Wiley Publications, 2001.

REFERENCE BOOKS:

1. K.Sawhney “A course in Electronic Measurements and Instruments”, Dhapat Rai & sons, 1991.
2. John P Bentley, “Principles of Measurement Systems”, 3rd Edition, Pearson Education Asia, (2000 Indian reprint).
3. Geddes and Baker, “Principles of Applied Biomedical Instrumentation”, 3rd Edition, John Wiley Publications, 2008.

SEMESTER IV	L	T	P	C
MICROCONTROLLERS & APPLICATIONS	3	0	0	3

(Common to ECE, BME, EEE, EIE, MECHATRONICS & SOLAR)

AIM:

To understand the principles of microcontrollers and applications towards real world existence.

OBJECTIVES:

- To learn the concepts of microprocessors.
- To get knowledge in interfacing devices.
- To know the concepts of microcontroller and its applications.
- To develop skill in simple program writing.

OUTCOME:

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

- Knowledge about Microcontroller that can be used for biomedical signal analysis and Medical image analysis.

UNIT I – INTEL 8086 MICROCPROCESSOR 9

Architecture of 8086-Register organization – Signal Description of 8086 - 8086 Instructions set – Addressing modes – Assembler directives and operators- simple programs.

.

UNIT II – PERIPHERAL INTERFACING 9

Programmable Peripheral Interface 8255 – Programmable Communication Interface 8251 USART – Programmable Interrupt Controller 8259A - Programmable Interval Timer 8253 – Keyboard/Display Controller 8279 – A-to-D converter – D-to-A converter.

UNIT III – INTEL 8051 MICROCONTROLLER 9

Introduction to 8 bit microcontroller – architecture of 8051- Signal descriptions of 8051- Role of PC and DPTR- Flags and PSW- CPU registers- Internal RAM & ROM- Special Function Register-Counter & Timers- Serial Communication.

UNIT IV – ASSEMBLY LANGUAGE PROGRAM OF INTEL 8051 9

Interrupt- Addressing Mode- Data Transfer Instruction- Arithmetic Instruction- Logical Instruction- Jump Loop & Call Instruction- I/O Port Programming.

UNIT V – INTERFACING AND APPLICATION OF INTEL 8051 9

LCD Interfacing - A/D and D/A Interfacing- Sensor Interfacing- Relays and Optoisolators- Stepper Motor Interfacing- DC Motor Interfacing.

TOTAL PERIODS: 45

TEXTBOOKS

1. Krishna Kant, “Microprocessors and Microcontrollers Architecture, programming and system Design using 8085, 8086, 8051 and 8096”. PHI2007. (Unit I & II).
2. Muhammad Ali Mazidi and Janica Gilli Mazidi, The 8051 microcontroller and embedded systems, Pearson Education, 5th Indian reprint, 2003. (Unit III to V)

REFERENCE BOOKS

1. Rafiquzzaman M. – Microprocessors – Theory and Applications Intel and Motorola, PHI Pvt. Ltd., New Delhi 2001.
2. Douglas V.Hall – Microprocessors and Interfacing programming and hardware, Tata McGraw Hill Edition 1997.
3. A.K Roy, K.M Bhurchandi, Intel Microprocessors Architecture, Programming and Interfacing McGraw Hill International Edition – 2001

SEMESTER IV	L	T	P	C
BIOMATERIALS & ARTIFITIAL ORGANS	3	0	0	3

AIM:

To understand the principles and biology underlying the design of implants and artificial organs

OBJECTIVE:

- To know about the different classes of materials used in medicine
- To gain knowledge about the application of biomaterials in medicine
- To understand the concept of biocompatibility and the methods of biomaterial testing
- To know about the technologies of biomaterial processing, clinical trials, ethical issues and regulatory standards.
- To gain knowledge in some of the existing designs of artificial organs.

OUTCOMES:

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

- Widen rational design approaches to biomaterials engineering.
- Identify significant gap required to overcome challenges and further development in medical devices.
- Develop critical analyses of biomaterials through proposal writing and review.

UNIT I - BIOMATERIAL PROPERTIES 8

Biomaterial –definition, Material characterization – Mechanical, thermal, Phase diagrams, Surface properties, Structure and properties of naturally occurring materials - Collagen, Bone, Teeth, Skin, Causes of failure - micro cracks, crazing, fatigue. Technologies of biomaterials processing - Surface coatings methods

UNIT II - CLASSES OF BIOMATERIALS 9

Different classes of materials used in medicine - Polymers – Synthesis - Mechanical & Thermal properties - Polyesters – Polyacrylates - Polyanhyrides - Biodegradable Polymers – Hydrogels – Elastomer – Dendrimers. Metals - Stainless steel - Cobalt-Chromium alloy - Titanium alloys. Ceramics and Bio glasses – non absorbable bio ceramics - biodegradable ceramics –bio reactive ceramics - deterioration of ceramics - Other Bioactive materials, Composites as biomaterials

UNIT III - SOFT AND HARD TISSUE APPLICATIONS 9

Sutures, Wound dressings, artificial skin - Drug delivery devices – Cardiovascular medical devices – Heart valves, Assist devices-Stent and grafts, Orthopedic fixation devices – Internal – External - Joints, Total Hip Arthroplasty – Evolution- Design.

UNIT IV - MATERIAL RESPONSE 8

Material and Tissue interaction, biological environment and host response - Inflammation, Wound Healing and Foreign Body Response - Failure mechanisms; corrosion, fracture, degradation of Implanted Materials – Polymers, Metals, ceramics.

UNIT V - BIOMATERIAL TESTING AND ARTIFICIAL ORGANS 10

Testing of biomaterials: In-vitro, in-vivo preclinical tests - biocompatibility – methods for improvement, surface modification of materials - implant retrieval and evaluation. Artificial Heart, eye and ear implants,

artificial pancreas, ophthalmic implantation, dental implantation, insulin administration devices, extracorporeal artificial organs, neural prostheses.

TEXTBOOKS

1. Joon Bu Park, Roderic S, Lakes, "*Biomaterials*", Springer-Verlag, New York Inc., 2010.
2. Ratner A, and S. Hoffman, B. D. "*Biomaterials Science: An Introduction to Materials in Medicine"*, Academic Press; 3 edition, November 8, 2012.

REFERENCE BOOKS

1. Chua, Chena.J.Y, Wanga.L.P, N.Huang, "*Plasma-surface modification of biomaterials",* Materials Science and Engineering: R: Reports, Volume 36, Number 5, 29 March 2002, pp. 143-206 (64)

SEMESTER IV	L	T	P	C
COMMUNICATION SYSTEMS LAB	**0**	**0**	**4**	**2**

AIM:

To impart the knowledge on constructing the basic communications models and interpret its outputs

OUTCOME:

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

- Understand the different types of modulation and demodulation

LIST OF EXPERIMENTS

1. Signal Sampling and reconstruction.
2. Amplitude modulation and demodulation
3. Frequency modulation and demodulation.
4. Pulse code modulation and demodulation.
5. ASK, FSK and PSK Modulation and Demodulation.
6. TDM and FDM
7. Line Coding Schemes

SEMESTER IV	L	T	P	C
BIO TRANSDUCERS LAB	**0**	**0**	**4**	**2**

AIM:

To gain knowledge on the characteristics and working of transducers.

OBJECTIVE:

- Students should be able to understand the working of bio transducers and their characteristics.

OUTCOME:

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

- Know the working of bio transducers and plot their characteristics

LIST OF EXPERIMENTS:

1. Characteristics of Temperature Transducers.
2. Temperature Measurement using Thermistor and its Linearization characteristics.
3. Characteristics of Optical Transducer.
4. Characteristics of LVDT.
5. Characteristics of Hall effect Transducer.
6. Characteristics of Strain Gauge.
7. Characteristics of Potentiometer Transducer.
8. Characteristics of Pressure transducer
9. Characteristics of piezo electric transducers
10. Characteristics of piezo resistive transducers

SEMESTER IV	L	T	P	C
MICROCONTROLLERS LAB	**0**	**0**	**4**	**2**

(Common to ECE, BME, EEE, EIE, MECHATRONICS & SOLAR)

AIM:

To provide the knowledge of assembly language programming of microprocessor and microcontroller and interfacing peripheral devices with microcontroller.

OBJECTIVE:

- To write the assembly language program for 8086 and 8051.
- To write the programs for communication between microcontroller and peripheral devices.
- To interface ADCs, DACs with microcontroller and learn the real time applications like stepper motor control, key board etc

OUTCOMES:

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

- Attain a good knowledge on the arithmetic operations of 8085, 8086
- Learn the 8051 Assembly Language Program for various operations

LIST OF EXPERIMENTS

1. 8085 & 8086 Assembly Language Program (ALP) for Arithmetic Operations.
2. 8051 Assembly Language Program (ALP) for Arithmetic Operations.
3. 8051 Assembly Language Program (ALP) for Logical Operations.
4. 8051 Assembly Language Program (ALP) for Bit Manipulation Operations.
5. 8051 Assembly Language Program (ALP) for arrange the numbers in Ascending and Descending order.
6. 8051 Assembly Language Program (ALP) for Interrupt & UART Operations.
7. Interfacing an ADC to 8051 Controller.
8. Interfacing DAC to 8051 Controller and generate Square, Triangular & Saw-tooth waveform.
9. Interfacing a Stepper motor to 8051 Controller and operate it in clockwise and anti-clockwise directions.
10. Interfacing a Keyboard & Display controller (8279) to 8051 Controller.

SEMESTER V	L	T	P	C
ENVIRONMENTAL SCIENCE AND ENGINEERING	3	0	0	3

(COMMON TO ALL BRANCHES OF B.E./B.Tech./BBA/BCA- CBCS Regulations 2015)

OBJECTIVE:

- To create awareness on the various pollutions and their impact.
- To provide comprehensive insight in natural resources.
- To educate the ways and means to protect natural resources.
- To impart fundamental knowledge on human welfare measures.

OUTCOMES:

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

- Understanding and appreciation of cultural aspects of society
- Understanding of professional and ethical responsibility of engineering practice
- Knowledge of contemporary issues

UNIT - I - ENVIRONMENT AND NATURAL RESOURCES 9

Environment - Definition, scope & importance - Public awareness- Forest resources, mineral resources , water resources, food resources , energy resources (uses, over -exploitation & adverse effects in each case) - Scope & role of environmental engineers in conservation of natural resources - Sustainability development.

UNIT - II - ECOSYSTEMS AND BIO – DIVERSITY 9

Ecosystem - Definition, structure and function - Energy flow -Ecological succession - food chain, food web, ecological pyramids- Introduction, types, characteristics, structure and function of forest, grassland, desert and Aquatic ecosystems - Bio - Diversity :values and uses, hotspots, threats and conservation.

UNIT - III - ENVIRONMENTAL POLLUTION 9

Pollution - Definition , manmade impacts and control measures of air, water and land pollution - Water quality standards & characterization - Importance of sanitation -Nuclear hazards – Hazardous waste management : Solid waste, waste water and biomedical waste - Prevention of pollution and role of individual – Disasters management : Floods, earthquake, cyclone and landslides - Clean technology options.

UNIT - IV - SOCIAL ISSUES AND ENVIRONMENT 9

Urban problems related to energy - Water conservation – Resettlement and rehabilitation of people - Environmental ethics - Climate change - Global warming - Acid rain - Ozone depletion- Waste land reclamation, Environment Protection Act for air, water, wild life and forests - Pollution Control Board.

UNIT - V - HUMAN POPULATION AND ENVIRONMENT 9

Population growth - Population explosion - Family welfare programme - Environment & human health - Human rights – Value education - Women and child welfare, Role of information technology in environment and human health.

Total: 45 hours

TEXT BOOKS:

1. Environmental Science and Engineering by Dr.A. Ravikrishnan, Sri Krishna Publications, Chennai.

REFERENCES:

1. Wager K.D. "Environmental Management", W.B. Saunders Co. Philadelphia, USA, 1998.
2. Bharucha Erach "The Biodiversity of India" Mapin Publishing Pvt Ltd, Ahmedabad, India
3. Trivedi R.K. "Handbook of Environmental Laws", Rules, Guidelines, Compliances and Standards Vol I & II, Enviro media.
4. Environmental Science and Engineering by Dr. J. Meenambal, MJP Publication, Chennai Gilbert M. Master: Introduction to Environmental Engineering and Science, Pearson Education Pvt Ltd., II Edition, ISBN 81-297-0277-0, 2004
5. Miller T.G. Jr Environmental Science Wadsworth Publishing Co.
6. Townsend C. Harper J. and Michael Begon, Essentials of Ecology,Blackwell Science.

SEMESTER V	L	T	P	C
MEDICAL INSTRUMENTAION – II	3	1	0	4

AIM:

To gain an adequate knowledge about measurement of various physiological parameters and to understand the fundamental principle and working of the biomedical instruments involved in the measurement.

OBJECTIVE:

- To know the concept of pacemaker and defibrillator.
- To study the function of pulmonary function analyzers and Lithotriptors.
- To study the various display techniques and use of ultrasonic in several of medical.
- To know application of diathermy principles.
- To study the sources of leakage currents and patient safety.

OUTCOMES:

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

- Operate and calibrate fundamental biomedical instrumentation used in hospital.
- Classify medical instruments based on principles and application used in hospital.
- To understands different Bio signal/potential.
- To understand the working principles of various instruments such as ECG, EMG, EEG, X-ray and other diagnostic and therapeutic equipments.

UNIT-I CARDIAC PACEMAKER AND DEFIBRILLATORS 9

Cardiac Pacemaker-Need for cardiac pacemaker, external pacemaker, implantable pacemaker, Cardiac Defibrillator- Need for a defibrillator, DC defibrillator, Implantable defibrillator, defibrillator analyzers.

UNIT-II PULMONARY FUNCTION ANALYZERS AND LITHOTRIPTORS 9

Pulmonary function measurements, spirometry, pneumotachometers, measurement of volume, pulmonary function analyzers, Lithotriptors-the stone disease problem, first lithotripter machine, modern lithotripter systems, extra corporeal shockwave therapy.

UNIT-III ULTRASONIC TECHNIQUES FOR DIAGNOSIS 9

Diagnostic ultrasound, medical ultrasound, basic pulse echo apparatus, display techniques-A, B, M modes, Echocardiogram, echoencephalogram, Ultrasonic applied as diagnostic tool in ophthalmology.

UNIT-IV PHYSIOTHERAPY AND ELECTROTHERAPY EQUIPMENTS 9

High frequency heat therapy, shortwave diathermy, microwave diathermy, ultrasonic therapy unit, surgical diathermy , electro diagnostic/therapeutic apparatus pain relief through electrical stimulation.

UNIT-V SPECIAL EQUIPMENTS AND PATIENT SAFETY 9

Endoscopy, Laparoscopy, thermography, Patient safety-Electric shock Hazards, leakage currents, safety codes for electro medical equipment, electrical safety analyzer, testing of Biomedical Equipment.

Total Hours: 45

TEXTBOOKS

1. Kanpur R.S, *"Hand-book of Biomedical Instrumentation",* Tata McGraw Hill, 2nd Edition, 2003.

2. Leslie Cromwell, Fred Weibell J, Erich Pfeiffer. A, *"Biomedical Instrumentation and Measurements"*, Prentice-Hall India, 2nd Edition, 1997.

REFERENCE BOOKS

1. John G. Webster, "Medical *Instrumentation application and design*", John Wiley, 3rd Edition, 1997.
2. Carr, Joseph J, Brown, John.M *"Introduction to Biomedical equipment technology",* John Wiley and sons, New York, 4th Edition, 1997.

SEMESTER V	L	T	P	C
LINEAR INTEGRATED CIRCUITS	3	0	0	3

(Common to ECE, BME, EEE & MECHATRONICS)

AIM:

To provide the basic concepts in the design of electronic circuits using linear integrated circuits and their applications in the processing of analog signals.

OBJECTIVES:

- To introduce the basics of Integrated Circuits and its fabrication.
- To familiarize with operational amplifiers and its Characteristics.
- To introduce the applications of Operational Amplifier
- To Introduce about the regulator and filters.
- To introduce ADC/ DAC and PLL.

OUTCOMES:

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

- Know the basics of Integrated Circuits and its fabrication
- Describe the applications of Operational Amplifier
- Know the various regulator and filters

UNIT – I: Integrated Circuit Fabrication 9

Classifications of ICs – IC chip size and Circuit Complexity – Fundamentals of Monolithic IC Technology – Basic Planar Process – Fabrication of Typical Circuit – Active and Passive Components of ICs – Fabrication of FET – Thick and Thin Film Technology – Technology Trends.

UNIT – II: Operational Amplifier and its Characteristics 9

Basic Information of operational Amplifier – Ideal Operational Amplifier - Operational Amplifier Internal Circuits – Examples of IC Op Amps – FET Operational Amplifiers – DC Characteristics – AC Characteristics – Analysis of Data Sheets of an Op Amp.

UNIT – III: Operational Amplifier Applications 9

Basic Op Amp Applications – Instrumentation Amplifiers – AC Amplifiers – V to I and I to V Converters – Op Amp Circuits Using Diodes – Sample and Hold Circuits – Log/Antilog Amplifiers – Adder/ Sub tractor – Multiplier and Divider – Differentiator and Integrator – Operational Transconductance Amplifier – Comparators – Multivibrators – Square, Triangular and Sawtooth wave Generators.

UNIT – IV: Regulators and Filters 9

Series Op Amp Regulators – IC Voltage Regulators – 723 General Purpose Regulators – Switching regulators – RC Active Filters – Transformation – State variable Filter – Switched Capacitor Filters – Active Filters using OTA's.

UNIT – V: D/A and A/D Converters, Timers and PLL **9**

Timer – Description of Functional Diagram – Monostable and Astable Operation – Schmitt Trigger – PLL – Basic Principles – Phase Detectors/ Comparators – Voltage Controlled Oscillator – Low Pass Filter – Monolithic PLL – PLL Applications – Basic DAC Techniques – A–D Converters – DAC/ ADC Specifications.

TUTORIAL: 15

TOTAL HOURS: 60

Text Book:

1. D. Roy Choudhury, Shail B. Jain, "Linear Integrated Circuits", New Age International Publishers, 3rd Edition 2007.

Reference Books:

2. Segio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", McGraw Hill, 2008.
3. Ramakant A. Gayakwad, "OP – AMP and Linear ICs", Prentice Hall, 1994.

SEMESTER V	L	T	P	C
BIOMEDICAL SIGNAL PROCESSING	3	1	0	4

AIM:

This course presents the fundamentals of biomedical signal processing with particular emphasis on problems in biomedical research and clinical medicine

OBJECTIVE:

- Introduction to the Biomedical Signals
- Different Filters used in biomedical signal
- It gives the idea about how to capture the biomedical signals
- It gives the idea about the Different Models for the Biomedical Signals.
- It gives the idea about the signal patterns and decision making on medical diagnosis

OUTCOMES:

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

- Be able to demonstrate an advanced understanding of the principles of digital signal processing.
- Be able to systematically apply methods to extract relevant information from biomedical signal measurements.
- Be able to critically assess the appropriateness of biomedical signal processing techniques for various problems in the field.
- Be able to evaluate the effectiveness of techniques applied to biomedical signals against specific benchmarks.

Unit – I: Biomedical Signal Processing - Introduction 9

Nature of biomedical signals-Examples of biomedical signals-objective and difficulties of biomedical signal analysis-computer aided diagnosis-concurrent, coupled and correlated processes-case studies-segmentation of PCG.

Unit – II Filters for Biomedical Signals 9

Types of Noise-stationary versus non stationary process-various noises interference in biomedical signals-Time domain filters-Frequency domain filters-Wiener filter-Adaptive filters for removal of Interference-selection of appropriate filter.

Unit – III Event Detection 9

Events in Biomedical Signals-Detection of Events and Waves-Correlation analysis of EEG Signals-Cross Spectral Techniques-Matched Filter-Homomorphic Filtering-Wave shape and waveform complexity-Morphological analysis of ECG waves-envelope Extraction Analysis-Analysis of activity.

Unit – IV Modeling of Biomedical Systems 9

Mathematical Model for Biomedical Signals-Point Processes-Parametric System Modeling-Autoregressive Modeling-Pole Zero Modeling-Electromechanical Models of Signal Generation-Analysis of Non-stationary Signals: Time Variant Systems-Fixed Segmentation-Adaptive Segmentation-Use of Adaptive Filters of Segmentation.

Unit – V Pattern Classification and Decision 9

Methods of Pattern Classification-Pattern Classification-Supervised Pattern Classification-Unsupervised Pattern Classification-Probabilistic Models and Statistical Decision-Logistic Regression Analysis-Training and Test Steps-Neural Networks-Measures of Diagnostic Accuracy and Cost-Reliability of Classifiers and Decisions.

Total No of Hours: 45

Text Books:

1. Rangaraj M. Rangayyan, "Biomedical Signal Analysis, A Case-Study Approach", John Wiley & Sons, Reprint 2013.
2. Eugene N. Bruce, "Biomedical Signal Processing and Signal Modeling", John Wiley & Sons, Inc., 2006.

Reference Books

1. D C Reddy, "Biomedical Signal Processing, Principles and Techniques", Tata McGraw Hill Pvt. Ltd., 2005
2. Willis J. Tompkins, "Biomedical Digital Signal Processing", Prentice Hall of India Pvt. Ltd., 2006.

SEMESTER V	L	T	P	C
COMPUTERS IN MEDICINE	3	0	0	3

AIM:

To import the knowledge on computer assistance medicine.

OBJECTIVE:

- To understand the basics of computer hardware PC
- To learn how to design the medical system
- To enable the students know about the computers in patient monitoring system
- To understand the medical system modeling by using computer
- To know about computers in medical research

OUTCOMES:

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

- Know the basic concepts of computer hardware and networking
- Learn the use of computers in various biomedical imaging and clinical laboratory

UNIT I OVERVIEW OF COMPUTER HARDWARE 9

8086 architecture, system connections, Microcontrollers, Motherboard and its logic, RS232-C and IEEE bus standards, CRT controllers, FDC, HDC, and PC based video card, modems and networking.

UNIT II COMPUTERS IN CLINICAL LABORATOR 9

Automated Methods in Hematology, Chromosome Analysis in Computer, Automated Scanning for cervical Cancer, CASA, Radioimmunoassay, Computerized ECG, EEG & EMG.

UNIT III COMPUTERS ASSISTED MEDICAL IMAGING 9

Introduction, Computers in Nuclear Medicine, Ultrasound Imaging: Ultrasonography, Computed X-ray Tomography, Radiation Therapy Planning, NMR.

UNIT IV COMPUTERS IN MEDICAL SYSTEMS MODELING 9

Neurocomputer, Sequential vs. Parallel Processing, Pattern Recognition- major Activity in Medicine, ANN Concepts, Adverse Drug Reactions.

UNIT V COMPUTER ASSISTED MEDICAL DECISION MAKING 9

Introduction, General Model of CMD, Various Approaches to Decision-making, Computer-assisted Decision Support Systems, Algorithmic Methods, Decision Analysis in Clinical Medicine

TOTAL HOURS: 45

TEXT BOOKS

1. R.D.Lele, “Computers in Medicine”, Tata McGraw-Hill, New Delhi, 1999. (Unit II to V)
2. Douglas V.Hall, “Microprocessors and Interfacing: Programming and hardware”, McGraw Hill, Singapore, 1999. (Unit I)

SEMESTER V	L	T	P	C
MEDICAL INSTRUMENTATION LAB	**0**	**0**	**3**	**2**

OBJECTIVES:

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

OUTCOMES:

Upon completion of the course, the student should be able 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 for various biosignals
- Know the measurement techniques for blood flow measurement and cell counting
- Learn the uses of pH, spectrometers and auto-analyzer

LIST OF EXPERIMENTS:

1. Design and analysis of biological pre amplifiers
2. Recording of ECG signal and analysis
3. Recording of EMG-Signal
4. Recording of EEG-Signal
5. Recording of various physiological parameters using patient monitoring system and telemetry units.
6. Measurement of pH and conductivity.
7. Measurement and recording of peripheral blood flow
8. Measurement of visually evoked potential.
9. Study of characteristics of optical Isolation amplifier
10. Galvanic skin resistance (GSR) measurement

SEMESTER V	L	T	P	C
LINEAR INTEGRATED CIRCUITS LAB	0	0	3	2

(COMMON TO ECE & BME)

AIM:

To acquire the knowledge to construct and realize the real time integrated circuits and evaluate its response.

OBJECTIVE:

To learn the characteristics of integrated circuits through op-amp

OUTCOMES:

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

- Design oscillators and amplifiers using operational amplifiers.
- Design filters using Op amp and perform experiment on frequency response.
- Analyse the working of PLL and use PLL as frequency multiplier.
- Design DC power supply using ICs

LIST OF EXPERIMENTS:

1. Measurement of op-amp parameters-CMRR, slew rate, open loop gain ,input and output impedances
2. Inverting and non-inverting amplifiers, integrators, and differentiators Frequency response, Comparators-Zero crossing detector Schmitt trigger-precision limiter
3. Instrumentation amplifier-gain, CMRR & input impedance
4. Single op-amp second order LFF and HPF
5. Active notch filter realization using op-amps
6. Wein bridges oscillator with amplitude stabilization
7. Generation and demodultiaon of PWM and PPM
8. Multipliers using op-amps - 1,2 & 4 quadrant multipliers
9. Square , triangular and ramp generation using op-amps
10. Astable and monostable multivibrators using op-amps
11. Log and Antilog amplifiers
12. Volatage regulation using IC 723
13. Astable and monostable multivibrators using IC 555
14. Design of PLL for given lock and capture ranges& frequency multiplication
15. Realisation of ADCs and DACs

SEMESTER V	L	T	P	C
BIOMEDICAL SIGNAL PROCESSING LAB	0	0	3	2

AIM:

To gain the practical knowledge about the various bio signals and its characteristics

OBJECTIVE:

- To represent the basic discrete time signals and analyzes it
- To design the IIR and FIR filter
- To analyze various types of bio signals and study its characteristics

OUTCOMES:

Upon completion of the course, the student should 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

LIST OF EXPERIMENTS

1. Representation of basic discrete time signals
2. Computation of convolution –linear convolution
3. Response of a difference equation to initial conditions; stability
4. DFT and FFT computation
5. FIR filter design using windowing techniques
6. IIR filters design-digital Butterworth filter and Chebyshev filter
2. 121 BM-Engg&Tech-SRM-2013
7. Simulation of Bio-signals.
8. Analysis of ECG signals.
9. Analysis of EEG signals
10. Analysis of EMG signals

SEMESTER VI	L	T	P	C
MEDICAL IMAGE PROCESSING	3	0	0	3

OBJECTIVE:

The course will provide the participants will an up-to-date background in current state-of –the art in medical imaging & medical image analysis. The aim of the course is to show how to extract, model & analyze information from medical data & applications in order to help diagnosis, treatment & monitoring of diseases through computer science.

OUTCOMES:

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

- Discuss medical image processing techniques and its applications.
- Apply image enhancement and restoration techniques.
- Use image compression and segmentation Techniques.
- Represent features of images.

UNIT I INTRODUCTION 9

Introduction to Modeling for Medical Image Analysis: Framework and Applications- Model-based Approach for Image understanding- Applications, Introduction to Biomechanical Models for Image analysis and simulation- Mesh Creation- Mesh Registration: Fitting to the 3D image- Information Assignment- Clinical Applications.

UNIT II IMAGE PROCESSING TECHNIQUES 9

Introduction to Techniques in Fractal Analysis and their applications in Brain MRI- Background on Fractal Geometry- Fractal Analysis Algorithms, Introduction to Techniques in Infrared Microspectroscopy and advanced Computational methods for Colon Cancer Diagnosis- Histology of the Human Colonic Surface- Methodology- Overview of Spectral data and Analysis- Diagnostic Potential of FTIR Microspectroscopy- Discussion and Future Trends.

UNIT III COMPUTERIZED IMAGE ANALYSIS METHODS 9

Introduction to Advances in Computerized Image analysis methods on Breast Ultrasound- Detection and Segmentation of Sonographic Breast Lesions- Feature Extraction, Introduction to Techniques in Blind Deblurring of Spiral Computed Tomography Images and Their Applications- Review of Blind Deblurring Methods- Applications.

UNIT IV ENCODING AND DECODING OF MEDICAL IMAGE DATA 9

Introduction to Model-Based 3D Encoding/2D Decoding of Medical Imaging Data- 3D/2D ROI-MLZC: 3D Encoding/2D Decoding Objectbased Architecture- Three-dimensional Integer DWT via Lifting- Object-based IDWT- Embedded Transform Coding, Introduction to Interpolation Techniques in Multimodality Image Registration and Their Application- Problems with Mutual Information: Local Maxima and Interpolation Artifacts- Analysis of Interpolation Artifacts- Strategies to Overcome Interpolation Artifacts.

UNIT V APPLICATIONS 9

Introduction to Automatic Construction of Cardiac Statistical Shape Models: Applications in SPECT and MR Imaging- Automatic Landmarking Procedure- Grid-enabled Implementation- Shape Model Characterization- Model-based Segmentation of MRI and SPECT Studies, Introduction to Techniques for Mutual Information-

based Brain Image Registration and Their Applications- Mutual Information as a Similarity Measure- Geometrical Transformation Model- Joint Histogram Estimation- Interpolation Induced Artifacts- Interpolation Induced Artifact Reduction- Optimization.

TOTAL HOURS: 45

TEXT BOOK:

1. Cornelius T Leondes, "Medical Imaging Systems Technology Analysis and Computational methods", A5 Volume Set, University of California.

REFERENCES:

1. Paul Suetens, "Fundamental of Medical Imaging", Second Edition, Cambridge University Press, 2009.
2. J.Michael Fitzpatrick and Milan Sonka, "Handbook of Medical Imaging", Volume 2. Medical Image Processing and Analysis", SPIE Publications, 2009.
3. Geoff Dougherty, "Digital Image Processing for Medical Applications", First Edition, Cambridge University Press, 2009.

SEMESTER VI	L	T	P	C
RADIOLOGICAL EQUIPMENTS	3	1	0	4

AIM:

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

OBJECTIVE:

- To study about the functioning of X-ray tubes and method by which fogginess can be reduced.
- To study about the different types radio diagnostic unit, transverse tomography and types of radio detection.
- To know the concepts of MRI functionality and imaging various sections of body.
- To understand the function of X ray generation and radio isotopes.

OUTCOME:

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

- Explain the different radio diagnostic and therapeutic techniques

UNIT I: X – RAY MACHINES & DIGITAL RADIOGRAPHY 9

Basis Of Diagnostic Radiology, Nature Of X-Rays, Production Of X-Rays,X-Ray Machine, Visualization Of X-Rays, Dental X-Ray Machines, Portable And Mobile X-Ray Units,Physical Parameters For X-Ray Detectors, Digital Radiography.

UNIT II: COMPUTER TOMOGRAPHY 9

Introduction, Principle Of Computed Tomographic Imaging, Reconstruction Algorithms, Scan Motion, X-Ray Sources, Collimation, X-Ray Detectors, Viewing Systems, Patient Dose, Quality Control.

UNIT III: MAGNETIC RESONANCE IMAGING & SPECTROCOPY 9

Principle Of MRI, MRI Instrumentation, Pulse Sequence, Spatial Encoding Of Magnetic Resonance Imaging Signal, Motion Suppression Techniques, Contrast Agents, Tissue Contrast In Magnetic Resonance Imaging, MR Angiography, Spectroscopy, Chemical Shift Imaging.

UNIT IV: NUCLEAR MEDICAL IMAGING SYSTEMS 9

Radio-Isotopes In Medical Diagnosis, Physics Of Radioactivity, Radiation Detectors, Pulse Height Analyzer, Monitoring Equipment, Radio-Isotope Rectilinear Scanner, Gamma Camera, Multi-Crystal Gamma Cameras, ECE, SPECT, PET Scanner.

UNIT V: HUMAN RADIOBIOLOGY 9

Stochastic Effects Of Radiation, Nonstochastic Effects Of Radiation, Dosimetry In Individuals &Populations, Background Radiation Human Populations That Have Been Exposed To Unusual Levels Of Radiation, Doe-Effect Models, Factors That Influence Doe-Effect Models, Estimating Risks Of Radiation, Source Of Information.

TOTAL HOURS: 45

TEXT BOOKS

1. William R. Hendee, E. Russel Ritenour," Medical Imaging Physics", Third Edition, Mosby Year Book, St. Louis, 1992.(Unit- II,III,IV)

2. R. S. Khandpur, “Handbook of Biomedical Instrumentation”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1997.(Unit-I,III,V)

REFERENCE BOOKS:

1. Chesney D.N~ and Chesney M.O., “X-Ray Equipments for Students Radiographer”, Blackwell Scientific Publications, Oxford, 1971.
2. Jacobson B. and Webster J.G., “Medicine and Clinical Engineering”, Prentice Hall India, New Delhi, 1999.
3. Alexander, Kalender and Linke, “Computer Tomography”, John Wiley, Chichster, 1986.

SEMESTER VI	L	T	P	C
BIO – TELEMETRY	3	0	0	3

AIM:

To learn about the signal transmission and bio telemetry systems.

COURSE OBJECTIVE:

- To gain basic knowledge of different transmission techniques for analog and digital signals and to provide information about the modulation techniques.

OUTCOMES:

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

- Apply the concepts and the principles in Telemetry system.
- Build the blocks to make a telemetry system.
- Know the transmission and reception of a system.
- Know about how optical fibers are used in signal transmission.

UNIT 1 TELEMETRY 9

Basic system - Classification - Non electrical telemetry systems - Mechanical and Pneumatic type, Voltage and Current telemetry systems - Local transmitters and Converters - Frequency telemetery system - Power Line carrier communication (PLCC) .

UNIT 2 AMPLITUDE MODULATION 9

Modulation - Need of modulation Mathematical representation of AM (AM, DSB - SC - AM, SSB - SC AM, VSB AM) - Frequency spectrum - Bandwidth - power relation - Generation of FM - square law modulator and Balanced modulator - AM transmitter - Detection of AM: square law detector - envelope detector - AM receiver – TRF and super heterodyne receiver.

UNIT 3 ANGLE MODULATION 9

Mathematical representation of Frequency modulation- Frequency spectrum - Band Width , Generation of frequency modulation - Varactor Diode modulator - Armstrong modulator , FM transmitter , FM detection- Foster Seely discriminator - Ratio detector - FM receiver.

UNIT 4 DIGITAL MODULATION AND MULTIPLEXING 9

Sampling - Quantization - Pulse Modulation: Overview of Pulse amplitude modulation, Pulse position modulation, Pulse width modulation and Delta modulation - Data Transmission: Overview of Amplitude shift keying, Frequency shift keying, Phase shift keying and QPSK - Multiplexing: Overview of Time Division Multiplexing, Frequency Division Multiplexing -.

UNIT 5 APPLICATION OF BIOTELEMETRY 9

Wireless Telemetry - Single Channel Telemetry systems - Multi channel Telemetry systems - Multi Patient Telemetry - Implantable Telemetry Systems - Ambulatory patient monitoring, remote monitoring

Total hours: 45

TEXT / REFERENCE BOOKS

.

1. R. S. Khandpur, Hand Book of Biomedical instrumentation, Tata McGraw Hill Publication, 2005.

2. Taub and Schilling, Principles of Communication, Tata McGraw Hill Publication, 3rd edition, 2008.
3. D. Patranabis, Telemetry Principles, Tata McGraw Hill Publication, 1999.

SEMESTER VI	L	T	P	C
NANOTECHNOLOGY IN MEDICINE	3	0	0	3

AIM:

To study about materials, fundamentals, applications of Nanotechnology.

OBJECTIVE:

- To know about the concept of Nanotechnology.
- To study about the fundamentals of Nanoscience.
- To study about materials and properties used for MEMS & NEMS
- To know about the medical use of nanomaterials.
- To study about the applications.

OUTCOMES:

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

- Concept of Nano science and Nanotechnology.
- Fabrication process using MEMS.
- To treat cancer using Nano medicine

UNIT-I: INTRODUCTION 9

Introduction to Nanotechnology: Nanomaterials, Fullerenes and carbon forms. Nanoparticles and Colloids, structure and bonding in nanoparticles, Nanomaterials fabrication by Bottom-up and Top down approaches, Classification of nanodevices based on the characteristics, Quantum dots and their properties.

UNIT - II : FUNDAMENTALS OF NANOSCIENCE 9

Size dependence of properties - Particle size determination - Bulk to nano transition - Semiconducting nanoparticles - Carbon nanostructures - Mechanical properties (hardness, ductility, elasticity) - Optical properties of nanotubes - Electrical properties of nanotubes.

UNIT-III: MEMS & NEMS 9

Definition of MEMS, materials for MEMS (Silicon, Polymers and metals) and their properties, Deposition processes, Photolithography, and etching processes, Limitations of MEMS, NEMS, difference between MEMS and NEMS, properties of NMES, fabrication processes, applications.

UNIT-IV: NANOMEDICINE 9

Nanomedicine: Medical use of Nanomaterials, Drug delivery systems. Cancer treatment, Surgery.Drug tracking systems.Targeted drug delivery systems.Applications of Nanomaterials in Medical imaging.Neuro-electronic interfaces.

UNIT-V: BIO MOLECULAR NANOTECHNOLOGY 9

Nanorobots and their application, nanosensors based on biomolecules such as DNA and proteins, nanoparticles for gene delivery systems, Computational genes, Biosensors for Glucose and measurement, Optical biosensors and their application ,Preparation of Nanosystems: Introduction to nanolithography - Carbon nanotubes: preparation - Synthesis and preparation of nanomaterials (crystalline and thinfilm) - Physical and chemical methods - Control and stability (size, shape, composition).

TOTAL HOURS: 45

TEXT BOOKS

1. Lynn E. Foster, Foreword by George Allen, Foreword by Joe Lieberman, “Nanotechnology’.
2. Di Ventra, Massimiliano; Evoy, Stephane; Heflin, James R., “Introduction to Nanoscale Science and Technology”, Springer publications, 2004 (UNITS I, II, III & IV)

REFERENCE BOOKS

1. Chattopadhyay, “Introduction to Nanoscience and Nanotechnology’, PHI, 2009
2. B.k. Parthasarathy, “Nanoscience And Nanotechnology”, Gyan Books, 2007

SEMESTER VI	L	T	P	C
ASSISTS DEVICES	3	0	0	3

AIM:

To study about the different types of medical devices which will restore normal functional ability of particular organ this is defective temporarily or permanently.

OBJECTIVE:

- Be able to list the principle and operation of devices that will help failing heart
- To study the various types of artificial kidney which does the clearance of urea from the blood
- Be able to list the various types of hand and leg replacement devices to overcome the orthopedic problems
- To understand the various types of hearing losses and hearing aids
- To know about devices which is used to assist the respiration & understand electrical stimulation techniques used in clinical applications.

OUTCOMES:

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

- Use the assist devices to save the life.
- Know the types of artificial kidney which does the clearance of urea from the blood
- Be able to list the various types of hand and leg replacement devices to overcome the orthopedic problems
- To cure various types of hearing losses using hearing aids
- To assist the respiration & understand electrical stimulation techniques used in clinical applications.

UNIT I: CARDIAC ASSIST DEVICES 9

Synchronous Counter pulsation, Assisted through Respiration Right Ventricular Bypass Pump, Left Ventricular Bypass Pump, Open Chest and closed Chest type, Intra Aortic Balloon Pumping Veno Arterial Pumping, Prosthetic Cardio Valves, Principle and problem, Biomaterials for implantable purposes, its characteristics and testing.

UNIT II: ARTIFICIAL KIDNEY 9

Functions of the kidney, artificial kidney, Dialyzers, Membranes for Haemodialysis, Haemodialysis machine, Portable kidney machine.

UNIT III: PROSTHETIC AND ORTHODIC DEVICES 9

Hand and Arm Replacement - Different Types of Models Externally Powered Limb Prosthesis Feedback in Orthodic System, Functional Electrical Stimulation, Sensory Assist Devices, Materials for Prosthetic and orthodic devices, Haptic Devices

UNIT IV: AUDIOMETRS AND HEARING AIDS 9

Mechanism of Hearing, Measurement of sound, basic audiometer, pure tone audiometer, speech audiometer, audiometer system Bekesy, evoked response audiometry system, calibration of audiometers, hearing aids. .

UNIT V: VENTILATORS 9

Mechanics of Respiration artificial ventilation, ventilators, types of ventilators, ventilator terms, classification of ventilators, pressure-volume-flow diagrams, modern ventilators, high frequency ventilators, humidifiers, nebulizers and aspirators.

TOTAL HOURS: 45

TEXT BOOKS

1. Kolff W.J., Artificial Organs, John Wiley and Sons, New York, 1979.
2. Andreas.F.Vonracum, "Hand book of bio material evalution", Mc-Millan publishers.
3. Albert M.Cook and Webster J.G., Therapeutic Medical Devices, Prentice Hall Inc., New Jersey, 1982

REFERECE BOOKS

1. Gray E Wnek, Gray L Browlin – "Encyclopedia of Biomaterials and Biomedical Engineering" – Marcel Dekker Inc New York 2004.
2. John. G . Webster – "Bioinstrumentation", John Wiley & Sons (Asia) Pvt Ltd - 2004.

SEMESTER VI	L	T	P	C
MEDICAL IMAGE PROCESSING LAB	0	0	3	2

AIM:

To impart knowledge and hands on training in analyzing various types of medical images

OBJECTIVE:

- To understand the fundamentals of digital image and its properties
- To enhance the medical images by applying various filters
- To segment the region of interest using various image processing algorithms

OUTCOMES:

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

- Gain the basic concepts of digital image and its properties
- Know the program to segment the region of interest using various image processing algorithms

DIGITAL IMAGE PROCESSING LAB EXPERIMENTS

1. Study of basic functions
2. Arithmetic operations on images, Image Complement
3. Histogram Processing – Techniques.
4. Image cropping
5. Line and Edge detection
6. FFT and DCT of images
7. Contact stretching, Threshold technique - Enhancement
8. Adaptive filters. Sharpening and smoothing Filters.
9. Compression technique

SEMESTER VI	L	T	P	C
BIOSENSORS & SIGNAL CONDITIONING LAB	0	0	3	2

AIM:
To understand the implementation of filtering techniques and to simulate the Bio Signals using Matlab.

OBJECTIVES:
- Analyze the Bio Signals like ECG, EEG, and EMG and simulate the Bio Signals.
- Study about DFT Computation and Fast Fourier Transform.
- Able to analyze the signals in terms of frequency spectrum and to determine the power.

OUTCOMES:
Upon successful completion of this course, students will be able to:
- Developing the program to analyze the signals in terms of frequency spectrum and to determine the power.
- Understand the program to analyze and simulate the Bio Signals

LIST OF EXPERIMENTS

1. Representation of time-series; computation of convolution.
2. Response of a difference equation to initial conditions; stability.
3. DFT computation.
4. Computational experiments with digital filtering.
5. Sampling and waveform generation.
6. FIR and IIR filters implementation.
7. Fast Fourier Transform.
8. Simulation of bio signals.
9. Analysis of ECG signals.
10. Analysis of EEG signals
11. Analysis of EMG signals

SEMESTER VII	L	T	P	C
PROFESSIONAL ETHICS AND HUMAN VALUES	3	0	0	3

(Common to All Branches)

AIM*:*

To create an awareness on Ethics and Human Values in engineering professions and to inspire moral and social values and Loyalty to appreciate the rights of others

OBJECTIVE:

After completing the course the learner should know how to maintain code of conduct in work places and respect to each other.

OUTCOMES:

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

- Understand the importance of ethics and values in life and society.

Unit – I: HUMAN VALUES 9

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – 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 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE),India, etc.

TOTAL HOURS: 45

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS

1. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint).
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics: Concepts and Cases”, Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.
5. Naagarazan. R. S, A Textbook on Professional Ethics and Human Values , New Age Publications.

SEMESTER VII	L	T	P	C
DISASTER MITIGATION AND MANAGEMENT	3	0	0	3

(Common to All Branches)

AIM:

To impart awareness on disasters and preparedness during disasters.

OBJECTIVES:

- To Understand basic concepts in Disaster Management
- To Understand Definitions and Terminologies used in Disaster Management
- To Understand the Challenges posed by Disasters
- To understand Impacts of Disasters

OUTCOMES:

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

- Develop an understanding of the key concepts, definitions a key perspective of all hazards emergency management
- Understand the emergency/disaster management cycle
- Have a basic understanding for the history of emergency management
- Develop a basic understanding of prevention, mitigation, preparedness, response and recovery
- Develop a basic understanding for the role of public an private partnerships

UNIT 1 INTRODUCTION 9

Concept of disaster; Different approaches; Concept of Risk; Levels of disasters; Disaster phenomena and events *(Global, national and regional)*; Natural and man-made hazards

UNIT 2 RISK ASSESSMENT AND VULNERABILITY ANALYSIS 9

Response time, frequency and forewarning levels of different hazards; Characteristics and damage potential of natural hazards; hazard assessment ;Dimensions of vulnerability factors; vulnerability assessment; Vulnerability and disaster risk; Vulnerabilities to flood and earthquake hazards

UNIT 3 DISASTER MANAGEMENT MECHANISM 9

Concepts of risk management and crisis management -Disaster management cycle; Response and Recovery; Development, Prevention, Mitigation and Preparedness-Planning for relief

UNIT 4 DISASTER RESPONSE 9

Mass media and disaster management-Disaster Response Plan; Communication, Participation, and Activation of Emergency Preparedness Plan-Logistics Management-Psychological Response-Trauma and Stress Management-Rumour and Panic Management-Minimum Standards of Relief-Managing Relief-Funding

UNIT 5 DISASTER MANAGEMENT IN INDIA 9

Strategies for disaster management planning; Steps for formulating a disaster risk reduction plan; Disaster management Act and Policy in India; Organisational structure for disaster management in India; Preparation of state and district disaster management plans

Total Hours: 45

TEXT BOOKS

1. Alexander, D. *Natural Disasters,* ULC press Ltd, London, 1993.
2. Carter, W. N. *Disaster Management: A Disaster Management Handbook,* Asian Development Bank, Bangkok, 1991.
3. Chakrabarty, U. K. *Industrial Disaster Management and Emergency Response,* Asian Books Pvt. Ltd., New Delhi 2007.

REFERENCE BOOKS

1. Abarquez I. & Murshed Z. *Community Based Disaster Risk Management: Field Practitioner's Handbook,* ADPC, Bangkok, 2004.
2. Goudie, A. *Geomorphological Techniques,* Unwin Hyman, London 1990.
3. Goswami, S. C. *Remote Sensing Application in North East India,* Purbanchal Prakesh, Guwahati, 1997.
4. *Manual on Natural Disaster Management in India,* NCDM, New Delhi, 2001.
5. *Disaster Management in India,* Ministry of Home Affairs, Government of India, New Delhi, 2011.
6. *National Policy on Disaster Management,* NDMA, New Delhi, 2009.
7. *Disaster Management Act. (2005),* Ministry of Home Affairs, Government of India, New Delhi, 2005.

SEMESTER VII	L	T	P	C
MEDICAL WASTE MANAGEMENT	3	0	0	3

AIM:

To learn more about managing medical waste, Health Care and its necessary.

OBJECTIVE:

- To understand the process of managing medical waste.
- To understand modern technologies for managing medical waste

OUTCOMES:

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

- Guidelines on Hospital Waste Management
- Specifications and Guidelines on Incinerators
- Training Manuals for Paramedics

UNIT I- INTRODUCTION **9**

General Introduction, Definition of Biomedical Waste, General and Hazardous health care waste – Colour Coding and types of containers for disposal of medical waste, Segregation, Collection & Disposal.

UNIT II -BIOMEDICAL WASTES **9**

Infectious waste, Genotoxic waste, Waste Sharps – Categories, Categorization and composition of Biomedical waste. Liquid Biomedical Waste - Radioactive wastes, Metals, Chemicals & drugs.

UNIT- III BLOOD PRODUCTS **9**

Human Blood and Blood Products, pathological wastes, Contaminated sharps, Contaminated animal carcasses, body parts, and bedding Basic information about infection, Infectious agents on organizations spread of infection, Basic information about Hospital acquired infection.

UNIT- IV STERILISATION **9**

Disinfections unit container for Autoclaving, Sharp waste containers for storage & transportation, autoclaving, Incineration, Plasma Pyrolysis /Gasification systems, Composting.

UNIT -V MODERN TECHNOLOGY FOR MEDICAL WASTES **9**

Modern Technology for handling Biomedical Wastes – Monitoring & Controlling of Cross Infections, Protective Devices – Bioethics and Handling of Waste Management.

Total Hours: 45

TEXT BOOK:

1. V. J. Landrum, Medical Waste Management and disposal, Elsevier, 1991

REFERENCE BOOKS:

1. Malhotra A., Hospital Management : An Evaluation, Global India Publications, 2009.
2. S L Goel, “Hospital Management”, Deep and Deep Publications, 2010.
3. J Glyn Hendry & Gary W Heinke, “Environmental Science and Engineering”, Prentice Hall India, 2004
4. Shyam Divan, “Environmental law and policy in India”, Oxford India Press, 2004.
5. Charles A Wentz, “Hazardous Waste Management”, McGraw Hill Inc, Newyork, 1995

SEMESTER VII	L	T	P	C
HOSPITAL ENGINEERING	3	0	0	3

AIM:

To provide the knowledge of planning, designing and safety management in Hospital services. To introduce the students to the field of hospital and equipment management.

OBJECTIVE:

- To understand the overview of hospital organization and planning.
- To study about the principles and tools of human resource management and manpower planning in hospitals.
- To understand the process of recruitment and training in hospitals and to know about the various departments of hospital.
- To plan the maintenance of records in the other supportive departments of hospital such as food, pharmacy.
- To study about various types of communication and safety aspects in hospital.

OUTCOMES:

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

- Design and conduct experiments for biomedical data acquisition, analysis and interpretation
- To understand and apply computational techniques for applications in biomedical engineering.
- Identify, formulate and solve problems related to biomedical engineering.
- Understand the professional and ethical responsibilities.

UNIT I : OVERVIEW OF HOSPITAL ADMINISTRATION 9

Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning – Roles of hospital in healthcare-hospital planning and design-outpatient services - Nursing unit-intensive care unit-nursing services.

UNIT II - CLINICAL AND ADMINISTRATIVE SERVICES 9

Radiology and imaging services-laboratory services-operation theatre suite pharmacy-Central sterile supply department- hospital infection- materials Management-evaluation of hospital services.

UNIT III: HUMAN RESOURCE MANAGEMENT, RECRUITMENT AND TRAINING 9

Principles of HRM – Functions of HRM – Manpower Planning. Different Departments of Hospital, Recruitment, Selection, Training Guidelines –Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer.

UNIT IV: PLANNING SUPPORTIVE SERVICES 9

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

UNIT V: COMMUNICATION, SAFETY ASPECTS IN HOSPITAL AND HOSPITAL INFECTION CONTROL 9

Purposes – Planning of Communication, Modes of Communication – Loss Prevention – Fire Safety – Alarm System – Safety Rules. Importance of infection control-hand hygiene-aseptic techniques-isolation precautions-disinfection and sterilization

TOTAL HOURS: 45

TEXT BOOKS:

1. R.C.Goyal, "Hospital Administration and Human Resource Management", PHI –Fourth Edition, 2006. (All Five Units)
2. G.D.Kunders, "Hospitals – Facilities Planning and Management – TMH, NewDelhi – Fifth Reprint 2007.

REFERENCE:

1. Cesar A. Caceres and Albert Zara, "The Practice of Clinical Engineering", Academic Press, New York, 1977.
2. Sanjiv Singh, Sakthikumar Gupta, Sunil Kant, "Hospital infection control Guidelines, principles and practice", Jaypee Brothers Medical Publishers Pvt

SEMESTER VII	L	T	P	C
BIOMETRIC SYSTEMS	3	1	0	4

AIM:

To study about fundamentals, Principles of various Biometric systems.

OBJECTIVES:

- To know about the fundamentals of Biometric systems
- To understand the finger print principles and technology
- To study about the Iris recognition method
- To understand the Facial scan technologies, face Recognition-Representation and Classification
- To understand the voice scan technology, features and their models.

OUTCOMES:

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

- Understand the recognize finger print , iris, face recognition, and voice identification

UNIT I: BIOMETRIC FUNDAMENTALS 9

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

UNIT II: FINGERPRINT IDENTIFICATION TECHNOLOGY 9

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

UNIT III: IRIS RECOGNITION 9

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

UNIT IV: FACE RECOGNITION 9

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

UNIT V: VOICE SCAN 9

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

TOTAL HOURS: 45

TEXT BOOKS:

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

REFERENCE BOOK:

1. John D. Wood word Jr., “Biometrics”, Dream tech Press, 2003, New Delhi.

SEMESTER VII	L	T	P	C
MINI PROJECT	0	0	3	2

OBJECTIVES:

1. The students in batches (not exceeding three in a batch) have to take up a project in the area of their own interest related to their specialization.

2. Each batch is guided by a faculty member. The students have to select suitable problems, design, prepare the drawings, produce the components, assemble and commission the project.

3. The students have to prepare and present a detailed project report at the end of the VI semester.

4. The evaluation will be made for the continuous internal assessment for the Project by a committee nominated by the Head of the Department.

Total Hours : 45

SEMESTER VII	L	T	P	C
COMPREHENSION	0	0	3	2

AIM:

The objective of "Comprehension" is to provide opportunity for the student to apply the knowledge acquired during the earlier semesters to real-life problems which he/she may have to face in future as an engineer. While learning as to how to solve real life problems, the student will receive guidance from teachers and also review various courses (subjects) learnt earlier. The comprehension assessment will consist of 100 to 5 tests in each Streams covering all the subject of study in the respective streams under B.E. Electronics and Communication Engineering Course

SEMESTER VII	L	T	P	C
PROJECT WORK & VIVA VOCE	0	0	12	6

OBJECTIVE

The objective of the project work is to enable the students to form the groups of not more than 3 members on a project involving theoretical and experimental studies related to the branch of study.

- Formation of Group as follows
- Group A: 8.5 CGPA and above
- Group B: 7 to 8.49 CGPA
- Group C: 5 to 6.9 CGPA

Group A Student will have a choice to take 2 students from Group B&C

- Every project work shall have a guide who is the member of the faculty of the institution. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, com-puter analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.
- The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.
- The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department.
- Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion.
- This final report shall be typewritten form as specified in the guidelines.
- The continuous assessment shall be made as prescribed in the regulations

ELECTIVE	L	T	P	C
HUMAN ANATOMY AND PHYSIOLOGY	3	0	0	3

AIM:

To understand clearly and identify the various parts of the human body, their anatomical position, their functions and how these can be used in the design of effective biomedical systems.

OBJECTIVES:

- To learn basics of human body, cell, and blood
- To study about the positioning and functioning of the cardiovascular and respiratory systems
- To study about the positioning and functioning of the nervous system and musculoskeletal system
- To study about the positioning and functioning of the digestive and excretory system
- To study about the positioning and functioning of the special organs and endocrine glands

OUTCOMES:

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

- Describe and explain specific parts and key terms applied in anatomy and physiology
- Describe important physiological mechanisms involved in cell, tissue, and organ
- Understand organization and functions of each organs and systems in human body
- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue and organ functions in each system.

UNIT I - INTRODUCTION HUMAN BODY -CELL, BLOOD 8

Overview of organ systems, Basic terminologies (Directional, regional, planes, feedback) - Cell: Different types of cells, Cell Structure and its organelles - Functions of each component in the cell - Membrane – transport across membrane - Origin of cell membrane potential - Action potential and propagation - Blood-Composition-RBC, WBC and Platelets.

UNIT II - CARDIOVASCULAR AND RESPIRATORY SYSTEMS 9

Structure of heart -Circulation types - Cardiac cycle- Volume and pressure changes - ECG - Heart sounds - Blood pressure -Regulation of BP - Parts of respiratory system , Mechanics of respiration - Carbon dioxide and oxygen transport - Regulation of respiration - Volumes and capacities of lung, Types of hypoxia

UNIT III - NERVOUS SYSTEM AND MUSCULOSKELETAL SYSTEM 9

Nerve cell anatomy -Functions of nervous system - Brain anatomy and hemispheres –Meninges - Cerebro Spinal Fluid-Circulation and Absorption-Spinal cord anatomy - Reflex action-PNS - Skeletal System - Functions -Anatomy of long bone –Formation, growth and repair - Structural and functional classification of joints - Functions of muscular system –Types of muscles - Sliding Filament Model - Neuromuscular junction - Physiology of muscle contraction

UNIT IV - DIGESTIVE AND EXCRETORY SYSTEM 9

Digestive system-Organization -Movements of GI tract - Digestion at various parts (Mouth to Large Intestine) - Accessory organs of Digestion (Salivary glands, Liver, Pancreas, Gall Bladder)– Defecation - Excretory System - Functions of urinary system - Microanatomy and functions of nephron - Physiology of urine formation – Micturition

UNIT V - SPECIAL ORGANS AND ENDOCRINE GLANDS **10**

Eyes-retina Layers, Visual Pathway - Internal ear-Physiology-Auditory Pathway - Sense of Taste - Sense of Smell, touch - Endocrine glands-different glands and their hormones - Pituitary, Thyroid Parathyroid glands-Secretions – Maintenance of Calcium homeostasis - Maintenance of glucose homeostasis

Total Hours: 45

TEXTBOOKS

1. Arthur C, Guyton, John Hall.E "*Textbook of Medical Physiology"*, W.B. Saunders Company, Twelfth edition, 2006

REFERENCES

1. Sarada Subramanyam,Madhavan Kutty. K and Singh. H.D, "*Text Book of Human Physiology"*– Chand. S,& Company, First Edition,1996.
2. Ranganathan T S, "*Text Book of Human Anatomy"* , Chand S, & Co. Ltd., Fifth Edition,1996.

ELECTIVE	L	T	P	C
NUCLEAR MEDICINE	3	0	0	3

OBJECTIVE:

- To study about the basics in Atoms, Nucleus, Atomic models
- To study about the Quantum mechanics, Mass Energy
- To Study about the Electro-magnetic properties
- To Study about the Radio activity principles, properties
- To Study about the Radiation Quality

OUTCOMES:

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

- Clinical competence by producing high quality images (PET, computed tomography, etc.) and by demonstrating an understanding of basic science concepts required for nuclear medicine imaging.
- Critical thinking by adequately responding to emergent clinical challenges and showing the ability to perform multiple tasks in a timely manner.
- Professional values by displaying professional conduct and demonstrating lifelong learning.
- Effective communication skills by demonstrating written and oral communication skills.

Unit I Atomic & Nuclear Structure **9**

Basics: Elementary introduction to structure of matter- elements- compounds and mixtures-molecules and atoms- Atomic & Nuclear structures- Atomic models – Periodic table- simple ideas of quantum mechanics - Mass energy equivalence – Fluorescence – Phosphorescence – luminescence

Unit-II Principles of Electro Magnetism **9**

Electromagnetic spectrum.. Electricity, Magnetism and Electro-Magnetic induction: Electricity in ionized gases-electric charges-electric induction- Coloumb law-unit of charge-resistance-ohms law-electric power-Joules law. Magnetism-magnetic properties-electromagnetic effect-electrical instruments like Voltmeter, Ammeter & Multi Meter.

Unit-III Radioactivity **9**

Radioactivity & Interaction of Radiation: Radioactivity - Discovery– Natural & Artificial Radioactivity-Isotopes and nuclides – binding forces between nuclear particles –alpha & beta particles – gamma radiation

Unit-IV Radio activity Properties **9**

Mechanisms of radioactive decay – half life - Interaction of electrons, X-rays & γ-rays with matter - Radiation intensity & exposure - radiation dose

Unit-V Radiation Quality **9**

Radiation quality – law of exponential attenuation – half value layer – linear attenuation coefficient – Scattering – photoelectric effect – Compton-scattering – pair production – particle interactions – total attenuation coefficient- relative clinical importance.

TOTAL HOURS: 45

REFERENCE BOOKS

1. Physics in Nuclear Medicine – Simon Cherry, James Sorenson & Michael Phelps.
2. Basic Medical Radiation physics: Stanton

3. Medical Radiation Physics – William R. Hendee.
4. Nuclear Radiation Detection – William J. Price, McGraw – Hill Book Company
5. Basics of Computers and Image hard copy production in Nuclear Medicine
6. Computers in Nuclear Medicine –A practical Approach – Kai.H.Lee
7. Effective use of computers in Nuclear Medicine: Michael J.Gelf and Stephen.RThomas.
8. Radiographic Latent Image Processing – W.E.J. Mckinne

ELECTIVE	L	T	P	C
ADVANCED MEDICAL IMAGING SYSTEMS	3	0	0	3

AIM:

This paper attempts to introduce the student on the advances of medical imaging techniques.

OBJECTIVES:

- To understand the concepts of medical imaging.
- To appreciate the image processing systems.
- To ascertain the ultra sound imaging system.
- It endeavors to enlighten the MRI.
- It gives knowledge of nuclear medical imaging system.

OUTCOMES:

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

- Advanced and integrated understanding of the applications of physical processes to the diagnosis and treatment of disease, including an understanding of contemporary developments in professional practice.
- Advanced understanding of the origins of radiation and its interactions with matter pertaining to the production and use of ionising radiation, with particular regard to the protection of people and environments.
- Skills to investigate analyse and interrogate scientific data to ensure quality control of complex technological systems and to diagnose causes of discrepancies.
- Technical and research skills to design, implement and evaluate developments in diagnostic and therapeutic technology that influence professional practice and scholarship.

UNIT-I: IMAGE PROCESSING SYSTEMS & TRANSFORMS 9

Image perception, Computer graphics and Image processing. MTF of the visual system, Image fidelity criteria, Image model, Image sampling and quantization, Windowing, Neighborhood operations. 2D - sampling theory, Image quantization, optimum mean square quantizer, Image transforms - 2D - DFT and other transforms. Rotation, resizing, mathematical transforms of image.

UNIT-II: ULTRA SOUND IMAGING SYSTEM 9

Physics and production of ultrasound, Medical ultrasound, acoustic impedance, absorption and attenuation of ultrasound energy, pulse geometry, ultrasonic field, ultrasonic transducers and probe design, principles of image formation, image processing, display system: A-mode, B-mode and M-mode. Real-time ultrasonic imaging systems, electronic scanners, image artifacts, Doppler ultra sound and Colour velocity mapping, duplex ultrasound, bio-effects and safety levels.

UNIT-III: MAGNETIC RESONANCE IMAGING SYSTEM 9

Principles of nuclear magnetism, RF magnetic field and resonance, magnetic resonance (MR) signal, nuclear spin relaxations, gradient pulse, slice selection, phase encoding, frequency encoding, spin echoes, gradient echoes, K-space data acquisition and image reconstruction. MRI scanner hardware: magnet, gradient coil, RF pulse transmission and RF signal reception. Diagnostic utility and clinical MRI, functional MRI, magnetic resonance angiography (MRA), magnetic resonance spectroscopy (MRS), diffusion MRI, bio-effects and safety levels.

UNIT-IV: NUCLEAR MEDICAL IMAGING SYSTEM 9

Radio nuclides for imaging, nuclear decay and energy emissions, brief of radionuclide production and detectors, pulse height analyzer, uptake monitoring equipment, Rectilinear scanners, Gamma Camera, Single-photon Emission Computed Tomography(SPECT), Positron Emission Tomography(PET).

.

UNIT-V: CLINICAL APPLICATIONS 9

Clinical aspects of PET/CT and SPECT/CT, cone beam CT for radiotherapy, perfusion CT, spiral CT, multi-slice CT, functional brain imaging, bone marrow scanning, CSF imaging, Thyroid and parathyroid imaging, Liver and spleen imaging.

TOTAL HOURS: 45

TEXT BOOKS

1. Gonzalaz. R and Wintz P. "Digital Image Processing", Addision Wesley Publishing Co, 2007
2. Carr & Brown, "Introduction to Biomedical Equipment Technology" Pearson Education, Asia.
3. R. S. Khandpur, "Handbook of Bio-Medical Instrumentation", Tata McGraw Hill.
4. J.Webster, "Bioinstrumentation", Wiley & Sons
5. Anil. K.J, "Fundamentals of digital Image Processing", Prentice Hall of India Pvt. Ltd., New Delhi, 1995
6. Bernd Jahne, "Digital Image Processing", 6th revised and extended edition, Springer

REFERENCE BOOKS

7. Semmlow John L. "Biosignal & Biomedical Image Processing - MATLAB based applications", Marcel Dekker Inc.,
8. Albert Macouski, "Medical Imaging systems", Prentice Hall, New Jersey
9. Dowsett, Kenny & Johnston, "The Physics of Diagnostic Imaging", Chapman & Hall Medical, Madras/London.
10. Brown, Smallwood, Barber, Lawford & Hose, "Medical Physics and Biomedical Engineering", Institute of Physics Publishing, Bristol.
11. Massey & Meredith , "Fundamental Physics of Radiology", John Wright & Sons.
12. S. Webb, "The Physics of Medical Imaging", Ada m Hilger, Bristol.
13. Sybil M Stockley, "A Manual of Radiographic Equipments", Churchill Livingstones.
14. Chistrmis , "Physics of Diagnostic Radiology"

ELECTIVE	L	T	P	C
ADVANCED MICROCONTROLLERS	3	0	0	3

AIM:

To learn the architecture and programming of advanced Intel family microprocessors and microcontrollers.

OBJECTIVES:

- To introduce the concepts in internal programming model of Intel family of microprocessors.
- To introduce the programming techniques using MASM, DOS and BIOS function calls.
- To introduce the basic architecture of Pentium family of processors.
- To introduce the architecture programming and interfacing of 16 bit microcontrollers.
- To introduce the concepts and architecture of RISC processor and ARM.

OUTCOMES:

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

- Understand the architecture of PIC microcontroller
- Program PIC microcontroller using various techniques
- Design and develop PIC microcontroller based embedded circuits

UNIT I ADVANCED MICROPROCESSOR ARCHITECTURE 9

Internal Microprocessor Architecture-Real mode memory addressing – Protected Mode Memory addresses –Memory paging - Data addressing modes – Program memory addressing modes – Stack memory addressing modes – Data movement instructions – Program control instructions- Arithmetic and Logic Instructions.

UNIT II MODULAR PROGRAMMING AND ITS CONCEPTS 9

Modular programming –Using keyboard and Video display –Data Conversions- Disk files- Interrupt hooks- using assembly languages with C/ C++

UNIT III PENTIUM PROCESSORS 9

Introduction to Pentium Microprocessor – Special Pentium registers- Pentium memory management – New Pentium Instructions –Pentium Processor –Special Pentium pro features – Pentium 4 processor – Intelligent Processors and its successors.

UNIT-IV 16-BIT MICRO CONTROLLER 9

8096/8097 Architecture-CPU registers –RALU-Internal Program and Data memory Timers-High speed Input and Output –Serial Interface-I/O ports –Interrupts –A/D converter-Watch dog timer –Power down feature –Instruction set- External memory Interfacing –External I/O interfacing.

UNIT V RISC PROCESSORS AND ARM 9

The RISC revolution – Characteristics of RISC Architecture – The Berkeley RISC – Register Windows – Windows and parameter passing – Window overflow – RISC architecture and pipelining – Pipeline bubbles – Accessing external memory in RISC systems – Reducing the branch penalties – Branch prediction – The ARM processors – ARM registers – ARM instructions – The ARM built-in shift mechanism – ARM branch instructions – sequence control – Data movement and memory reference instructions – Real Time Applications of RISC and ARM.

Total Hours: 45

TEXT BOOK

1. Barry B.Brey, The Intel Microprocessors 8086/8088, 80, 86, 80286, 80386 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming and interfacing, Prentice Hall of India Private Limited, New Delhi, 2003. (UNIT I, II and III).
2. John Peatman, Design with Microcontroller McGraw Hill Publishing Co Ltd, New Delhi. (UNIT IV).
3. Alan Clements, "The principles of computer Hardware", Oxford University Press, 3rd Edition, 2003. (UNIT V)

REFERENCE BOOKS

1. Rajkamal, The concepts and feature of micro controllers 68HC11, 8051 and 8096; S Chand Publishers, New Delhi.

ELECTIVE	L	T	P	C
ROBOTICS AND AUTOMATION IN MEDICINE	3	0	0	3

AIM:

This paper attempts to edify the student on the basics of automation, its design and control. It lays emphasis on specialized robotic systems and critical surgeries performed and recent technical innovations and future applications especially in micro and nano scale surgery.

OBJECTIVES:

- To understand the concept of automation and apply the same in the field of medicine
- To appreciate the accuracy and precision achieved by robotic systems which is critically essential in surgical procedures
- To ascertain the design, integration and control of robotic systems and discover solutions to challenges posed by the technical side of medical robotics
- It endeavors to enlighten the student on the cutting-edge technologies used presently.
- Their limitations and the need for miniature equipments to provide better surgical results.

OUTCOMES:

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

- Understand the concept of automation and apply the same in the field of medicine
- Explain the design, integration and control of robotic systems and discover solutions to challenges posed by the technical side of medical robotics
- Gain the accuracy and precision achieved by robotic systems which is critically essential in surgical procedures

UNIT I: INTRODUCTION 9

Geometric configuration of robots - manipulators - drive systems - internal and external sensors - end effectors - control systems - robot programming languages and applications - Introduction to robotic vision

UNIT II: ROBOTIC SURGERY 9

Surgical robots-types, advances and advantages. Technologies involved in robotic surgery-sensors, actuators, micromechanics, communication control, virtual reality and artificial intelligence. Application of intelligent tools for robotic systems design, integration of electronics and communications systems with human nerve network.

UNIT III: MOBILE ROBOTICS 9

Architecture for advanced mobile robotics, actuator design, navigation, obstacle avoidance, sensors and vision systems. Legged robotic devices, control of mobile robots in semi structured environment - Advanced robotics: control, instrumentation - navigation - route planning - autonomous operation - haptic interface - haptic feedback in systems design - system architecture - data fusion, system integration.

UNIT IV: ADVANCES IN MICROMECHATRONICS 9

Robot force control strategies, autonomous mobile multi jointed systems. Robotic systems: current applications of the da Vinci system, Zeus, neuro arm, cyber knife, ROBODOC, robotic radio surgery system, pintrace. Application of FES for restoration of locomotion. Development of specialized sensors for online monitoring of biological parameters, computer assisted surgery, rehabilitation robotics in virtual environment, applications in unstructured environment.

UNIT V: BIOMEDICAL APPLICATIONS 9

Nerve cell repair using micro mechatronics, micro and Nano devices for targeted delivery of medicines to tumour sites and diagnosis using navigable biosensors. Surgeries performed using robotic systems- TECAB, mitral valve surgery, bariatric surgery, minimally invasive surgeries. Surgical procedures in general surgery, neurology, urology, gasteroenterology, cardiology, Orthopedics, paediatrics and radio surgery.

TOTAL HOURS: 45

TEXT BOOKS

1. "Advanced Robotics & Intelligent Machines", by J. O. Gray, Institution of electrical engineers, Darwin G. Caldwell, D. G. Campbell, Institution of Electrical Engineers (1996)
2. "Computer Vision, Virtual Reality and Robotics in Medicine", by Nicholas Ayache Springer-Verlag (1995)3. Robotics Research by Raymond A. Jarvis, Alexander Zelinsky Springer (2003).
3. "Embedded Robotics", by Thomas Bräunl Springer (2003)

ELECTIVE	L	T	P	C
MEDICAL PHYSICS	3	0	0	3

AIM:

The purpose of the course is to understand the concepts and methods of physics in the diagnosis and treatment of human disease

OBJECTIVES:

- To study the arrangement of atoms in periodic system
- To study the interaction of radiation with cells.
- To study the somatic effects of radiation.
- To study the genetic effects of radiation.
- To study the application of physics in medicine

OUTCOMES:

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

- Understand the principle of radioactivity and uses of some radio-isotopes
- Physics relating the interaction of radiation with matter
- Radiation effects in human tissues and organs

UNIT I : ATOMIC PHYSICS 9

Traditional definition of atom, periodic system of elements, mechanical properties of atom, emission of light and its frequencies. Electromagnetic spectra. Principles of Nuclear Physics – Natural radioactivity, Decay series, type of radiation and their applications, artificially produced isotopes and its application, accelerator principles.

UNIT II: INTERACTION WITH LIVING CELLS 9

Target theory, single hit and multi target theory, cellular effects of radiation, DNA damage, depression of Macro molecular synthesis, Chromosomal damage.

UNIT III: SOMATIC EFFECT OF RADIATION 9

Radio sensitivity protocol of different tissues in human, LD 50/30 effect of radiation on skin, blood forming organs, lenses of eye, embryo and Endocrinal glands.

UNIT IV: GENETIC EFFECT OF RADIATION 9

Threshold of linear dose effect, factors affecting frequency of radiation induced mutation, Gene controlled hereditary diseases, biological effect of microwave and RF wave. Penetration and propagation of signals effects in various vital organs, Protection standards.

UNIT V: PHOTO MEDICINE 9

Synthesis of Vitamin D in early and late cutaneous effects, Phototherapy, Photo hemotherapy.

LASER PHYSICS – Characteristics of Laser radiation, Laser speckle, biological effects, laser safety management.

TOTAL HOURS: 45

TEXT BOOKS:

1. "Introduction of Health physics" ,Herman comber Thomas E Johnson McGraw Hill

2. “Radiology for the Radiologist” , 7th Edition, EvicJ.Hall, Amato J.Giacacippino Williams & Wilkins tuwar business
3. Branski.S and Cherski.P ‘Biological effects of Microwave’ Hutchinson & ROSS Inc. Strondsburg 1980.
4. Moselly, ‘Non ionising Radiation’ Adam HilgarBrustol 1988.
5. Glasser.O. “Medical Physics”,Vol.1, 2, 3 year Book Publisher Inc Chicago, 1980.

ELECTIVE	L	T	P	C
BRAIN COMPUTER INTERFACE	3	0	0	3

AIM:

To learn about Brain computer interface and about the approaches of BCI.

OBJECTIVES:

- To learn the basics of brain computer interfacing and to study about data acquisition, hardware and software requirements.
- To study about the BCI approaches.
- To get an idea about EEG Feature Extraction methods
- To acquire knowledge about EEG Translation methods
- To acquire knowledge about MATLAB tools for BCI

OUTCOMES:

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

- Gain the knowledge about EEG Translation methods and MATLAB tools for BCI
- Understand the EEG Feature Extraction methods and the BCI approaches

UNIT 1 INTRODUCTION 9

Introduction to Brain computer interfaces, The Evolution of BCIs, Brain signals for BCIs: Neuronal Activity in motor cortex and related areas, Electrical and Magnetic fields produced by the brain, Signals reflecting brain metabolic activity, Concept of BCI, Invasive and Non-invasive Types, EEG Standards, Signal Features, Spectral Components, EEG Data Acquisition, Pre-processing, Hardware and Software , Artifacts, Methods to Remove , Near Infrared BCI.

UNIT 2 BCI APPROACH METHODS 9

Mu Rhythm – Movement Related EEG Potentials – Mental States – Visual Evoked Potential Based – P300 component.

UNIT 3 EEG FEATURE EXTRACTION METHODS 9

Time/Space Methods – Fourier Transform – Wavelets – AR models – Band pass filtering PCA – Laplacian Filters – Linear and Non-linear Features.

UNIT 4 EEG FEATURE TRANSLATION METHODS 9

LDA – Regression – Memory Based – Vector Quantization – Gaussian Mixture Modeling – Hidden Markov Modeling.

UNIT 5 MATLAB-BASED TOOLS FOR BCI 9

Introduction, Data Streaming: Field Trip, DataSuite: DataRiver and MatRiver, EEGLAB Online Data Processing: A minimalistic BCI script using native MATLAB code, Other MATLAB BCI Classification tools, BCILAB.

Total Hours: 45

TEXT BOOKS

1. Jonathan R. Wolpaw, Elizabeth Winter Wolpaw, Brain computer interfaces principles and practice, Oxford University Press-2012.

2. Desney S, Tan & Anton Nijholt, Brain Computer interfaces: Applying our minds to human computer interaction, Springer Science and Business Media, 2010.

REFERENCE BOOKS

1. Bernhard Graimann, Brendan Allison, Gert Pfurtscheller, Brain computer interfaces Revolutionizing Human – Computer interaction, Springer-2010.
3. Special Issue on Brain Control Interfaces, IEEE Transactions on Neural Systems and Rehabilitation Engineering, Vol 14, June 2006.
4. Andrew Webb, Statistical Pattern Recognition, Wiley International, Second Edition, 2002.
5. R.Spehlmann, EEG Primer, Elsevier Biomedical Press, 1981.

ELECTIVE	L	T	P	C
BIOMEDICAL MICRODEVICES	3	0	0	3

AIM:

To students to gain basic knowledge on MEMS (Micro Electro Mechanical System). This enables them to design, analyze, fabricate and test the MEMS based components.

OBJECTIVES:

- Introduction to MEMS.
- To study the Mechanics for MEMS Design.
- To study Electro Static Design and System Issues.
- To know various MEMS Applications

OUTCOMES:

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

- Introduce students to the diverse and highly interdisciplinary field of biomedical micro devices with an emphasis on biomedical microelectromechanical systems and micro technologies.
- Students will learn the building blocks of these devices, how they are constructed, and the principles governing their operation and performance.
- Emphasis is placed on learning the fundamental principles of these microdevices so that students can appreciate the technical challenges and opportunities that biomedical microdevices brings to life and medical sciences.
- Students will be able to engage in hands-on activities featuring fabrication and design of biomedical microdevices.

UNIT I INTRODUCTION TO MEMS 9

MEMS and Microsystems, Typical products of MEMS and Microsystem products, Micro sensors, Micro actuator, Evolution of Micro fabrication, Microsystems and Microelectronics, MEMS materials.

UNIT II PRINCIPLES OF MICROSYTEMS 9

Micro sensors- Acoustic wave sensors, Biomedical Sensors and Biosensors, Optical Sensors, Pressure sensors, Micro actuation- Actuation using Thermal Forces, Piezoelectric Crystals, Electrostatic Forces, MEMS with Micro actuators- Micro grippers , Micro motors , Micro valves , Micro accelerometers

UNIT III MICROMACHINING 9

Introduction, Photolithography, Bulk Micromachining, Thin Film Deposition, Etching, surface Micromachining, LIGA

UNIT IV MICRO-OPTO-ELECTROMECHANICAL SYSTEMS 9

Fundamental Principle of MOEMS Technology, Review Properties of Light, Light Modulators, Beam Spliotter, Micro lens, Micro mirrors, Digital Micro mirror Device(DMD),Light Detectors, Grating Light Valve, Optical Switch

UNIT V MEMS APPLICATION 9

Application – Health Care, Micro fluid Dispenser, Micro needle, Micro pumps, Chem-Lab-On-A-Chip(CLOC), E-Nose, DNA sensors, Surface Acoustic Wave(SAW) Sensors.

TOTAL HOURS: 45

TEXT BOOKS:

1. Tai Ran Hsu," MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002. Liu,"MEMS", Pearson education, 2000(Unit-I,II)
2. N. P. Mahalik, "MEMS",Tata McGraw hill, Sixth reprint, 2012.(Unit-III,IV,V)

REFERENCE BOOKS:

1. Nadim Maluf," An introduction to Micro electro mechanical system design", ArtechHouse, 2000.
2. Mohamed Gad-el-Hak, editor," The MEMS Handbook", CRC press Baco Raton,2000.
3. Stephen Santeria," Microsystems Design", Kluwer publishers, 2000.

ELECTIVE	L	T	P	C
TELEMEDICINE AND PACS	**3**	**0**	**0**	**3**

AIM:

To provide the students, a basic understanding of Telemedicine concepts and PACS.

OBJECTIVE:

- To know about basics of Telemedicine.
- To study about various types of communication and networking
- To know the basics concepts of networks, network configuration and network security
- To study of various applications of Telemedicine
- To know about picture archiving and communication system

OUTCOMES:

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

- Know the basics concepts of networks, network configuration and network security
- Understand the various applications of Telemedicine
- Gain the various types of communication and networking

UNIT 1 INTRODUCTION (9)

Fundamentals of Telemedicine, Block diagram of Telemedicine, History of telemedicine: Main phases of Telemedicine, Pre electronic Telemedicine, Electronic Telemedicine. Scope & Benefits and Limitation of Telemedicine.

UNIT 2 COMMUNICATION AND NETWORK (9)

Types of information: Audio, Video, Data, Fax, Still Image. Types of Communication and Networks: Overview of PSTN, POTS, ISDN, ATM, Videoconferencing, Wireless Communication – RF, GSM Satellite and Microwave, CDPD.

UNIT 3 DATA EXCHANGE AND NETWORK SECURITY (9)

Basic concepts of internet, Network Configuration, Circuit and Packet Switching, H.320 series, h.324 Protocols: TCP/IP, Standards for DICOM, Security: Encryption – DES, RSA, and Cryptography.

UNIT 4 APPLICATIONS OF TELEMEDICINE (9)

Teleradiography – Basic parts of a Teleradiography System, Image acquisition and display system, Communication, Interpretation. Telepathology: Applications, Requirements, Security and Confidentiality tools, Telecytology: Applications, Telecardiology, Telehome – Care Home based Applications, Teleoncology: Applications, Telesurgery, Telepsychiatry, Teledermatology: Techniques.

UNIT 5 PICTURE ARCHIVING AND COMMUNICATION SYSTEM (9)

Picture Archiving and Communication System Components and Workflow, Communications and Networking, Integration of HIS, RIS, PACS, and ePR.

Total Hours: 45

TEXT BOOKS:

1. Olga (EDT), Ferrer – Roca, M. Sosa (EDT), Marcelo C, Handbook of Telemedicine, IOS press 1998.
2 .Ling Guan, Multimedia image and video processing, CRC Press, 2000.
3 H K Huang, “PACS and Imaging Informatics: Basic Principles and Applications” Wiley Blackwell, 2010.

REFERENCE BOOKS:

1. Thorsten M Buzug, Heinz Handels, Dietrich Holz, and Telemedicine: Medicine and communication, Springer Verlag 2001.
2. http://www.teide.net/catai/Books/handbook2.htm

ELECTIVE	L	T	P	C
DESIGN OF MEDICAL DEVICES	3	0	0	3

AIM:

The purpose of this course is to impart knowledge in the universal design consideration for medical devices.

OBJECTIVES:

- To gain knowledge about data acquisition, noise reduction and protection techniques.
- To get an idea about the product level design in medical field.
- To understand the basic designing concepts for diagnostic, therapeutic equipments.
- To understand the basic designing concepts for implants and Prosthesis.

OUTCOMES:

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

- Ability to apply the principles of engineering design from recognition of need to a fully-tested product.
- Ability to organize and manage a design project and work effectively in a team to complete the project.
- Ability to recognize the existence, similarities and differences of various regulator processes for assessment and approval for commercialization of biomedical devices and systems in national and the global markets.
- Ability to apply knowledge of natural physiological systems to the design of their replacements and to devise means to overcome constraints in doing so.
- Ability to design and conduct tests to verify design input and validate the final product to meet user needs

UNIT I: DATA ACQUISITION AND NOISE ISSUES 9

Physical Principles of Sensing, Sensor Interfacing, Driving Bridges, Signal Conditioning Amplifiers, Data Acquisition: Sample and Hold Conversion, Multi-channel Acquisition, Internal Noise In OPAMPS, Bypass Capacitors and Resonances, Electromagnetic Interference, interference from external electric field, conductive interference, electrical safety and signal isolation, Overload Protection, Output Filtering¸ Power Failure Warning

UNIT II: DESIGN METHODOLOGIES 9

EDR design methodologies, PCB assembly, mechanical assembly, product design and modeling, fabrication and assembly, Multi-layer circuit design, Advanced OrCAD design, Design rule specifications

UNIT III: DIAGNOSTIC EQUIPMENT DESIGN 9

ECG, EEG, Blood pressure monitor, Thermometer, System description and diagram of pulse oximeter, Optical fiber optics for circulatory and respiratory system measurement, Magnetic resonance imaging (MRI) Hardware design

UNIT IV: THERAPEUTIC EQUIPMENT DESIGN 9

Pacemaker, External cardio-vector defibrillator, Implantable cardio-vector defibrillator, Deep brain stimulation, Functional electrical stimulator (FES), Hemodialysis delivery system, Mechanical ventilator

UNIT V: IMPLANT AND PROSTHESIS DESIGN 9

Intraocular lens implant, Cochlear implants, Heart valves, Design of artificial pancreas, Drug eluting stent and its engineering design, synthetic crafts, Total hip prosthesis, Joint replacement

Total Hours: 45

TEXT BOOKS

1. Gail Baura, **"Medical Device Technologies: A Systems Based Overview Using Engineering",** Elsevier science, 2002.
2. Martin Culjat, Rahul Singh, Hua Lee, **"Medical Devices: Surgical and Image-Guided Technologies",** John Wiley & Sons.
3. Reinaldo Perez, **"Design of medical electronic device",** Elsevier science, 2002.
4. Richard C. Fries, **"Handbook of Medical Device Design",** Marcel Dekker AG, 2nd Edition 2005.

REFERENCE BOOKS

1. Anthony Y.K.Chan, **"Biomedical Device Technology: Principles and Design",** Charles C Thomas, 2008.
2. Theodore R. Kucklick, "**The Medical Device Ramp-D Handbook",** Taylor & Francis Group LLC, 3rd Edition 2013.

ELECTIVE	L	T	P	C
TOTAL QUALITY MANAGEMENT	3	0	0	3

AIM:

Concepts of quality; Core values and paradigms for TQM, including corporate citizenship and protection of the environment; Models for performance excellence: Deming Prize, Baldrige Quality Award, European Quality Award

OBJECTIVES:

- Understand the philosophy and core values of Total Quality Management (TQM);
- determine the voice of the customer and the impact of quality on economic performance and long-term business success of an organization;
- Apply and evaluate best practices for the attainment of total quality.

OUTCOMES:

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

- select and apply appropriate techniques in identifying customer needs, as well as the quality impact that will be used as inputs in TQM methodologies;
- measure the cost of poor quality and process effectiveness and efficiency to track performance quality and to identify areas for improvement;
- understand proven methodologies to enhance management processes, such as benchmarking and business process reengineering;
- choose a framework to evaluate the performance excellence of an organization, and determine the set of performance indicators that will align people with the objectives of the organization.

UNIT I – INTRODUCTION 9

Definition of quality – Dimensions of quality – Quality planning – Quality costs – Analysis techniques for quality costs – Basic concepts of total quality management – Historical review – Principles of TQM – Leadership – Concepts – Role of senior management – Quality council – Quality statements –Strategic planning – Deming philosophy – Barriers to TQM implementation.

UNIT II – TQM PRINCIPLES 9

Customer satisfaction – Customer perception of quality – Customer complaints – Service quality – Customer retention – Employee involvement – Motivation, empowerment, teams, recognition and reward – Performance appraisal – Benefits – Continuous process improvement – Juran trilogy – PDSA cycle – 5S – Kaizen – Supplier partnership – Partnering – Sourcing – Supplier selection – Supplier rating – Relationship development – Performance measures – Basic concepts – Strategy –Performance measure.

UNIT III – STATISTICAL PROCESS CONTROL (SPC) 9

The seven tools of quality – Statistical fundamentals – Measures of central tendency and dispersion – Population and sample – Normal curve – Control charts for variables and attributes – Process capability – Concept of six sigma – New seven management tools.

UNIT IV – TQM TOOLS 9

Benchmarking – Reasons to benchmark – Benchmarking process – Quality Function Deployment(QFD) – House of quality – QFD process – Benefits – Taguchi quality loss function – Total Productive Maintenance (TPM) – Concept – Improvement needs – FMEA
– Stages of FMEA.

UNIT V – QUALITY SYSTEMS **9**

Need for ISO 9000 and other quality systems – ISO 9000:2000 Quality system – Elements – Implementation of quality system – Documentation – Quality auditing – TS 16949 – ISO 14000 –Concept – Requirements and benefits.

Total Hours: 45

TEXT BOOKS

1. Besterfiled, D.H. "Total Quality Management", Pearson Education, Inc. 2003.
2. Zeiri., "Total Quality Management for Engineers", Wood Head Publishers, 1991.

REFERENCES

1. Evans, J. R., and Lidsay, W.M., "The Management and Control of Quality", 5th Edition, South-Western (Thomson Learning), 2002.
2. Oakland.J.S. "Total Quality Management", Butterworth – Hcinemann Ltd., Oxford, 1989.
3. Narayana V. and Sreenivasan, N.S., "Quality Management – Concepts and Tasks", New Age International, 1996.

ELECTIVE	L	T	P	C
MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS	3	0	0	3

OBJECTIVES:

- To identify the objectives, nature, scope, role & responsibilities of a manager of a business undertaking.
- To apply the knowledge of demand, demand elasticity & demand forecasting by using statistical techniques for any hypothetical enterprise.
- To explain production function relation, law of variable proportion, returns of scale, producer equilibrium, economies
- To explain the relevance of cost behaviour analysis & costs that are useful for managerial decision making and Break Even Point(BEP) of an enterprise.
- To differentiate & distinguish price and output decisions in different market structures i.e., perfect, monopoly, monopolistic & Oligopoly competition.
- To compare & contrast the differences between private & public sector undertakings in their features, objectives, scope, merits, uses & limitations in functioning.

OUTCOMES:

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

- Determine the objectives, nature, scope, role & responsibilities of a manager of a business undertaking.
- Predict the demand for a product or product mix of a company & to analyze various factors influencing demand elasticity.
- Forecast & compute the future sales level of a product by using various quantitative & qualitative techniques and with the help of past sales data.
- Examine optimum production & cost functions with the help of mathematical equations & by developing graphical solutions through linear programming applications.
- Assess the cost behaviour, costs useful for managerial decision making and determine Break Even Point (BEP) of an enterprise.

UNIT - I Introduction to Managerial Economics 9

Definition, Meaning, Nature and Scope Managerial Economics-Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

UNIT - II Theory of Production and Cost Analysis 10

Production Function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts, Opportunity cost, Fixed Vs Variable costs, Explicit costs Vs Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA) - Determination of Break-Even Point (simple problems) - Managerial Significance and limitations of BEA.

UNIT III Introduction to Markets & Pricing strategies 8

Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. Pricing Strategies

UNIT IV Capital and Capital Budgeting **9**

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

UNIT V Introduction to Financial Accounting & Ratios **9**

Introduction to Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments only). Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt-Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

TOTAL HOURS: 45

TEXT BOOK

1. A R Aryasri: Managerial Economics and Financial Analysis, Tata Mc Graw Hill, 2006
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2003.

REFERENCES

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi, 2004.
2. Domnick Salvatore: Managerial Economics In a Global Economy, 4th Edition, Thomson, 2003.
3. Narayanaswamy: Financial Accounting-A Managerial Perspective, Prienceton Hall of India, 2005

ELECTIVE	L	T	P	C
VIRTUAL INSTRUMENTATION	3	0	0	3

AIM:

Enable students to understand basics, programming techniques, data acquisition and interfacing techniques of virtual instrumentation and to use VI for different applications

OBJECTIVE:

- To understand what is Virtual instrumentation and to realize the architecture of VI.
- To familiarize with the VI software and learn programming in VI.
- To study various Instrument Interfacing and data acquisition methods.
- To understand various analysis tools and develop programs for Process control applications.

OUTCOMES:

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

- To learn interpreting data sheet of 74 series, CD 4000 series, ECL 10000 seriespower supply considerations for digital IC.
- To learn RS-232, RS-485, R8422, ISA, PCL, HC, SPI, CAN bus characteristics. Bus interface for R8422 and RS485
- To have a clear view on Principles of PAL's PLD's GAL's CPLD and their design considerations.
- To learn Principles and design considerations of specific PROM, EPROM, SRAM, SDRAM
- To learn Multiphase clock generators, LCD display controller, PRBS generator, watch dog timer, interfacing with SPI bus, interfacing with flash memory.

UNIT I –INTRODUCTION TO REVIEW OF VIRTUAL INSTRUMENTATION 9

History of Instrumentation systems, Evolution of Virtual Instrumentation, Premature Challenges, Virtual Instrumentation - Programming Requirements, Drawbacks of Recent Approaches, Conventional Virtual Instrumentation, Distributed Virtual Instrumentation, Virtual Instruments Versus Traditional Instruments, Advantages of VI

UNIT II – PROGRAMMING TECHNIQUES 9

Introduction, Virtual Instruments, Dataflow Programming, Control Structures, Selection Structures, Arrays, Clusters, Waveform Charts and Graphs, tables, File I/O

UNIT III – DATA ACQUISITION BASICS 9

Introduction, Components of Measuring System, Origin of Signals, Transducer, Sensors, General Signal Conditioning Functions, Analog-to-Digital Control

UNIT IV – COMMON INSTRUMENT INTERFACES 9

Introduction, Current Loop, RS232, RS422 and RSS485, GPIB, VISA, Interface Buses, Data Transmission Concepts

UNIT V –APPLICATIONS OF VI 9

Fiber-Optic Component Inspection, Data Acquisition and User Interface of Beam Instrumentation System, Virtual Instrumentation and CAD Tool for Electronic Engineering Learning, The Virtual Instrument Control System, Distributed Multiplatform Control System, Implementation of a Virtual Factory Communication System, Neural Networks for Measurement and Instrumentation in Virtual Environments.

TOTAL HOURS: 45

TEXT BOOKS

1. Dr. Sumathi. S and Prof. Surekha. P, “LabVIEW Based Advanced Instrumentation Systems”, 2nd edition, 2007.

REFERENCE BOOKS

1. Lisa .K, Wells and Jeffrey Travis, “LABVIEW for Everyone”, Prentice Hall, 2009.
2. Skolkoff, “Basic concepts of LABVIEW 4”, PHI, 1998.

ELECTIVE	L	T	P	C
BIOMEDICAL INFORMATICS	3	0	0	3

AIM:

To study the applications of information science and its impact in medical field

OBJECTIVE:

- To understand the hospital management system and integrated hospital information system
- To know about the basic concepts of artificial intelligence and expert systems
- To study the hospital management information systems and computer assisted patient education
- To understand the concept of 3 dimensional imaging and its applications
- To study the concepts of telemedicine, its issues and reliability

OUTCOMES:

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

- Have Knowledge about the historical information of hospital.
- Have a well-founded knowledge of overview of computer hardware used in the Hospital Information system
- Have a fundamental knowledge of Hospital Information system
- Have a skill about the visual programming and multimedia information.
- Acquire the skills integrated medical information system.

UNIT I **9**

Introduction - Hospital management and information system: functional area - pre-requisites - integrated hospital information systems - health information system- and disaster management plan.

UNIT II **9**

Artificial intelligence - expert systems - materials and methods- computer based patient Records- computer assisted medical education

UNIT III: **9**

Hospital Management and Information systems - structure and functions - computer assisted patient education computer assisted patient surgery.

UNIT IV **9**

Three-dimensional imaging: limitations of endoscopy and imaging - benefits of virtual endoscopy - materials and methods- limitations- applications - merits and demerits - surgical simulation - virtual environment

UNIT V **9**

Telemedicine – needs - materials and methods - Internet telemedicine - controversial issues – reliability - cost analysis – applications – telesurgery - the Internet

TOTAL HOURS: 45

TEXT BOOK:

1. Mohan Bansal, “Medical Informatics- a primer”, Tata McGraw-Hill, 2003.

REFERENCE BOOKS:

1. Hsinnchun Chen, “Medical Informatics: Knowledge Management and Data Mining in Biomedicine”, Springer, 2005.
2. F. T. De Dombal, “Medical Informatics: The Essentials”, Butterworth-Heinemann, 1996.
3. Charles P. Friedman, Jeremy C. (EDT) Wyatt, “Evaluation Methods in Medical Informatics” - Springer Verlag, 1997.

ELECTIVE	L	T	P	C
THERAPEUTIC & SURGICAL EQUIPMENTS	3	0	0	3

AIM:

To make the students aware of various therapeutic equipments in use and to ensure the students to use the therapeutic equipment in a safe and effective manner

OBJECTIVE:

- To acquire an adequate knowledge about measurement of various physiological parameters and to understand
- The fundamental principle and working of the biomedical instruments involved in the measurements.

OUTCOMES:

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

- Gain the fundamental principle and working of the biomedical instruments involved in the measurements.
- Understand the knowledge about measurement of various physiological parameters.

UNIT 1 INSTRUMENTS FOR CARDIOLOGY 9

Cardiac Pacemakers - Need for Cardiac Pacemaker - External Pacemakers - implantable Pacemakers - Recent Developments in Pacemaker system analyzer. Cardiac Defibrillators -Need for a Defibrillator - DC Defibrillator - Implantable Defibrillators - Pacer-cardio vector - defibrillator analysis

UNIT 2 INSTRUMENTS FOR SURGERY 9

Instruments for surgery - principle of surgical diathermy - surgical diathermy machine - safety aspects in Electro-Surgical diathermy Units. Physiotherapy and electrotherapy equipment - High frequency heat therapy - short wave Diathermy - Microwave diathermy - Ultrasonic therapy unit - Pain relief through Electrical Stimulation - Bladder Stimulators - Cerebellar Stimulators.

UNIT 3 HAEMODIALYSIS 9

Haemodialysis Machines - Function of the kidneys - Artificial Kidney - Dialyzers - Membrances of haemodialyzers - Haemodialysis machines - Portable Kidney machines. Lithotripters - The stone disease problem - First lithotripter machine - modern lithotripter systems - Extracorporeal Shockwave Therapy

UNIT 4 PULMONARY AND RADIOTHERAPY INSTRUMENTS 9

Anesthesia Machine - Need for Anesthesia - Anesthesia machine - Electronics in Anesthesia machine. Radiotherapy Equipment - Development of Betatron, chemotherapy,Heart lung Machine.

UNIT 5 VENTILATORS 9

Ventilators: Mechanics of Respiration - Artificial Respiration - Ventilators - Types of ventilators - Classification of Ventilators - Pressure - volume - flow Diagrams - Modern ventilators - High frequency ventilators. Humidifiers - Nebulizers and Aspirators. Max. 45 Hours.

TEXT / REFERENCE BOOKS

1. R. S. Khandpur, Handbook of biomedical Instrumentation, Tata McGraw Hill Publication company Ltd, New Delhi, 1997.

2. Joseph J. Carr, John Michael Brown, Introduction to Biomedical Equipment Technology 4th edition, Pearson Education.2001.
3. John G. Webster, Biomedical Instrumentation, Wiley Publications.2007.

ELECTIVE	L	T	P	C
EMBEDDED & REAL TIME SYSTEMS	3	0	0	3

OBJECTIVE:

- To understand the concept and Devices of Embedded Systems
- To understand the basic programming tool for embedded systems
- To learn about various RTOS available
- To understand the basic real time systems and databases

OUTCOMES:

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

- Gain the basic programming tool for embedded systems
- Know the basic concept and Devices of Embedded Systems
- Understand the basic real time systems and databases

Unit – I Embedded Devices **9**

Introduction to Embedded Systems – Microcontroller 8051 – Advanced Processor Architecture – Memory Organization – Real World Interfacing – Devices for embedded Systems – Communication Buses for Device network.

Unit – II Embedded Programming **9**

Programming concepts and Embedded Programming in C, C++ and Java – Program modeling – Inter-process Communication – Synchronization of Processes – Threads - Tasks.

Unit – III Real Time Operating Systems **9**

OS Services – Process Management – Time and Even Functions – Memory Management – Device, file and IO subsystems – Interrupts – Design and Scheduling – OS Security Issues – Microc/OS-II and Vx Works – Windows CE, OSEK - RTLinux

Unit – IV Real Time Systems and Tasks **9**

Performance Measures – Estimating Program run Times – Task Assignment and Scheduling: Classical uniprocessor Scheduling Algorithms – Uniprocessor Scheduling of IRIS Tasks – Task Assignment – Mode Changes – Fault Tolerant Scheduling.

Unit – V Databases and Communication **9**

RT Databases – Real-time Vs General Purpose Databases – Main memory Databases – Transaction Priorities and Aborts – Concurrency Control Issues – Disk Scheduling Algorithms – Maintaining Serialisation Consistancy – Databases for Hard Real Time Systems – Communication Media – Network Topologies – Protocols.

Text Books

1. Raj Kamal, “Embedded Systems, Architecture, Programming and Design”, Tata McGraw Hill Education Private Limited, 2012.
2. C. M. Krishna, Kang G. Shin, “Real Time Systems”, McGraw Hill International Editions, 2012.

Reference Books:

1. Shibu K. V, “Introduction to Embedded Systems”, McGraw Hill Internationals, 2014.

2. Wayne Wolf, “Computers as Components, Principles of Embedded Computing Design”, Elsevier 2005.
3. Jane W. S. Liu, Real Time Systems”, Pearson Education, Seventh Impression, 2008.

ELECTIVE	L	T	P	C
REHABILITATION ENGINEERING	**3**	**0**	**0**	**3**

AIM:

This paper attempts to edify the student on the basics of Rehabilitation engineering design and build devices and systems to meet a wide range of needs that can assist individuals with mobility, communication, hearing, vision, and cognition. These tools help people with day -to-day activities and tasks related to employment, independent living, and education. This course is important and emerging field in biomedical engineering.

OBJECTIVES:

- To understand the concept of Rehabilitation engineering and apply the same in the field of medicine
- To appreciate the accuracy and precision achieved by systems.
- To design wheeled mobility
- It endeavors to enlighten the student on the cutting-edge technologies used presently.
- To understand sensory augmentation.

OUTCOMES:

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

- By the end of this course the student will be able to design rehabilitation aid and apply them with confidence, to help the challenged people.
- Explain the needs of rehabilitations and its future development
- Describe therapeutic exercise techniques, Orthopedic Prosthetics, Orthotics

UNIT I: REHABILITATION FUNDAMENTALS 9

Description of the rehabilitation engineering, Explaination engineering concepts in sensory rehabilitation, engineering concepts in motor rehabilitation, languages and applications - Introduction to robotic vision Rehabilitation concepts, Engineering concepts in sensory rehabilitation, Engineering concepts in motor rehabilitation, Future of engineering in Rehabilitation.

UNIT II: ORTHOPEDIC PROSTHETICS AND ORTHOTICS IN REHABILITATION 9

Intelligent prosthetic knee, functional electrical stimulation, hybrid assistive system, computer application in rehabilitation engineering, myoelectric hand, the prosthetic hand and its applications, Elaborateorthotic knee joint, Computer aided engineering in component design, Intelligent prosthetic knee, Hierchically controlled prosthetic hand, myoelectric hand, Orthotic knee joint, Externally powered and controlled orthoses and prosthesis, FES systems-restoration of hand, restoration of standing and walking, HAS-hybrid assistive system for walking.

UNIT III: WHEELED MOBILITY 9

Features of wheelchair, structure of wheel chair, Compare the manual and power wheel chair in detail, the parts of poweredwheel chair, the maintenance procedure of power wheel chair. Wheelchairs: Categories, functions, Wheelchair structure and component design, Materials, Frame and design, Wheels and casters, Power wheelchair electrical system.

UNIT IV: ACTIVE PROSTHESIS AND ELECTRONIC TRAVEL APPLICATIONS 9

Salient features of the myoelectric hand, principle of laser cane, the different types of active prostheses, Classify various disabilities Active prostheses: active above -knee prostheses, myoelectric hand and arm prostheses, Laser cane, Ultrasonic blind detector, Ultrasonic binaural sensing, Disabilities.

UNIT V: SENSORY AUGMENTATION AND SUBSTITUTION 9

Visual augmentation, the principle of substitutory devices used for auditory vision substitution. tactual vision substitution, auditory augmentation, devices used for visual auditor substitution, devices used for tactual auditory substitution, tactual augmentation, methods to prevent visual impairment, braille, optacon, optical character recoganisation, Visual systems: Visual augmentation, Tactual vision substitution, Auditory vision substitution. Auditory system: Auditory augmentation, Visual auditory substitution, Tactual auditory substitution. Tactual system: Tactual augmentation, Tactual augmentation.

TOTAL HOURS: 45

TEXT BOOKS

1. Handbook of Biomedical Engineering, second edition –Volume IIBronzinoJosephD.CRC press,2010.
2. An Introduction to Rehabilitation, Cooper Rory A., Taylor and Francis,London, 2012.
3. Textbook of Rehabilitation, Sunder S., Jaypee, 2012.

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

AIM:

Introducing the fundamentals of pathology and microbiology through the study of cell structure, inflammation tumors, different disease diagnosis, microscopy, characterisation of micro organism, diseases caused by them and their control.

OBJECTIVE:

- To study the normal cell structure, cell degeneration, regeneration and neoplasia.
- To study different Haemodynamic disorders
- To study about the characteristics of micro organism.
- To study about genetic disorders due to bacteria, fungi, viruses and their control.
- To study various tissue processing and different staining techniques.

OUTCOMES:

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

- Have a Fundamental Knowledge about the cell and concepts of tumor.
- Have to learn about the fluid present in the body and hemodynamic derangement.
- Have a fundamental knowledge of real time imaging with basic hardware architecture, algorithms and transform techniques.
- Have knowledge about basic concepts of infection and immunity of the human body.
- Acquire the fundamental knowledge of structure of Bacteria, virus and its causes.

UNIT I: NORMAL CELL STRUCTURE 9

Cell Degeneration and regeneration-Inflammations , Pathologic Processes that occur in human body, Apoptosis, Degeneration, Hypertrophy, Neoplasia, Difference between benign and malignant tumors - Etiology of tumors - Spread of Tumors.

UNIT II: FLUID AND HEAMODYNAMIC DERANGEMENTS 9

Edema, normal Hemostasis, thrombosis, Hemorrhage – Thrombus – Embolism – Disseminated intra vascular Coagulation – Hematological disorders-Bleeding Disorders – Leukemia – lymphoma.

UNIT III: STRUCTURE OF BACTERIA & VIRUS 9

General Structural Organisation of bacterial and viral cell- growth and identification of bacteria, observation of culture. Microscopy - Light microscopy, dark field microscopy, phase contrast microscopy fluorescence and electron microscopy.

UNIT IV: GENETIC DISORDERS AND IMMUNITY 9

Autosomal and sex linked disorders- Storage disorders -Types of hypersensitivity reactions - Immune deficiency syndrome - Primary-HIV- Autoimmune diseases - SCID, SLE, Rheumatoid arthritis

UNIT V: STAINING TECHNIQUES 9

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

TOTAL HOURS: 45

TEXT BOOKS:

1. Robbins S.L & Ramzi S.C, “Pathologic Basis of Diseases’, W.B. Saunders Co. 1999
2. Anatha Narayanan.R & Jayaram Panicker C.R, ‘Text Book of Microbiology, Orient Laongman’1998.

ELECTIVE	L	T	P	C
ARTIFICIAL INTELLIGENCE & PATTERN RECOGNITION	3	0	0	3

AIM:

To study about the Artificial Intelligence and the Pattern Recognition Techniques available

OBJECTIVE:

- To learn the basics of AI and its problem solving methods
- To Study the principles of pattern Recognition techniques and the analysis.

OUTCOMES:

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

- Have to know about the basics concept of artificial intelligence
- Have to gain knowledge to problem solving
- Have a fundamental knowledge of pattern recognition
- Have skills about the manipulating, transforms using classifiers theorems.
- Acquire the skills cluster analysis and feature extraction

1. INTRODUCTION 9

Definition of AI, Intelligent agents, perception and language processing, problem solving, searching, heuristic searching, game playing, Logics, logical reasoning.

2. BASIC PROBLEM SOLVING METHODS 9

Forward Vs Background, knowledge representation, frame problems, heuristic functions, weak methods of matching.

3. PRINCIPLES OF PATTERN RECOGNITION 9

Patterns and features, training and learning in pattern recognition, pattern recognition approach, different types of pattern recognition.

4. DECISION MAKING 9

Baye's theorem, multiple features, decision boundaries, estimation of error rates, histogram, kernels, window estimaters, nearest neighbor classification, maximum distance pattern classifier, adaptive decision boundaries.

5. CLUSTER ANALYSIS AND FEATURE EXTRACTION 9

Unsupervised learning, hierarchical clustering, Graph theories approach to pattern clustering, fuzzy pattern classifier, application of pattern recognition in medicine.

TOTAL HOURS: 45

TEXT BOOKS

1. Elain Rich and Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw- Hill, 2009.
2. Earl Gose, Richard Johnsonbaugh, Steve Jost, "Pattern Recognition and Image Analysis", Prentice Hall of India Pvt. Ltd., New Delhi, 2000.

ELECTIVE	L	T	P	C
QUALITY CONTROL IN BIOMEDICAL ENGINEERING	3	0	0	3

AIM:
The course is designed to make the student better understanding of Quality standards and management methodologies in medical Engineering.

OBJECTIVES:
- After active participation in this course and an effort to learn overview of various methodologies used for management in health care.
- To understand the various Quality standards and regulations used for health care.
- To gain the knowledge about management methodologies in medical Engineering.
- To achieve the various tools
- It gives knowledge in regulatory bodies

OUTCOMES:
Upon completion of the course, the student should be able to
- Know the overview of various methodologies used for management in health care.
- Gain the knowledge about management methodologies in medical Engineering.
- Understand the knowledge in regulatory bodies

UNIT I **9**
Philosophy of Quality Management, Customer Focus, Top Management Commitment, Team work, Quality control Tools, Problem solving methodologies, New Management Tools, work habits, stnategic Quality planning.

UNIT II **9**
Quality policy development, quality function development, designing for Quality, Manufacturing for Quality.

UNIT III **9**
Need for standardization, Regional, National, International standardization, classification of equipment, methods of Testing standardization, Maintenance of standardization & Recalibration.

UNIT IV **9**
FDA Regulations, Joint Commission, Accreditation of hospitals, other Regulatory codes.

UNIT V **9**
Need for ISO 9000 System, Advantages, clauses of ISO 9000, Implementation of ISO 9000, Quality costs, Quality Auditing, Case studies.

TOTAL HOURS: 45

TEXT BOOKS

1. Rose, J.E., "Total Quality Management", Kogan Page Ltd., 1993.
2. Cesar A. Cacere & Albert Zana, “The Practise of clinical Engineering”, Academic Press, Newyork, 1977.

REFERENCE BOOKS

1. John Bank, "The Essence of Total Quality Management", Prentice Hall of India, 1993.
2. Webster J.G and Albert M.Cook, “Clinical Engineering, Principles & Practices”, Prentice Hall Inc., Engle wood cliffs, New Jersy, 1979.

ELECTIVE	L	T	P	C
INFORMATION SECURITY	3	0	0	3

AIM:

To study the critical need for ensuring Information Security in Organizations

OBJECTIVES:

- To understand the basics of Information Security
- To know the legal, ethical and professional issues in Information Security
- To know the aspects of risk management
- To become aware of various standards in this area
- To know the technological aspects of Information Security

OUTCOMES:

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

- Specify protocols for building secure software systems.
- Identify issues to protect digital assets in compliance with cyber laws.
- Evaluate alternative designs focusing on efficiency, scalability, and security.
- Preserve privacy in data publishing and data analysis.

UNIT 1 INTRODUCTION 9

History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

UNIT II SECURITY INVESTIGATION 9

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

UNIT III SECURITY ANALYSIS 9

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk

UNIT IV LOGICAL DESIGN 9

Blueprint for Security, Information Security Poicy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity

UNIT V PHYSICAL DESIGN 9

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel

TOTAL HOURS: 45

TEXT BOOK

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Vikas Publishing House, New Delhi, 2003

REFERENCE BOOKS

1. Micki Krause, Harold F. Tipton, " Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2004.
2. Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw-Hill, 2003
3. Matt Bishop, " Computer Security Art and Science", Pearson/PHI, 2002.

ELECTIVE	L	T	P	C
CYBER SECURITY	**3**	**0**	**0**	**3**

AIM:

To study the critical need for ensuring Cyber Security in real time problems

OBJECTIVES:

- To understand the basics of Cyber Security
- To know the legal, ethical and professional issues in Cyber Security
- To know the various attacker techniques

OUTCOMES:

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

- Concepts such as probability, consequence, harm, risk identification, assessment and mitigation; and the relationship between information and system risk
- Threats, how they materialise, typical attacks and how those attacks exploit vulnerabilities
- Physical and process controls that can be implemented across an organisation to reduce information and systems risk, identify and mitigate vulnerability, and ensure organisational compliance
- Understanding the personal, organisational and legal/regulatory context in which information systems could be used, the risks of such use and the constraints (such as time, finance and people) that may affect how cyber security is implemented.

UNIT I CYBER SECURITY FUNDAMENTALS 9

Network and security concepts – basic cryptography – Symmetric encryption – Public key Encryption – DNS – Firewalls – Virtualization – Radio Frequency Identification – Microsoft Windows security Principles.

UNIT II ATTACKER TECHNIQUES AND MOTIVATIONS 9

Antiforensics – Tunneling techniques – Fraud Techniques - Threat Infrastructure.

UNIT III EXPLOITATION 9

Techniques to gain a foot hold – Misdirection, Reconnaissance, and disruption methods.

UNIT IV MALICIOUS CODE 9

Self Replication Malicious code – Evading Detection and Elevating privileges – Stealing Information and Exploitation.

UNIT V DEFENSE AND ANALYSIS TECHNIQUES 9

Memory Forensics – Honeypots – Malicious code naming – Automated malicious code analysis systems – Intrusion detection systems – Defense special file investigation tools.

TEXT BOOK

1. James Graham, Richard Howard and Ryan Olson, “Cyber Security Essentials”, CRC Press, Taylor & Francis Group, 2011.

REFERENCE BOOKS

1. By Dan Shoemaker, Ph.D., William Arthur Conklin, Wm Arthur Conklin, “Cybersecurity: The Essential Body of Knowledge”, Cengage Learning, 2012.

2. Ali Jahangiri, “Live Hacking: The Ultimate Guide to hacking Techniques & Counter measures for Ethical Hackers & IT Security Experts”, 2009.

INDUSTRIAL ELECTIVE	L	T	P	C
BUSINESS INTELLIGENCE AND IT'S APPLICATION	3	0	0	3

AIM:

To learn about the building up of a successful BI strategy.

OBJECTIVES:

- Introduce students to various business intelligence concepts
- To learn the concepts of data integration
- To introduce enterprise reporting

OUTCOMES:

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

- Understand and discuss what cognitive computing is, and how it differs from traditional approaches.
- Plan and use the primary tools associated with cognitive computing.
- Plan and execute a project that leverages cognitive computing.
- Understand and discuss the business implications of cognitive computing.

UNIT-I INTRODUCTION TO BUSINESS INTELLLIGENCE 9

Introduction to OLTP AND OLAP – BI Definition and BI Concepts – Business Applications of BI - BI Framework- Role of Data Warehousing in BI –BI Infrastructure Components- BI Process – Developing Data Warehouse – Management Framework – Business driven approach –BI Technology –– BI Roles & Responsibilities.

UNIT - II BASICS OF DATA INTEGRATION 9

Concepts of Data Integration need and advantages of using Data Integration – Introduction to common data integration approaches – Introduction to ETL using SSIS – Introduction to Data Quality – Data Profiling Concepts and Applications.

UNIT - III INTRODUCTION TO MULTIDIMENSIONAL DATA MODELING 9

Introduction to Data and Dimensional Modeling – Multi Dimensional Data Model – ER modeling Vs Multi Dimensional Model – Concepts of Dimensions - facts - cubes- attributes- hierarchies- star and snowflake schema – Introduction to Business Metrics and KPIs – Creating Cubes using SSAS.

UNIT - IV BASICS OF ENTERPRISE REPORTING 9

Introduction to Enterprise Reporting - Concepts of dashboards - balanced scorecards – Introduction to SSRS Architecture– Enterprise Reporting using SSRS reporting service

UNIT - V BI ROAD AHEAD 9

BI and Mobility – BI and cloud computing – BI for ERP systems - Benefits of BI in ERP-NorthWind_Traders Data-Data Analyses through Excel-Kettle Tool – Conversion of data using Kettle Tool.

TOTAL HOURS: 45

TEXT BOOKS

1.RN Prasad, Seema Acharya, "Fundamentals Of Business Analytics" Wiley India,2011

REFERENCES

1.Soumendra Mohanty, “Data Warehousing Design, Development and Best Practices”, Tata McGraw-Hill, New Delhi, 2007.
2.David Loshin, “Business Intelligence”, Morgan Kaufmann Publishsers, San Francisco, Fifth edition, 2007.
3.Larissa Terpeluk Moss and Shaku Atre, “Business Intelligence Roadmap”, Pearson Education, 2007.

INDUSTRIAL ELECTIVE	L	T	P	C
SOFT SKILLS	3	0	0	3

INDUSTRIAL ELECTIVE	L	T	P	C
LEARNING IT ESSENTIALS BY DOING	**3**	**0**	**0**	**3**

UNIT I

Fundamentals of Computer architecture-introduction-organization of a small computer, Central Processing Unit - Execution cycle - Instruction categories - measure of CPU performance Memory - Input/output devices - BUS-addressing modes. System Software - Assemblers - Loaders and linkers - Compilers and interpreters, Operating system - introduction - memory management schemes Process management Scheduling - threads.

UNIT II

Problem solving with algorithms- Programming styles, Coding Standards and Best practices - Introduction to C Programming, Testing and Debugging. Code reviews, System Development Methodologies - Software development Models, User interface Design - introduction - The process - Elements of UI design & reports.

UNIT III

RDBMS- data processing - the database technology - data models, ER modeling concept -notations - Extended ER features, Logical database design – normalization, SQL - DDL statements - DML statements - DCL statements, Writing Simple queries - SQL Tuning techniques - Embedded SQL – OLTP

UNIT IV

Objected oriented concepts - object oriented programming, UML Class Diagrams- relationship - Inheritance - Abstract classes –polymorphism, Object Oriented Design methodology - Common Base class, Alice Tool - Application of OOC using Alice tool.

UNIT V

Client server computing - Internetworking - Computer Networks ,Working with TCP/IP - IP address - Sub netting - DNS - VPN - proxy servers World Wide Web - Components of web application - browsers and Web Servers, URL - HTML - HTTP protocol - Web Applications - Application servers - Web Security.

TOTAL: 45 PERIODS