## FACULTY OF ENGINEERING DEGREE OF BACHELOR OF ENGINEERING IN BIOMEDICAL ENGINEERING

## DEPARTMENT OF BIOMEDICAL ENGINEERING

## (REGULAR PROGRAMME) CURRICULUM & SYLLABI (2017-2018)



KARPAGAM ACADEMY OF HIGHER EDUCATION (Established Under Section 3 of UGC Act 1956) COIMBATORE 641 021 INDIA.

## Semester I & II

#### 17BECC101

#### ENGLISH FOR ENGINEERS

(9)

#### **OBJECTIVES:**

The goal of this course is for students:

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To improve word power Receptive Skills
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.

## **COURSE OUTCOMES:**

Students undergoing this course will be able to

- To use English language for communication: verbal & non-verbal.
- To enrich comprehension and acquisition of speaking & writing ability.
- To inculcate the habit of reading and to develop their effective reading skills.
- To hone their listening, speaking, Reading and writing skills.
- To gain confidence in using English language in real life situations.
- To improve word power: lexical, grammatical and communication competence.

## Unit- I LSRW SKILLS & GRAMMAR

## Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and

## **Representing**)

**Listening** –Types of listening- Listening to class reading - Video tapes/ Audio tapes. **Speaking** – Introduction on self. **Reading** - Reading for comprehension – Reading different kind of passages like descriptive, narrative, objective, conversational and argumentative. **Writing** – Formal and Informal letters- Letters to the Editor.

## Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

Tenses -Articles. Vocabulary - Word Formation – Word expansion (Root word) - Prefix and Suffix.

## Unit – II LSRW SKILLS & GRAMMAR

# Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) (8)

**Listening** – Understanding the passage in English –Pronunciation practice. **Speaking** – Asking and answering questions. **Reading** – Critical reading – Finding key information in a given text (Skimming - Scanning). **Writing**– Coherence and cohesion in writing – Short paragraph writing – Writing short messages.

Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

WH questions –Yes/No Question - Subject Verb agreement. **Vocabulary** – Compound Nouns/Adjectives – Irregular verbs.

## Unit – III LSRW SKILLS & GRAMMAR

## Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and

## **Representing**)

**Listening** – Listening for specific task – fill in the gaps. **Speaking** – Phonemes – Syllables – Role play – Conversation Practice. **Reading** –comprehension passages based on general topics or matters of current affairs. **Writing** - Autobiographical writing & Biographical writing.

## Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

Preposition – Infinitive & Gerund. **Vocabulary** – Foreign words used in English – British and American usage.

## Unit- IV LSRW SKILLS & GRAMMAR, CAREER ORIENTED

## Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and

## **Representing**)

**Listening** – Responding to questions – Reading in class for complete understanding and for better pronunciation. **Speaking** – Debate- Presentations in seminars. **Reading** – Making inference from the reading passage – Predicting the content of reading passages. **Writing** - Interpreting visual materials (tables, graphs, charts, etc) & Instruction writing.

## Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

Parts of Speech , Sentence pattern – Voice (active and passive voice). Vocabulary – One word substitution.

## Unit-V LSRW SKILLS & GRAMMAR, FIELD WORK

## Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) (10)

**Listening** –Distinction between native and Indian English (Speeches by TED and Kalam). **Speaking-** Extempore talk –Just-a-minute talk. **Reading-**Reading strategies–Intensive reading – Text analysis. **Writing -** Creative writing – Writing circulars and notices – Writing proposal.

## Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

Direct and Indirect speech – Conditional sentences - Auxiliary verbs. **Vocabulary** – Abbreviations & Acronyms.

Note: Students shall have hands on training in improving listening skill in the language laboratory @

2 periods per each unit.

Total-45

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## **TEXT BOOK:**

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Sangeeta	Technical	OUP,	2015
	<u>Sharma</u> ,	Communication:	New Delhi.	
	Meenakshi	Principles And Practice		
	<u>Raman</u>	2 <sup>nd</sup> Edition		

## **REFERENCES:**

S NO	A LITHOD (C) NAME	TITLE OF THE	DUDI ICHED	YEAR OF
5. NU.	AUTHOR(5) NAME	BOOK	PUBLISHER	PUBLICATION
1	Lakshminarayanan,	Communication	SCITECH	2009
	K.R. & Murugavel, T.	Skills for Engineers	Publications, Chennai	
2	Rizvi Ashraf, M	Effective Technical	Tata McGraw-Hill,	2007
		Communication	New Delhi.	
3	Rutherford Andrea, J.	Basic	Pearson Education,	2006
		Communication	New Delhi.	
		Skills for Technology		

## WEBSITES:

www.learnerstv.com – Listening/ Speaking/ Presentation
www.usingenglish.com – Writing/ Grammar
www.englishclub.com – Vocabulary Enrichment/ Speaking
www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking
<u>www.teachertube.com</u> – Writing Technically
www.Dictionary.com – Semantic / Grammar

#### 17BECC102

#### **OBJECTIVES:**

The goal of this course is for the students

- To develop analyzing skills for solving different engineering problems.
- To understand the concept of Matrices.
- To remember the basics of differential calculus and its applications.
- To apply the problems in differential equations.
- To Create knowledge about vector differentiation.
- To acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.

#### **INTENDED OUTCOMES:**

Upon completion of this course the students will be able

- Acquire the basic knowledge and understanding of mathematics.
- Apply advanced matrix knowledge to engineering problems.
- Understand the concepts of differential calculus problems.
- Improve their ability in evaluating geometrical applications of differential calculus problems.
- To solve the problems by applying the differential Equations.
- Evaluating engineering problems involving vector differentiation.

## UNIT I MATRICES

Review of Matrix Algebra - Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic forms – Reduction to canonical form through orthogonal reduction.

#### UNIT II DIFFERENTIAL CALCULUS

Limits, Continuity (Concepts only)- Differentiation- Differentiation Techniques: standard formulae, product rule, quotient rule, chain rule, method of substitution, implicit functions and successive differentiation.

## UNIT III GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS (12)

Curvature – centre, radius and circle of curvature in Cartesian co- ordinates – Evolutes – Envelope – Evolute as envelope of normals.

#### UNIT IV DIFFERENTIAL EQUATIONS

Introduction to Ordinary differential equations: Linear ordinary differential equations of second and higher order with constant coefficients.

Introduction to Partial differential equations: Linear Partial differential equations of second and higher order with constant coefficients.

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#### **UNIT V VECTOR DIFFERENTIATION**

Vectors-Differentiation of vectors – scalar and vector point functions –vector operator – vector operator applied to scalar point functions: Gradient; vector operator applied to vector point functions: Divergence and curl; Physical interpretation of divergence and curl, Directional derivative, solenoidal and irrotational vectors.

Total: 60

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATION
1	Hemamalini. P.T	Engineering	McGraw Hill	
		Mathematics	Education (India)	2014
			Private Limited, New	2014
			Delhi.	
2	Sundaram, V.	Engineering	Vikas Publishing	
	Lakhminarayan,K.A.	Mathematics	Home, New Delhi.	2006
	&Balasubramanian,R	for first year.		2000
3	Bali, N.P. & Manish	A Text Book of	Laxmi Publications	
	Goyal	Engineering	Pvt. Ltd., New Delhi.	2014
		Mathematics		

#### **TEXT BOOKS:**

#### **REFERENCES:**

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATION
1	Grewel . B. S.	Higher Engineering Mathematics	Khanna Publications, New Delhi.	2014
2	BhaskarRao. P. B, Sri Ramachary SKVS, BhujangaRao. M	Engineering Mathematics I	BS Publications, India.	2010
3	Ramana. B.V	Higher Engineering Mathematics	TataMcGrawHillPublishingCompany,New Delhi.	2007
5	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education, India	2009

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## **WEBSITES:**

- 1. www.efunda.com
- 2. <u>www.mathcentre.ac.uk</u>
- 3. www.intmath.com/matrices-determinants
- 4. www. Intmath.com/calculus/calculus-intro.php

#### 17BEPH103 17BEPH203

## **ENGINEERING PHYSICS**

3 0 0 3 100

#### **OBJECTIVE:**

The goal of this course is for students:

- To understand the properties of matter and thermodynamics with its applications.
- To introduce the concepts of light, laser and fiber optics for diverse applications.
- To study the fundamentals of quantum physics and their applications.
- To comprehend the properties of crystal and its various crystal structures.
- To study the basics of sound and ultrasonics with appropriate applications
- To understand about nuclear reactors for energy resources

#### **INTENDED OUTCOME:**

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

- Identify the elastic nature of materials and its thermodynamic properties.
- Infer the characteristics of laser and optical fibers for engineering applications.
- Develop the idea of quantum mechanics through applications.
- Identify the different atomic arrangements of crystals and its defects.
- Make use of the concepts of sound waves for medical applications.
- Illustrate the basic ideas of nuclear reactors for energy resources.

## UNIT I PROPERTIES OF MATTER AND THERMODYNAMICS (9)

Three types of modulus of elasticity – basic definitions, relation connecting the modulii (Derivation), Poisson's ratio- Torsional pendulum- bending of beams - bending moment – uniform and non uniform bending

Thermodynamics – laws of thermodynamics- concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

## UNIT II LASER AND FIBER OPTICS

Introduction – emission and absorption process- Einstein's coefficients derivation. Types of LASER - CO<sub>2</sub>, Semiconductor LASER- Applications of LASER in industry and medicine.

Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram)

## UNIT III QUANTUM PHYSICS

Introduction to quantum theory – Black body radiation - dual nature of matter and radiation – de Broglie wavelength, uncertainty principle –Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- physical significance of wave function, scanning electron microscope

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## UNIT IV CRYSTAL PHYSICS

Lattice – unit cell – Bravais lattice – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCP structures, crystal defects – point, line and surface defects

## UNIT V ULTRASONICS AND NUCLEAR PHYSICS

Production of ultrasonics by piezoelectric method –Non Destructive Testing – pulse echo system through transmission and reflection modes - A, B and C – scan displays, Medical applications – Sonogram. Introduction – basics about nuclear fission and fusion, Radiation detectors – semi conductor detector. Reactors – essentials of nuclear reactor- power reactor.

Total-45

## **TEXT BOOK:**

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBI	LISHER	YEAR OF PUBLICATION
1	Ganesan.S and Baskar T	Engineering Physics I	GEMS Coimbator	Publisher, re-641 001	2015
	Duskur		Connoator	0 0 1 001	

## **REFERENCES:**

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Serway and Jewett	Physics for Scientists	Thomson	2010
		and Engineers with Modern Physics	Brooks/Cole, Indian reprint, New Delhi	
2	Gaur, R.K. and	Engineering Physics	Dhanpat Rai	2011
	Gupta, S.C		Publications,New Delhi	
3	M.N. Avadhanulu	A Text book of	S.Chand and	2011
	and PG Kshirsagar	Engineering Physics	company, Ltd., New	
			Delhi	
4	D.C. Ghosh, N.C.	Engineering Physics	University Science,	2011
	Ghosh, P.K.		New Delhi	
	Haldar			
5	P. Khare, A.	Engineering Physics:	Jones & Bartlett	2009
	Swarup	Fundamentals and	Learning	
		Modern Applications		

#### WEBSITES:

- 1. www.nptel.ac.in
- 2. www.physicsclassroom.com
- 3. www.oyc.yale.edu
- 4. www.physics.org

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#### **OBJECTIVES:**

- The goal of this course is for students :
- To make the students conversant with basics of water technology.
- To make the student acquire sound knowledge of electrochemistry and storage devices.
- To acquaint the student with concepts of fuels and combustion.
- To develop an understanding of the basic concepts of corrosion science.
- To acquaint the students with the basics of surface chemistry.
- To understand the chemical principles in the field of engineering and technology

## **INTENDED OUTCOME:**

Upon completion of this course, the student will be able to:

- Outline the basic principles of chemistry for water treatment (K).
- Examine the electrochemical properties to design non conventional energy storage devices (S).
- Apply the concepts combustion of different fuels (S).
- Identify the concepts of corrosion and its protection in the engineering field (S).
- Apply the concepts of surface chemistry in the field of engineering (S).
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (S).

#### UNIT I WATER TECHNOLOGY

Sources-Characteristics – Specification for drinking water, BIS &WHO-Alkalinity – Types of alkalinity and determination (No problems) – Hardness – Types and estimation by EDTA method (No problems) - Domestic water treatment – Disinfection methods (Chlorination, Ozonation. UV treatment) – Boiler feed water – Requirements – Disadvantages of using hard water in boilers – Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) – External conditioning – Demineralization process – Desalination - Reverse osmosis.

## UNIT II ELECTROCHEMISTRY AND STORAGE DEVICES

Electrolytic conductance-application (conductometric titration)- Electrochemical cells – EMF – Measurement of emf – Single electrode potential – Nernst equation – Reference electrodes – Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – Glass electrode and measurement of pH – Electrochemical series – Significance – Potentiometric titrations (Redox -  $Fe^{2+}vs$  dichromate) –-Batteries- Primary batteries-Leclanche cell- Secondary batteries- Lead acid battery. An introduction to Fuel Cell- H<sub>2</sub>-O<sub>2</sub> Fuel Cell.

## UNIT III FUELS AND COMBUSTION

Coal - Proximate and Ultimate analysis - Metallurgical coke - Manufacture by Otto-Hoffman method - Petroleum processing and fractions - Synthetic petrol - Bergius and Fischer-Tropsch method - Knocking - Octane number and Cetane number - Gaseous fuels - Water gas, Producer

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gas, Combustion of fuel-Introduction-GCV-NCV- Problems on Calculation of GCV & NCV - Flue gas analysis.

## UNIT IV CORROSION SCIENCE

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion -Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings - Organic coatings-Paints - Constituents and functions -Inorganic coatings- Metallic coatings - Electroplating of Cu over Fe and Electro less plating (Ni) - Surface conversion coating - Hot dipping.- Anodizing of Al

## UNIT V SURFACE CHEMISTRY AND PHASE RULE

Introduction-Adsorption-Types, adsorption of gases on solids, adsorption of solutes from solutions, Adsorption isotherms-Freundlich adsorption isotherm-Langmuir adsorption isotherm- Role of adsorbents in industries (catalysis and water softening).

Phase Rule: Definition -Phase diagrams – one component water system, two component Ag-Pb system. Total: 45

## **TEXT BOOKS:**

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Vairam.S	Engineering Chemistry	Gems Publishers, Coimbatore.	2014
2.	Dr.Ravikrishnan.A	Engineering Chemistry I & II	Sri Krishna Hi tech Publishing Company (P) Ltd., Chennai.	2012

#### **REFERENCE BOOKS:**

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Raman Sivakumar	Engineering Chemistry I &II	McGraw-Hill Publishing Co.Ltd., 3 <sup>rd</sup> Reprint NewDelhi.	2013
2.	Kuriakose. J.C. and Rajaram	Chemistry in Engineering and Technology. Vol. I & II 5 <sup>th</sup> edition.	Tata McGraw Hill Publishing Company, New Delhi.	2010
3.	Jain, P.C. and Monika Jain	Engineering Chemistry.	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.	2009
4.	Dara.S.S	Text book of Engineering Chemistry.	S.Chand & Co.Ltd., New Delhi	2008
5.	Sharma.B. K	Engineering Chemistry	Krishna Prakasam Media (P) Ltd., Meerut	2001

## **WEBSITES:**

1. http://www.studynotes.ie/leaving-cert/chemistry/

2. http://www.rejinpaul.com/2011/04/engineering-chemistry-ii-second.html

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#### 17BEBME104 INTRODUCTION TO BIOMEDICAL ENGINEERING 3003 100

#### **OBJECTIVES:**

The goal of this course is for students :

- To give exposure on the basics of Biomedical engineering to the students.
- To have a basic knowledge on medical devices and equipment
- To understand the evolution of modern health care system
- To induce medical Morality and Ethics in the students
- To understand the various diagnostic methods and therapeutic systems available
- To get to know the various biomedical signals and other parameters associated with the Human body

#### **INTENDED OUTCOMES:**

Upon completion of this course, the student will be able to:

- Understand the basics of Bioinstrumentation
- Exposed to the ethics for Biomedical engineers
- Analyze models of physiological system.
- Handle biomedical equipments
- Know the various physiological systems of human body and the associated biopotentials
- Understand the codes of ethics for engineers

## UNIT-I INTRODUCTION

Historical Perspective-Evolution of modern health care system, Roles played by Biomedical engineers, Professional status of biomedical engineering, Electrical Signals – Conductivity & temperature.

#### **UNIT-II DIAGNOSTIC DEVICES**

Sources of biomedical signals, Basic medical instrumentation system-General block diagram of a medical instrumentation system, Diagnostic devices-ECG, EEG, blood pressure measurement, Temperature and Respiration rate measurement, Blood cell counters, General constraints in design of medical instrumentation systems.

#### **UNIT-III DIAGNOSTIC IMAGING**

X-rays, Nuclear Medical Imaging-Positron Emission Tomography, Magnetic Resonance Imaging Scanners, Diagnostic Ultrasound, Thermal imaging systems.

#### UNIT-IV THERAPEUTIC EQUIPMENT

Cardiac Pacemakers, Cardiac Defibrillators, Artificial heart, Instruments for Surgery, Haemodialysis Machines-Artificial Kidney, Dialyzers, Ventilators-Humidifiers, Nebulizers and Aspirators, Anaesthesia Machine.

#### UNIT-V ETHICS FOR BIOMEDICAL ENGINEERS

Morality and Ethics-A Definition of terms, Human Experimentation, Ethical issues in feasibility studies, Ethical issues in emergency use, Ethical issues in treatment use, Codes of ethics for bio

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engineers.

Total: 45

## **TEXT BOOKS**

S. No.	Author (s) Name	Title of the book	Publisher	Year of Publication
1	Enderle, John D., Bronzino, Joseph D., Blanchard, Susan M	Introduction to Biomedical Engineering	Elsevier Inc	2 <sup>nd</sup> edition, 2005
2.	R. S. Khandpur	Handbook of Biomedical Instrumetation	McGraw-Hill Publishing Company Limited	2 <sup>nd</sup> edition, 2003
3.	Daniel A Vallero	Biomedical ethics for Engineers	Elsevier publication	1 <sup>st</sup> edition, 2007

## **REFERENCE BOOKS**

S. No.	Author (s) Name	Title of the book	Publisher	Year of Publication
1	Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer	Biomedical Instrumentation and Measurement	Prentice Hall of India, New Delhi	2 <sup>nd</sup> edition2002
2.	John G Webster	Medical Instrumentation: Application and Design	John Wiley and sons, New York	4 <sup>th</sup> edition, 2010
3.	Joseph J Carr, John M Brown	Introduction to Biomedical Equipment Technology	John Wiley & Sons, New York	4 <sup>th</sup> edition, 2008

#### BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

#### **OBJECTIVES**

The goal of this course is for students :

- To impart the basic knowledge about the Electric circuits.
- To understand the working of various Electrical Machines.
- To know about various measuring instruments.
- To understand the basic concepts in semiconductor devices and digital electronics.
- To explain the working principle, construction, applications of DC machines, AC machines & measuring instruments.
- To highlight the importance of transformers in transmission and distribution of electric power

#### **INTENDED OUTCOMES**

Upon completion of this course, the student will be able to:

- The students shall develop an intuitive understanding of the circuit analysis, basic concepts of electrical machines, basics of electronics and be able to apply them in practical situation
- Predict the behavior of any electrical and magnetic circuits.
- Formulate and solve complex AC, Dc circuits.
- Identify the type of electrical machine used for that particular application
- Understand the role of electronic components in biomedical field
- Know the various electric and electronic components

#### **UNIT I ELECTRIC CIRCUITS & MEASUREMENTS**

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase balanced Circuits.

#### UNIT II ELECTRICAL MACHINES

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

#### UNIT III MEASURING INSTRUMENTS

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

#### UNIT IV SEMICONDUCTOR DEVICES AND APPLICATIONS

Characteristics of PN Junction Diode –Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics

#### **UNIT V- DIGITAL ELECTRONICS**

Number systems – binary codes - logic gates - Boolean algebra, laws & theorems- simplification of Boolean expression - implementation of Boolean expressions using logic gates

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#### Total: 45

## **TEXT BOOKS**

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Mittle, V.M	Basic Electrical Engineering	Tata McGraw Hill Edition, New Delhi	2004
2	Sedha R.S	Applied Electronics	S. Chand & Co	2006

## REFERENCES

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Muthusubraman ian R, and Muraleedharan K A	Basic Electrical, Electronics and Computer Engineering	Tata McGraw Hill, Second Edition	2006
2	Nagsarkar T K and Sukhiia M S	Basics of Electrical Engineering	Oxford press	2005
3	Mahmood Nahvi and	Electric Circuits	Schaum' Outline Series, McGraw Hill	2002
4	Premkumar N	Basic Electrical Engineering	Anuradha Publishers	2003

## 17BEPH11117BEPH211ENGINEERING PHYSICS LABORATORY0 0 4 2 100

#### **Course Objective:**

- To develop basic laboratory skills and demonstrating the application of physical principles.
- To prepare for the lab experiment and perform individually a wide spectrum of experiments.
- To present experimental data in various appropriate forms like tabulation, and plots.
- To analyze, Interpret and Summarize experimental results.
- To communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
- To analyse the relevant problems in engineering stream.

#### **Course Outcome:**

- The students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications.
- Prepare for the lab experiment and perform individually a wide spectrum of experiments.
- Present experimental data in various appropriate forms like tabulation, and plots.
- Analyze, Interpret and Summarize experimental results.
- Communicate clearly understanding of various experimental principles, instruments/setup, and procedure.
- Prepare to develop the skills for understanding basic electric circuits.

## LIST OF EXPERIMENTS – PHYSICS

- 1. Determination of velocity of sound and compressibility of liquid Ultrasonic interferometer.
- 2. Determination of wavelength of mercury spectrum spectrometer grating.
- 3. Determination of Young's modulus of the material Non uniform bending (or) Uniform bending.
- 4. Determination of Viscosity of liquid Poiseuille's method.
- 5. Spectrometer Dispersive power of a prism.
- 6. Torsional pendulum Determination of Rigidity modulus.
- 7. Particle size determination using Diode Laser
- 8. Determination of Laser parameters Wavelength, and angle of divergence.
- 9. Determination of acceptance angle in an optical fiber.
- 10. Determination of thickness of a thin wire Air wedge method
- 11. Determination of Band Gap of a semiconductor material.
- 12. Determination of Specific resistance of a given coil of wire Wheatstone Bridge

## **COURSE OBJECTIVES**

The goal of this course is for students :

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
- To estimate the amount of alkalinity ions, hardness, chloride in water sample
- To make the student acquire practical skills in the determination of conductance of solutions, EMF etc
- To acquaint the students with the determination of molecular weight of a polymer by viscometry
- To understand the use of Spectrophotometry
- To carried out different types of titrations for estimation of concerned in materials

## **COURSE OUTCOMES**

Upon completion of the course the students will be able to

- The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.
- Estimate the amount of alkalinity ions, hardness, chloride in water sample
- Measure molecular/system properties of conductance of solutions, EMF etc
- Acquaint the students with the determination of molecular weight of a polymer by visocometry
- Determine the corrosion rate of steel by weight loss method.
- Carrying out different types of titrations for estimation of concerned in materials using comparatively more qualities and quantities of materials involved for accurate results.

## LIST OF EXPERIMENTS – CHEMISTRY

- 1. Estimation of alkalinity of Water sample.
- 2. Estimation of hardness of Water by EDTA
- 3. Estimation of chloride in Water sample (Argentometric method)
- 4. Determination of corrosion rate by weight loss method.
- 5. Conductometric Titration (Simple acid base).
- 6. Conductometric Titration (Mixture of weak and strong acids).
- 7. Conduct metric Titration using  $BaCl_2$  vs  $Na_2$  SO<sub>4</sub>.
- 8. pH Titration (acid & base).

- 9. Potentiometric Titration (Fe<sup>2+</sup> / KMnO<sub>4</sub> or  $K_2Cr_2O_7$ ).
- 10. Estimation of Ferric ion by Spectrophotometry.
- 11. Determination of water of crystallization of a crystalline salt (Copper sulphate).
- 12. Determination of molecular weight and degree of polymerization using Viscometry.
- 13. Determination of chemical oxygen demand.

## 17BEBME112 COMPUTER PRACTICE AND PROGRAMMING LABORATORY 1043100

## **COURSE OBJECTIVES**

- To familiarize with open source office packages
- To write programs for Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings and Functions.
- To discuss the fundamental principles of C Programming, as well as indepth data and information processing techniques
- To solve problems, explore real-world software development challenges, and create practical and contemporary applications
- To learn about data structures
- To apply the string handling functions to solve the given problem

## **COURSE OUTCOMES**

- Study logical structure of a computer program
- analyze logical structure of a computer program
- understand computer program, and different constructor to develop a program in 'C' language
- Utilize the basic data structures.
- Distinguish and use the fundamental data types.
- Utilize a simple programming environment, compile programs and interpret compiler errors.

## **THEORY:**

What is computer- Computer Components- What is C- C Character set- Constants, Variables and Keywords-General form of C Program - Relational and Logical Operators - Selection Structures- If and nested if - Switch Case - Loops-Definition and types- Functions- Arrays- Introduction to Strings-Pointers.

## **PRACTICALS:**

- 1. Working with word Processing, Spreadsheet and presentation software in Linux
- 2. Programming in Scratch:

Practicing fundamental concepts of programming like sequence, selection decision statements, working of loops and event driven programming

3. C Programming:

Practicing programs to get exposure to basic data types, algebraic expressions, Conditional statements, Input and Output Formatting, Decision Statements, Switch Case, Control structures, arrays, Strings and function, implementation of pointers.

Total: 45

#### **REFERENCES:**

S. No. Author(s) Name Title of the book Publish	er Year of Publication
---	---------------------------

2 Yashavant Kanetkar Let us "C" BPB Publications, 13 <sup>th</sup> 2013	1	E. Balagurusamy	Computing Fundamentals and C	TMH Education, 5th Edition	2014
	2	Yashavant Kanetkar	Let us "C"	BPB Publications, 13 <sup>th</sup> Edition	2013

#### **COURSE OBJECTIVES:**

The goal of this course is for students :

- To prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as manufacturability, and sustainability
- To Understand the application of industry standards and techniques applied in engineering graphics
- To Apply auxiliary or sectional views to most practically represent engineered parts
- To sketch freehand drawings and to efficiently communicate ideas graphically
- To understand Dimension and annotate two-dimensional engineering drawings
- To prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

#### **COURSE OUTCOMES:**

Upon completion of this course, the student will be able to:

- Understand the engineering drawing and its place in society.
- gain the knowledge of usage of Drawing instruments
- Expose the visualization of engineering drawing and engineering graphics standards.
- Expose the engineering communication.
- Apply dimensions in drawings
- Use various graphic tools

## UNIT I INTRODUCTION

Introduction to Engineering Drawing, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

#### UNIT II SCALES AND PLANE CURVES

SCALES: Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conics – Construction of Ellipse, Parabola and Hyperbola by eccentricity method

## UNIT III 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 IV PROJECTION OF POINTS, LINES AND PLANE SURFACES

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

## UNIT V PROJECTION OF SOLIDS

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

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## Introduction to Drafting Software/Package (Not for Exam)

Basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings. Introduction to 3D primitives.

TOTAL: 45

## **TEXT BOOKS**

S. No	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Venugopal K and Prabhu Raja V	Engineering Graphics	New Age International Publishers	2007
2	VTU	A Primer on Computer Aided Engineering Drawing	Belgaum	2006

#### REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Kumar M S	Engineering Graphics	D D Publications, Chennai	2007
2	Bureau of Indian Standards	Engineering Drawing Practices for Schools and Colleges SP 46-2003	BIS, New Delhi	2003
3	Luzadder W J	Fundamentals of Engineering Drawing	Prentice Hall Book Co., New York	1998

## WEB REFERENCES

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

3

#### 17BECC151

#### YOGA

#### **OBJECTIVE:**

- To enable the **student** to have good health.
- To practice mental hygiene.
- To possess emotional stability.
- To integrate moral values.
- To attain higher level of consciousness.
- To Develop The Self Discipline, and Self Control

#### **OUTCOME:**

- Gain the knowledge about the theory and practice of Yoga and its nature
- Gain knowledge about Definition of psychology, Methods of psychological sciences
- Demonstrate Kriyas, Asanas, Mudras, Pranayama and meditative postures.
- To aware of Yoga Psychology and Definition & characteristics of Personality
- understand the knowledge of Advance Asanas
- To aware of Scope and substance of Indian Psychology, Cognitive process like Sensation, Perception, Attention, Memory and Thinking

#### UNIT-I

Introduction To Yoga- Meaning Of Yoga – Concept Of Yoga- Aim And Objectives Of Yoga – History Of Yoga - Systems Of Yoga.- Stages (Or) Limbs Of Yoga

#### UNIT-II

Asanas-Surya Namashkar- Thdasana- Veerabadhra Asana- Trikonasana- Utkatasana- ArdhaChakrasana-Ardha Kati Chakrasana- Thandasana- Gomugasana- Padmasana- Vajrasana- Paschimottasana-Matsyendrasana-BavanaMukthasana- SuptaPadhangusthasana-Sethubhandhasana- Navasana-ArdhaBavanamukthasana- Mathasyasana- Naukasana- Bujangasana- Salabasana- Makkarasana-Dhanurasana.

#### UNIT-III

Advance Asanas- Sirasasana- Garudasana- Natrajasana- Rajakoptasana- Chakrasana- Kukutasana- Virikshasana- Sarvagasana- Halasana-. Mayurasana .

#### UNIT-IV

Pranayama- Meaning- Types Of Pranayama- Bhastrika- Bhramari- Udgeeth- Kabalbhati- Bahya-AnulomVilom- Pranay Pranayama- Benefits Of Pranayama. Neti - JalaNeti , Sutra Neti, Nouli-Three Types, Douthy-Three Types

#### UNIT- V

Mudras- Uses Of Mudras- Gyan- Shoonya- Apaan- Prana- Vayu- Prithvi- Linga- Apana- Adi Mudra- Agni Mudra- Surya Mudra- Varuna- Hakini Mudra.

#### **REFERENCES:**

S.No	Author Name	Title Of Book	Publisher	Yearof Publication
1.	Dr.K.Chandrasekaran	Sound Health	PremKalyan	2009

		Through Yoga		
2.	B.K.S.Iyangar	Light	Crossroad	2013
		On Pranayama	Centuary	
3.	Thirumular	Thirumandhiram	Sriramakrishna	2016
			Math	

#### 17BECC201A

## BUSINESS COMMUNICATION

## 3003 100

## **OBJECTIVES:**

- To help students comprehend the role of listening skills in effective communication.
- To familiarize students with verbal and non-verbal communication.
- To expose students to neutral accent.
- To develop emotional intelligence skills in them for enhancing their self-esteem.
- To assist them in setting goals and developing positive attitude.
- To enable students to acquire decision making skills, problem solving skills and assertive skills.
- To improve soft skills and inter personal skills of the students

#### **INTENDED OUTCOMES:**

Students undergoing this course will be able to

- Design and deliver a persuasive presentation that convinces the audience of the topic's relevance and overcomes resistance, using appropriate visual support and adhering to a specified time limit.
- Use a strategic communication model and critical thinking to identify objectives, analyze audiences and choose the most effective structure and style for delivering strategically sound written and spoken messages.
- Practice principles of effective business writing and document design in all written documents.
- Build an understanding of different organizational cultures, business practices, and social norms to communicate more effectively in domestic and cross-cultural business contexts.
- To gain confidence in using English language in real life situations.
- Develop their soft skills and inter personal skills, which will make the transition from college to workplace smoother and help them excel in their job.

## UNIT I

What is Business Communication? - Types of Communication - Formal and informal communication -

Process of Communication- modes of Communication – Barriers to communication. **UNIT II** 

Written Business Communication – Style- word-usage- organisation of Ideas – mechanics of writing andfill up of forms - Cover Letter- Letter for Job Application- Letter ofComplaint - Memos -Resumes - Email-Reports Revising and proofreading- Advertising slogans- jargons- interpretation ofgraphs using expressions of comparison and contrast .

#### UNIT III

Reading and Understanding the news articles - Oral Business Communication - First Impressions -Attire – Effective Presentation strategies- Nuances of delivery – Controlling nervousness and stage fright- Visual aids Presentations- Capturing Audience - Tone - Behavior - Telephone

Etiquette- Non - verbal communication - Eye contact - Facial expressions - Posture - Gestures - Body langage – Etiquette- Organization of presentation – brain storming- Negotiations.

## UNIT - IV

Difference between goals and dreams - SMART goal setting - 3 Ds of goal setting- Determination, Discipline and Direction - Developing the right attitude - Motivation - Intrinsic and Extrinsic motivation - Dealing with change - Dedication - Taking responsibilities - Decision making.

## UNIT - V

Intrapersonal skills - Self-analysis - Thought process – Interpersonal skills - Confidence building - Resolving conflicts- Analytical skills - Team Building - Leadership skills - Planning/organizing - Ability to work independently - Professional ethics - Communicating via e-mail. Ethical perspectives and their implications for responsible communication - Proposal Presentation

## **TEXT BOOK:**

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Meenakshi Raman ; Prakash Singh	Business Communication	Oxford University Press	2012

#### **REFERENCES:**

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATION
1	Murthy, G .R. K.	Soft Skills for	The ICFAI University	2008
		Success.	Press, Hyderabad.	
2	Jagadeesan, G &	Soft Skills	The ICFAI University	2008
	Santanakrishnan,R	Development:	Press, Hyderabad.	
		Training and		
		Evaluation.		
3	Sherfield, Robert	Developing Soft	Pearson Education, New	2005
	M., Rhonda J.	Skills.	Delhi.	
	Montgomery, &			
	Patricia G. Moody			

#### WEBSITES

http://tribehr.com/social-hr-software/talent-management/skills-tracking www.ispeakyouspeak.blogspot.com https://alison.com/subjects/6/Personal-Development-Soft-Skills www.learning-development.hr.toolbox.com http://www.niit.com/solution/soft-skill-training http://mybcommlab.com to test your understanding of the concepts presented in each chapter and explore additional materials that will bring the ideas to life in videos, activities, and an online multimedia e-book.

## 17BECC201B

## **TECHNICAL ENGLISH**

3003

100

## **OBJECTIVES:**

- The goal of this course is for students :
- To motivate learners to acquire listening & speaking skills in both formal and informal context.
- To focus on question forms & to make them understand the importance of using question tags and also the functional use of transformation of sentences.
- To improve their reading habit and to train them in critical and analytical reading.
- To equip them to write for academic as well as work place context.
- To enable students to face interviews.
- To improve business letter writing skill of the students

## **INTENDED OUTCOMES:**

Students undergoing this course will be able to

- To acquire second language: speaking convincingly, expressing their opinions clearly, negotiating and arguing using appropriate communicative strategies.
- To enhance them reading texts critically and analytically.
- To develop writing effectively, persuasively and producing different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- To enrich the ability to face interviews the confidence.
- To help students develop listening skills for academic and professional purposes.
- To enable students write letters effectively in informal and business situations.

## UNIT-1 LSRW SKILLS & GRAMMAR

Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) (9)

Listening - Difference between Hearing & Listening –Listening to informal conversation. Speaking -Spoken structures on different situations - Introduction, Greeting, Comments on topics like Films, Games etc, Excuse, Request, Agreement, Disagreement, etc., Reading – Extensive and Intensive reading. Writing – Report writing - Writing a covering letter.

Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

Regular & Irregular verbs - Kinds of sentences - Question tags. Homonyms and Homophones.

## UNIT-II LSRW SKILLS & GRAMMAR

## Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) (9)

Listening – Note Taking- Improving grasping ability. Speaking – Welcome address - Vote of thanks - Master of ceremony. Reading – Active and Passive reading - Reading for vocabulary- Reading for a purpose. Writing - Writing a review (Film review) - Summary of a story. Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

Modal verbs - Conjunction - Expression of cause and effect. Phrasal verbs - Idioms.

## UNIT – III LSRW SKILLS & GRAMMAR

# Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) (9)

**Listening -** Barriers to listening (Physical, Psychological, Linguistic & Cultural). **Speaking** – Stress, Pause and Intonation. **Reading** – Rapid reading – Skimming, Scanning and Surveying. (SQ3R)**Writing** - Essay writing -Minutes of meeting - Agenda

## Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

Active and Passive voice - Purpose expression. Same words used as noun and verb - Often misspelt and confused words.

## UNIT-IV LSRW SKILLS & GRAMMAR, CAREER ORIENTED

# Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) (9)

**Listening** – Listening to telephone conversation - Viewing model interviews. **Speaking** – Group Discussion - Correlation between verbal & non - verbal communication. **Reading** – Reading comprehension (short & long text) - Reading job advertisements and profile of a company. **Writing** – Checklist preparation.

## Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

Grammar - Numerical expressions - Collocations. Singular and Plural (Nouns)

## Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) (9)

**Listening** – Types of listening- Improving listening comprehension. **Speaking** - Oral presentation - Vocal communication techniques - Voice, quality, volume, pitch etc., **Reading** -Note making - Making notes from books/ any forms of writing materials. **Writing** - Describing process & products - Recommendation writing – Short essays writing-

## Grammar & Vocabulary (Function Grammar & Technical Vocabulary)

Transformation of sentences (Simple, Compound & Complex).Collection of Technical Vocabularies with their meanings.

**Note:** Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

#### Total-45

## **TEXT BOOK:**

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATIO
				Ν
1	<u>Sangeeta</u>	<u>Technical</u>	OUP,	2015
	<u>Sharma</u> ,	Communication:	New Delhi.	
	Meenakshi	Principles And		
	<u>Raman</u>	Practice		
		2 <sup>nd</sup> Edition		

## **REFERENCES:**

S.	AUTHOR(S) NAME	TITLE OF THE	PUBLISHER	YEAR OF
NO.		BOOK		PUBLICATIO
				Ν
1	Lakshminarayanan,	Communication	SCITECH Publications,	2008
	K.R. & Murugavel, T.	Skills for	Chennai	
		Engineers		
2	Rizvi Ashraf, M	Effective	Tata McGraw-Hill,	2007
		Technical	New Delhi.	
		Communication		
3	Rutherford Andrea, J.	Basic	Pearson Education, New	2006
		Communication	Delhi.	
		Skills for		

	Technology	

#### WEBSITES :

www.learnerstv.com – Listening/ Speaking/ Presentation			
www.usingenglish.com – Writing/ Grammar			
www.englishclub.com - Vocabulary Enrichment/ Speaking			
www.ispeakyouspeak.blogspot.com - Vocabulary Enrichment/ Speaking			
www.teachertube.com – Writing Technically			
www.Dictionary.com – Semantic / Grammar			

## 17BECC202ENGINEERING MATHEMATICS II3 2 0 4 100

#### **OBJECTIVES:**

- To have knowledge in integral calculus.
- Determine mathematical tools needed in evaluating multiple integrals and their usage.
- Utilize Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.
- Apply the knowledge of Mathematics in various Engineering fields by making them to identify the functions in engineering problems as analytic function and their analyze as a function of a complex variables.
- Develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence.
- To specify some difficult integration that appear in applications can be solved by complex integration in application areas such as fluid dynamics and flow of the electric current.

## **COURSE OUTCOMES:**

- The student will be able to solve problems in Fluid Dynamics, Theory of Elasticity, Heat and Mass Transfer etc.
- The students will be able to understand mathematical tools needed to evaluate the areas and volumes using multiple integrals.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage. Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.
- To find the Analytic functions using the Cauchy Riemann equations and they will learn mapping properties of elementary functions and mapping properties of some special transcendental functions.

- Students will understand relations between conformal mappings and quadratic differentials and how geometric structures are changing under conformal mappings.
- To evaluate complex integrals using the Cauchy integral formula and the residue Theorem and to appreciate how complex methods can be used to prove some important theoretical results.

#### UNIT I INTEGRAL CALCULUS

Definite and indefinite integrals – Techniques of integration – Substitution rule, Trigonometric integrals, Integration by parts, Integration of rational functions by partial fraction, Integration of irrational functions – Improper Integrals.

## UNIT II MULTIPLE INTEGRALS

Double integral – Cartesian coordinates – Polar coordinates – Area as double integrals- Change the order of integration – Triple integration in Cartesian co-ordinates.

#### UNIT III VECTOR INTEGRATION

Integration of vectors – line integral- surface integral- volume integral- Green's theorem - Gauss divergence theorem and Stoke's theorems (Statement Only), hemisphere and rectangular parallelopipeds problems.

#### UNIT IV ANALYTIC FUNCTIONS

Analytic functions - Cauchy-Riemann equations in Cartesian and polar forms – Sufficient condition for an analytic function (Statement Only) - Properties of analytic functions – Constructions of an analytic function - Conformal mapping: w = z+a, az, 1/z and bilinear transformation.

#### UNIT V COMPLEX INTEGRATION

Complex Integration - Cauchy's integral theorem and integral formula (Statement Only) – Taylor series and Laurent series - Residues – Cauchy's residue theorem (Statement Only) - Applications of Residue theorem to evaluate real integrals around unit circle and semi-circle (excluding poles on the real axis).

#### Total: 60

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#### **TEXT BOOKS:**

S.NO.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
	NAME	BOOK		PUBLICATION
1	Hemamalini. P.T	Engineering	McGraw-Hill	2014
		Mathematics I & II	Education Pvt.Ltd,	
			New Delhi	
2	Grewal, B.S.	Higher Engineering	Khanna Publishers,	2014
		Mathematics	Delhi.	

## **REFERENCES:**

S. NO.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
	NAME	BOOK		PUBLICATION
1	Erwin Kreyszig	Advanced	John Wiley & Sons.	2011
		Engineering	Singapore	
		Mathematics.		
2	Venkataraman, M.	Engineering	The National	2005
	К.	Mathematics.	Publishing	
			Company, Chennai	
3	Narayanan. S,	Advanced	Viswanathan	2002
	Manicavachagam	Mathematics for	S.(Printers and	
	pillay.T.K and	Engineering Students.	Publishers) Pvt.	
	Ramaniah.G		Ltd. Chennai.	
4	Michael D.	Advanced	Pearson Education,	2009
	Greenberg	Engineering	India	
		Mathematics		

## **WEBSITES:**

- 1.www.efunda.com
- 2. <u>www.mathcentre.ac.uk</u>
- 3. www.sosmath.com/diffeq/laplace/basic/basic.html
- 4. www.mathworld.wolframe.com

## **OBJECTIVES:**

The goal of this course is for students :

- To give a comprehensive insight into natural resources.
- To impart knowledge on ecosystem and biodiversity.
- To educate the ways and means of the environment.
- To protect the environment from various types of pollution.
- To impart some fundamental knowledge on human welfare measures.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.

#### **INTENDED OUTCOME:**

Upon completion of this course, the student will be able to:

- Recognize the importance of natural resources (S).
- Associate themselves with the various ecosystems (S).
- Describe the importance of biodiversity (S).
- Identify and minimize the difference pollutions (S).
- Prioritize and analyses the social issues (S).
- Integrate the environmental principles in the projects undertaken in field of engineering and technology (A).

## UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES (9)

Definition, Scope and Importance – Need for public awareness -Forest resources: Use and over-exploitation, deforestation- Water resources-Use and over-utilization of surface and ground water, floods, drought, conflicts over water- Land resources-Land as a resource, land degradation, man induced landslides, soil erosion and desertification –Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources- Food resources-World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture- Energy resources-Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources- role of an individual in conservation of natural resources.

## UNIT II ECOSYSTEM

Chemistry and Environment-Environmental segments, Composition and Structure of atmosphere-Concept of an ecosystem- Structure, components and function of an ecosystem Energy flow in the ecosystem – Food chain, Food web and Ecological pyramids, Structure and function of Terrestrial ecosystem (Forest, Desert and Grassland ecosystem) and Aquatic ecosystem (Fresh water and Marine ecosystem)

## UNIT III BIODIVERSITY

Introduction to biodiversity, Definition- Genetic diversity, Species diversity and Ecosystem diversity, Biogeographical classification of India, Importance of biodiversity-Value of biodiversity - Hot Spots of biodiversity-Threats to biodiversity - Endangered and Endemic Species of India – Conservation of biodiversity- In-Situ and Ex-Situ conservation of biodiversity.

## UNIT IV ENVIRONMENTAL POLLUTION

Definition – causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution and Thermal pollution. Solid waste management-causes, effects and control

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measures of urban and industrial wastes- Role of an individual in prevention of pollution-Disaster management-earthquake, tsunami, cyclone and landslides.

#### UNIT V SOCIAL ISSUES AND ENVIRONMENT

From Unsustainable to Sustainable development, Urban problems related to energy sources, Water conservation, Rain water harvesting and Watershed management, Resettlement and rehabilitation of people, its problems and concerns, Environmental ethics- Issues and possible solutions- Climate change-Green house effect and Global warming, Acid rain, Ozone layer depletion, Wasteland reclamation-Environment Protection Act- Human Rights-Value education, Role of Information Technology in Environment and Human health-Population growth, Variation of population among nations-Population explosion.

## Total: 45

## **TEXT BOOKS:**

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Ravikrishnan,	Environmental	Sri Krishna Hi tech Publishing	2012
	А	Science	Company Private Ltd., Chennai	
2.	Anubha kaushik	Environmental	New Age International (P) Ltd.,	2010
	C.P. Kaushik	Science and	New Delhi.	
		Engineering		

#### **REFERENCES:**

S.No.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William	Principles of	Tata Mc Graw -Hill Publishing	2008
	P.Cunningham	Environmental	Company, New Delhi.	
		Science		
2.	Linda D. Williams	Environmental	Tata Mc Graw -Hill Publishing	2005
		Science	Company Ltd., New Delhi.	
		Demystified		
3.	Bharucha Erach	Environmental	Mapin Publishing (P) Ltd.,	2005
		Science	Ahmedabad.	
		Demystified		
4.	Tyler Miller G. Jr	Environmental	Thomson & Thomson	2004
		Science	Publishers, New Delhi.	
5.	Trivedi, R.K. and	Introduction to Air	Techno-Science Publications,	2003
	Goel, P.K	Pollution	Jaipur.	

## WEBSITES:

- 1. http://people.eku.edu/ritchisong/envscinotes1.html
- 2. http://nptel.ac.in/courses.php?disciplineId=120
- 3.www.newagepublishers.com/samplechapter/001281.

4.<u>www.unesco.org/ext/field/beijing/scienceb.htm,www.infinitepower.org/education.htm</u>

5. http://www.sciencedaily.com/news/top/environment/

## **OBJECTIVE:**

The goal of this course is for students :

- To inculcate the fundamental principles and concepts of magnetic materials for different engineering applications.
- To impart basic knowledge of superconductivity and associated applications.
- To serve the fundamental concepts of dielectric materials for diverse applications in energy engineering.
- To divulge the basics of crystals, their structures and different crystal growth techniques.
- To make the students familiar in the fundamentals of ceramics, composites and nanomaterials.
- To learn about advanced materials and characterization

#### **INTENDED OUTCOME:**

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

- Explain the ideas of classical and quantum electron theories and energy band structures.
- Illustrate the basics of semiconductor physics and its related concepts.
- Compare the different magnetic materials, its properties and infer its role in various fields.
- Identify the properties of superconducting materials and its engineering applications.
- Extend the various polarization techniques and applications of dielectric materials.
- Summarize the basics of nano structures and synthesizing techniques.

## UNIT I CONDUCTING MATERIALS

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

#### UNIT II SEMICONDUCTING MATERIALS

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect –Determination of Hall coefficient – Applications.

## UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS

Origin of magnetic moment – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications.

Superconductivity: properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Temperature superconductors – Applications of superconductors – Magnetic levitation.

#### **UNIT IV DIELECTRIC MATERIALS**

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Clausius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – Applications of dielectric materials – ferroelectricity and applications.

## UNIT V ADVANCED MATERIALS AND CHARACTERIZATION TECHNIQUES

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Nano materials: synthesis – Physical and chemical vapour deposition – ball milling - properties of nanoparticles and applications. Carbon nanotubes: structure – properties and applications.

Spectroscopy: Basic concepts, Theory and Experimental techniques – Raman Spectroscopy, Nuclear Magnetic Resonance Spectroscopy (NMR).

#### Total- 45

#### **TEXT BOOK:**

S.No.	AUTHOR(S) NAME		TITLE BOOK	OF	THE	PUBLISH	IER	YEAR PUBLICA' N	OF TIO
1	Ganesan.S	and	Engineeri	ng Phy	sics II	GEMS Coimhata	Publisher,	2015	
	Daskar. I					Connoato	re-041 001		

#### **REFERENCES:**

S.NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF
	NAME			PUBLICATION
1	William D	Material Science and	John Wiley &	2013
	Callister Jr	Engineering-An	Sons Inc., New	
		Introduction	York.	
2	James F	Introduction to Materials	Macmillan	2014
	Shackelford	Science for Engineers	Publication	
			Company, New	
			York	
3	Charles Kittel	Introduction to Solid State	John Wiley &	2005
		Physics	sons, Singapore.	
4	Colin N.	Fundamentals of Molecular	McGraw-Hill	2008
	Banwell, <u>Elaine</u>	Spectroscopy	Companies, New	
	M. McCash		Delhi	

#### WEBSITES:

- 1. www.nptel.ac.in
- 2. www.physicsclassroom.com
- 3. www. oyc.yale.edu
- 4. <u>www.physics.org</u>

#### 17BEBME212ENGINEERING WORKSHOP PRACTICE0042100

#### **COURSE OBJECTIVES:**

The goal of this course is for students

- To provide exposure to the students with hands on experience on various basic engineering practices in civil, mechanical, electrical and electronics engineering.
- To understand carpendry works
- To understand Plumbing works
- To understand smithy and foundry works
- To classify various tools used in carpendry ,plumbing and foundry works
- To understand basic concept of machining

#### **COURSE OUTCOMES:**

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

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

#### PART – A (MECHANICAL)

#### 1. WELDING

i. Preparation of arc welding of butt joints, lap joints and tee joints.

#### 2. BASIC MACHINING

- i. Simple Turning and Taper turning
- ii. Drilling and Tapping
- iii. Sheet Metal Work
- iv. Model making Trays, funnels, etc.

#### 3. DEMONSTRATION ON

- i. Smithy operations
- ii. Foundry operations
- iii. Plumbing Works
- iv. Carpentary Works

#### PART –B (ELECTRICAL & ELECTRONICS)

#### 4. ELECTRICAL ENGINEERING

- i. Study of electrical symbols and electrical equipments.
- ii. Construct the wiring diagram for Stair case wiring and Fluorescent lamp wiring.
- iii. Construct the wiring diagram for Residential house wiring using switches, fuse, indicator, lamp and energy meter.
- iv. Measurement of electrical quantities voltage, current, power & power factor in R load.
- v. Measurement of energy using single phase energy meter.

#### 5. ELECTRONICS ENGINEERING

- i. Study of Electronic components- Resistor (color coding), capacitors and inductors.
- ii. Soldering practice Components Devices and Circuits Using general purpose PCB.iii. Study of logic gates AND, OR, NOT, NOR and NAND.

#### TOTAL 45

#### REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Jeyachandran, K. and Balasubramanian, S	A Premier on Engineering Practices Laboratory	Anuradha Publications, Kumbakonam	2007
2	Jeyapoovan, T., Saravanapandian, M	Engineering Practices Lab Manual	Vikas Puplishing House Pvt. Ltd, Chennai	2006
3	Bawa, H.S	Workshop Practice	Tata McGraw – Hill Publishing Company Limited, New Delhi	2007

#### **17BEBME213**

#### **C PROGRAMMING LAB**

#### **COURSE OBJECTIVES:**

- To provide an awareness to Computing and C Programming
- To know the correct and efficient ways of solving problems
- To learn to develop algorithm for simple problem solving
- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming
- Understand, analyze and implement software development tools like algorithm, pseudo codes and programming structure

#### **OUTCOMES:**

- Able to understand the basic terminology used in computer programming
- Able to write, compile and debug programs in C language.
- Able to use different data types in a computer program.
- Able to design programs involving decision structures, loops and functions.
- Able to understand the dynamics of memory by the use of pointers
- Understand the concept of function and operator
- Develop programming skill and to solve engineering related problems.

#### **List of Experiments**

- 1. Write a C program to find Factorial of a given number using do while loop.
- 2. Write a C Program to print Fibonacci series using while loop.
- 3. Write a C Program to check a given number is Prime or Not.
- 4. Write a C Program to compute the sum of even numbers for a given n value.
- 5. Write a C Program to check the given string is Palindrome or Not.
- 6. Write a C Program to check the given number is Armstrong or Not using functions.
- 7. Write a C Program to count the number of vowels from the given string using switch case.

8. Write a C Program to read a line of text from keyboard and print the number of characters, words and spaces.

- 9. Write a C Program to print the student"s record using structure.
- 10. Write a C Program to find factorial of a number using recursion function.

#### **17BEBME251**

#### . COURSE OBJECTIVE:

The goal of this course is for students

- To describe the content and delivery of a business planning course.
- To examine the perceived effectiveness of the business planning course relating to entrepreneurial skills gained by students
- To examine the usefulness of business plans as a pedagogical tool in imparting knowledge and skills to identify and integrate key business functional areas.
- To explain relevance of Ethics while taking business decisions.
- To understand the risk assessments and business plan process
- To learn about the various market research

#### **COURCE OUTCOMES:**

#### After this course the student will be able to:

- Think about self business
- Know the various risk factors in business
- Read various business articles and know the market research
- Get familiar with various Government policies
- Various factors of successful business
- Have a good knowledge about various markets

#### UNIT I

Entrepreneurship - Types- Entrepreneurial Competencies -Business Plan - Meaning - Basic parameters

- Project parameters - Factors of successful business - Term Loans and Working Capital Management.

#### UNIT II

Business Plan Process - Sources of Information – Online Resources - Offline Resources - Sources of Market Research - Benefits of market study - Coverage of market study.

#### UNIT III

Business Plan components - Company description - Industry Analysis - Target Market - Competition -Strategic position - Risk assessment - Technology plan - Management and Organization – Government policy

#### **REFERENCES:**

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Rhonda Abrams	The Successful business Plan Secret \$ Strategies	Prentice Hall	_
2	Rhonda Abrams	The business plan in a day	Prentice Hall	-

#### **OBJECTIVES:**

- To develop analytical skills for solving engineering problems.
- To teach the students the basic concepts of LPP.
- To teach the students the basic concepts of Transportation and Assignment problems.
- To make the students to study about the Integer Programming.
- To make the students to study about the Network Analysis.
- To make students understand the concept of Branch Bound Method

#### •

#### **COURSE OUTCOMES:**

- Be able to solve problems in different environments and develop critical thinking.
- Be able to shape and solve Transportation Models and Assignment Models.
- Be able to build and solve integer programming.
- Be able to build and solve Nonlinear programming.
- Use the theory, methods and techniques of the course to solve problems;
- Give an account of the foundations of calculus of variations and of its applications in mathematics and physics

#### UNIT I LINEAR PROGRAMMING PROBLEM

Formulation of LPP - Graphical Method - Simplex Method - Artificial variable technique and two phase simplex method. Duality - Dual and simplex method - Dual Simplex Method.

#### UNIT II TRANSPORTATION AND ASSIGNMENT PROBLEM

Transportation Model- finding initial basic feasible solutions- moving towards optimality- Degeneracy. Solution of an Assignment problem - Hungarian Algorithm.

#### UNIT III INTEGER PROGRAMMING

Integer Programming Problem – Gromory's fractional cut Method – Branch Bound Method

#### UNIT IV NETWORK ANALYSIS

PERT & CPM- network diagram-probability of achieving completion date- crash time- cost analysis.

#### UNIT V CALCULUS OF VARIATIONS

Calculus of Variations - Basic definition, Simplest problem, Isoperimetric problem, Problems with Higher order derivatives, Euler Lagrange Equation, Weierstrass - Erdmann conditions; Pontryagin Maximum Principle; Transversality condition; Applications

#### **TEXT BOOKS:**

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO	NAME	BOOK		PUBLICATION
•				

# Total : 60

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1	Hamdy Taha. A.	Operations Research	Prentice – Hall of India Private Limited, New Delhi	2013
2	Dr. Grewal B.S.	Higher Engineering Mathematics	Khanna Publishers, New Delhi.	2013

### **REFERENCES:**

S.	AUTHOR(S) NAME	TITLE OF THE	PUBLISHER	YEAR OF
NO		BOOK		PUBLICATIO
•				Ν
1	Natarajan A.M.,	<b>Operations Research</b>	Pearson Education,	2005
	Balasubramani P.,		New Delhi.	
	Thamilarasi A			
2	Srinivasan G	Operations Research:	PHI Private Limited,	2007
		Principles and	New Delhi.	
		Applications		
3	Winston	Operations Research,	Cengage Learning	2004
		Applications and	India Pvt. Ltd, New	
		Algorithms	Delhi.	
4	Kanti Swarup,	Operations Research	Sultan Chand &	2010
	Manmohan, Gupta		Sons, New Delhi.	

#### **WEBSITES:**

- 1. <u>www.mathworld</u>. Wolfram.com
- 2. <u>www.mit.edu</u>
- 3. www.nptel.com

#### LINEAR ALGEBRA AND SPECIAL FUNCTIONS **17BEBME301B** 3204 100

#### **OBJECTIVES:**

- To introduce the basic notions of groups, rings, fields which will then be used to solve related problems.
- To understand the concepts of vector space, linear transformations and diagonalization.
- To apply the concept of inner product spaces in orthogonalization.
- To understand the concept of Hyperbolic, Beta and Gamma Functions. •
- To solving Bessel functions of the first kind and their properties. •
- To provide a firm basis for further reading and study in the subject. •

#### **COURSE OUTCOMES:**

- Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- Demonstrate accurate and efficient use of advanced algebraic techniques.
- Demonstrate their mastery by solving non trivial problems related to the concepts and by proving simple theorems about the statements proven by the text.
- Be able to acquire basic knowledge on vector spaces and linear transformations. •
- To apply various techniques in solving differential equations and to understand the method of finding the series solution of Bessel's differential equations.
- Be able to build and solve the special functions. •

#### UNIT I **VECTOR SPACES**

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space.

#### UNIT II LINEAR TRANSFORMATIONS

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations - Eigen values and Eigen vectors - Similarity, Diagonalization.

#### UNIT III **INNER PRODUCT SPACES**

The Dot Product on R<sup>n</sup> and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements -Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: **Quadratic Forms** 

UNIT IV HYPERBOLIC FUNCTIONS, BETA AND GAMMA FUNCTIONS (12)Hyperbolic Functions: Hyperbolic functions and Inverse Hyperbolic functions – Identities – Real and imaginary parts – solving problems using hyperbolic functions.

Beta and Gamma Functions: Definitions - Properties - Relation between beta and gamma integrals – Evaluation of definite integrals in terms of beta and gamma functions.

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#### UNIT V BESSEL FUNCTIONS

Bessel Functions – Preliminaries – Definitions – Bessel Differential Equation – Differential recurrence relations – the pure recurrence relation – A generating function – Bessel's integral – Index half and odd integer.

#### **TEXT BOOKS:**

S. NO.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
	NAME	BOOK		PUBLICATION
1	Kreyszig,E	Advanced	John Wiley & Sons, New	2014
		Engineering	Delhi.	
		Mathematics		
2	Shahnaz Bathul	Text book of	PHI Publications, New	2009
		Engineering	Delhi.	
		Mathematics		

#### **REFERENCES:**

S.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
NO.	NAME	BOOK		PUBLICATION
1	Dr. Grewal B.S.	Higher	Khanna Publishers,	
		Engineering	New Delhi.	2013
		Mathematics		
2	Anton and	Elementary Linear	Wiley India Edition,	
	Rorres	Algebra,	New Delhi.	2012
		Applications		2012
		version		
3	Jim Defranza,	Introduction to	Tata McGraw-Hill,	
	Daniel Gagliardi	Linear Algebra	New Delhi.	2008
		with Application		

### **WEBSITES:**

- 1. www.sosmath.com
- 2. www.nptel.ac.in
- 3. <u>www.mathworld.wolfram.com</u>

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#### Total: 60

#### UNIT-I NUMBER SYSTE MS AND BO OLEAN ALGEBRA (12)

Binar y, Octal, Decimal, Hexadecimal-Number base conversions – complements – signed Binar y numbers. Binar y Arithmetic- Binar y codes: Weighted –BCD-2421-Gra y code-Excess 3 code-ASCII – Error detecting code – conversion from one code to another-Boolean postulates and laws –De-Morgan's Theorem- Principle of Dualit y- Boolean expression – Boolean function-Minimization of Boolean expressions – Sum of Products (SOP) –Product of Sums (POS)-Minterm-Maxterm- Canonical forms – Conversion between canonical forms –Karnaugh map Minimization – Don't care conditions.

#### UNIT-II LOGIC GATES AND COMBINA TIONAL CIRCUITS (12)

LOGIC GATES: AND, OR, NOT, NAND, NOR, Exclusive – OR and Exclusive – NOR-Implementations of Logic Functions using gates, NAND –NOR implementations –Multi level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates.

**COMBINATIO NAL CIRCUITS:** Design procedure – Adders-Subtractors – Serial adder/ Subtractor - Parallel adder/ Subtractor- Carr y look ahead adder- BCD adder- Magnitude Comparator-Multiplexer/ Demultiplexer- encoder / decoder – parit y checker – code converters. Implementation of combinational

logic using MUX.

#### UNIT-III SEQUEN TIAL CIRCUIT

Flip flops SR, JK, T, D and Master slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering –Realization of one flip flop using other flip flops –As ynchronous / Ripple counters – S ynchronous counters –Modulo – n counter –Classification of sequential circuits – Moore and Meal y -Design of S ynchronous counters: state diagram- State table –State minimization –State assignment- <u>ASM Excitation table and maps Circuit implementation</u>– <u>Register</u>– shift registers- Universal shift register – Shift counters – Ring counters.

#### UNIT-IV ASYNCH RONOUS SEQUENTIAL CIRCUITS

Design of fundamental mode and pulse mode circuits – primitive state / flow table – Minimization of primitive state table –state assignment – Excitation table – Excitation map- c ycles – Races –Hazards: Static –Dynamic –Essential –Hazards elimination.

#### UNIT-V MEMORY DEVICES

Classification of memories –RAM organization – Write operation – Read operation – Memory cycle – Timing wave forms – Memory decoding – memory expansion – Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell –Dynamic RAM cell –ROM organization - PROM –EPROM – EAPROM –Programmable Logic Devices – Programmable Logic Array (PLA)- Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA). Implementation of combinational logic using ROM, PAL and P LA

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#### 17BECC302

#### **DIGITAL ELECTRONICS**

#### **OBJECTIVES**

The goal of this course is for students :

- To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
- To introduce the concept of memories and programmable logic devices.
- To illustrate the concept of synchronous and asynchronous sequential circuits
- To summarize the concept of memories and programmable logic devices.

#### **INTENDED OUTCOMES:**

- Understand number systems and codes
- Understand basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- Understand the methods for simplifying Boolean expressions
- Understand the formal procedures for the analysis and design of combinational circuits and sequential circuits
- Understand the concept of memories and programmable logic devices.
- Interpret the concept of synchronous and asynchronous sequential circuits

#### UNIT-I NUMBER SYSTEMS AND BOOLEAN ALGEBRA

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Binary, Octal, Decimal, Hexadecimal-Number base conversions – complements – signed Binar y numbers. Binar y Arithmetic- Binar y codes: Weighted –BCD-Gray code-Excess 3 code-ASCII – Error detecting code – conversion from one code to another-Boolean postulates and laws –De-Morgan's Theorem- Principle of Duality- Boolean expression – Boolean function- Minimization of Boolean expressions – Sum of Products (SOP) –Product of Sums (POS)-Minterm- Maxterm-Canonical forms – Conversion between canonical forms –Karnaugh map Minimization – Don't care conditions.

UNIT-IILOGIC GATES AND COMBINA TIONAL CIRCUITS(12)LOGIC GATES: AND, OR, NOT, NAND, NOR, Exclusive – OR and Exclusive – NOR-<br/>Implementations of Logic Functions using gates, NAND –NOR implementations –Multi level gate<br/>implementations.(12)

**COMBINATIONAL CIRCUITS:** Design procedure – Adders-Subtractors – Serial adder/ Subtractor - Parallel adder/ Subtractor- Carr y look ahead adder- BCD adder- Magnitude Comparator-Multiplexer/ Demultiplexer- encoder / decoder – parit y checker. Implementation of combinational logic using MUX.

#### UNIT-III SEQUENTIAL CIRCUIT

Flip flops SR, JK, T, D and Master slave – Characteristic table and equation– Edge triggering – Level Triggering –Realization of one flip flop using other flip flops –Asynchronous– Synchronous counters –Classification of sequential circuits – Moore and Meal y -Design of Synchronous counters: state diagram- State table –State minimization –State assignment- Register – shift registers- Universal shift register

#### UNIT-IV ASYNCH RONOUS SEQUENTIAL CIRCUITS

Design of fundamental mode and pulse mode circuits – primitive state / flow table – Minimization of primitive state table –state assignment – Excitation table – Excitation map- cycles – Races –Hazards: Static –Dynamic –Essential –Hazards elimination.

#### UNIT-V MEMORY DEVICES

Classification of memories –RAM organization– Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell –Dynamic RAM cell –ROM organization - PROM –EPROM –EEPROM –Programmable Logic Devices – Programmable Logic Array (PLA)- Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA).

Total: 60

#### **TEXT BOOKS:**

S.No.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Morris Mano.M	Digital Design	Prentice Hall of India Pvt. Ltd., New Delhi	2003
2	John M .Yarbrough	Digital Logic Applications and Design	Thomson- Vikas publishing house, New Delhi	2002

#### **REFERENCES:**

S.No.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Salivahanan.S and Arivazhagan.S	Digital Circuits and Design	Vikas Publishing House Pvt. Ltd, New Delhi	2004
2	Charles H.Roth	Fundamentals of Logic Design	Thomson Publication Company, New Delhi.	2003
3	Donald P.Leach and Albert Paul Malvino	Digital Principles and Applications	Tata McGraw Hill Publishing Compan y Limited, New Delhi	2003
4	Jain.R.P	Modern Digital Electronics	Tata McGraw–Hill publishing compan y limited, New Delhi	2003
5	Thomas L. Flo yd	Digital Fundamentals	Pearson Education, New Delhi	2003

#### WEBSITES:

http://www.allaboutcircuits.com/vol\_2/chpt\_9/2.html http://www.educypedia.be/electronics/digital.html (12)

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3003

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#### **OBJECTIVE**

The goal of this course is for students :

- To develop programming skill and to solve engineering related problems using C++, Object Oriented Programming (OOP) and Data Structure Concepts.
- Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
- Demonstrate the use of various OOPs concepts with the help of programs
- Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.
- Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.
- Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.

#### **INDENTED OUTCOME**

- Understanding Design correct programs to solve problems.
- Choose efficient data structures and apply them to solve problems.
- Analyze the efficiency of programs based on time complexity.
- Prove the correctness of a program using loop invariants, pre-conditions and post-conditions in programs.
- Understand the concept of function overloading, operator overloading, virtual functions and polymorphism
- Develop programming skill and to solve engineering related problems using C++, Object Oriented Programming (OOP) and Data Structure Concepts

#### **UNIT – I INTRODUCTION TO DATA STRUCTURES**

Abstract data types – Arrays – Static, Dynamic and Generic arrays. Strings – Fixed and variable size – static and dynamic strings.

#### UNIT – II LINKED LISTS

Dynamic storage management – singly and doubly linked list – Stack – Application of stack – Fixed, variable and Generic stack – queues – queue based on Dynamic linked list – Trees – Binary Trees – Graphs – Warshall's Algorithms – Shortest paths.

#### **UNIT – III OBJECTS ORIENTED PROGRAMMING**

Objects and classes – methods, messages, encapsulation, abstraction, inheritance, polymorphism, dynamic building. Traditional approach Versus object orientation; benefits of object orientation – flexibility in software development – reusability – extensibility – maintainability.

#### **UNIT – IV OBJECTS AND CLASSES**

Specifying classes – using – C++ objects and data types – constructors and destructors – object as function arguments – structures and classes. Array fundamentals – array as class member data – array of objects. Structures – simple structure – accessing structure member – structure within structure – structure and classes – Function overloading – Inline function – Virtual function and polymorphism.

#### **UNIT - V OPERATOR OVERLOADING**

Overloading unary operator – overloading binary operator – data conversion. Inheritance – derived class and base class – derived class constructors – public and private inheritance – level of inheritance. C++ graphics – text – mode graphics functions – graphics – mode graphics functions – colors – rectangles and lines – polygons and inheritance – text in graphics mode – Addresses and pointers, Simple file operations: streams – string I/O – character I/O.

#### **TEXT BOOKS:**

S. NO.	AUTHOR(S)	TITLE OF THE	PUBLISHER	YEAR OF
	NAME	BOOK		PUBLICATION
1	N.S. Kutti and	Data Structures in	Prentice Hall of India	2001
	P.Y. Padhye	C++	Pvt., Ltd., New Delhi	
2	Liberty &	C++: An introduction	Prentice Hall of India	2002
	Keogh	to programming	Pvt., Ltd., New Delhi	

#### **REFERENCES:**

S.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF
NO.	NAME			PUBLICATION
1	Bjarne Stroustrup	The C++ Programming	Addison Wesley by	1994
		Language	publication, New York	
2	Jean – Paul	An Introduction to Data	Tata McGraw Hill	1998
	Tremblay and	Structures with		
	Paul G.Sorenson	Applications		
3	E. Balagurusamy	Object oriented	Tata McGraw Hill, New	1996
		Programming with C++	Delhi	

#### **17BEBME304 ELECTRONIC DEVICES AND CIRCUITS** 3003 100

#### **OBJECTIVES**

The goal of this course is for students :

- To understand the operational characteristics of a Semiconductor in Equilibrium and Non-Equilibrium conditions.
- To understand the working of PN junction diodes and special purpose diodes.
- To understand the basic working physics of BJT and FET both in ideal and non- ideal conditions.
- To understand the working of Rectifiers and Voltage regulators.
- To understand the fabrication process of Monolithic ICs
- To improve knowledge about the working of Rectifiers and Voltage regulators.

#### **INTENDED OUTCOMES**

- Understand the fundamental concepts
- Logically analyze any electronic circuit
- Apply the logic in any application
- Understand the specifications of regulators and power supply circuits.
- Apply positive feedback principle and design oscillators.
- Design multivibrator circuits.

#### UNIT I SEMICONDUCTOR DIODES AND SPECIAL PURPOSE DIODES

Semiconductors: Intrinsic semiconductor - extrinsic semiconductor - Fermi level in an intrinsic semiconductor - intrinsic semiconductor and extrinsic semiconductor. Semiconductor diodes : Formation of PN junction - working principle - VI characteristics - PN diode currents - diode current equation - diode resistance - transition and diffusion capacitance. Special purpose diodes : Zener diode, schottky diode

#### UNIT II BIPOLAR TRANSISTORS

Bipolar Transistors: Construction - working - transistor currents - transistor configurations and inputoutput characteristics - Early effect (base width modulation) - transistor as an amplifier Transistor as a switch.

#### UNIT III FIELD EFFECT TRANSISTORS

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, CCD.

#### **UNIT III FIELD EFFECT TRANSISTORS**

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Field-Effect Transistors: construction, working and VI characteristics of JFET – comparison of BJT and JFET – MOSFET – enhancement MOSFET, depletion MOSFET - working principle and VI characteristics, comparison of MOSFET with JFET.

### UNIT IV DC POWER SUPPLIES

Rectifiers and Filters: Block schematic of a typical DC power supply, single phase HWR, FWR, fullwave bridge rectifier, power supply filters (ripple factor and efficiency analysis), Voltage regulators: voltage regulation, Zener diode shunt regulator, transistor series regulator, transistor shunt regulator, switching regulators.

### UNIT V OSCILLATORS AND MULTIVIBRATORS

RC phase shift oscillator, Wein-bridge oscillator, Hartley oscillator, Colpitts oscillator, types of multivibrators, Astable, monostable and bistable multivibrators.

# Total: 45

#### **TEXT BOOKS:**

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	Millman and Halkias	Electronic devices	Tata McGraw Hill	2010
		and Circuits	International	
2	David A.Bell	Fundamental of electronic devices and circuits	Oxford press	2009

#### **REFERENCES:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Street Man	Solid State Electronic Devices'	Prentice Hall Of India,6th edition	2005
2	Mathur Kulshrestha and Chadha	Electron devices and Applications and Integrated circuits'	Umesh Publications	2005
3	Thomas L. Floyd	Electron Devices	Charles and Messil Publications	2012
4	G.K.Mithal	Electronic Devices and Circuits	Khanna Publishers	2013
5	Robert L. Boylestad and Louis Nashelsk y	Electronic Devices and Circuit Theor y	Pearson Education, 9 <sup>th</sup> Edition,	2009.

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6	B. Somanathan Nair	Electronic Devices and Applications	PHI,	2006
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#### **17BEBME305**

#### **BIOCHEMISTRY**

#### **OBJECTIVES**

The goal of this course is for students

- To study about the biochemistry of living cells, metabolism of biomolecules and the methods of investigation and diagnostic tools.
- To summarize the role of these biomolecules by providing basic information on specific • metabolic diseases and disorders of these biomolecules.
- To analyse the structural and functional properties of carbohydrates, proteins and lipids •
- To discuss about functions of each organelles and Transport of substances across biological membranes
- To infer about the biochemistry of living cells
- Demonstrate the concepts of biochemistry of living cells

#### **INTENDED OUTCOMES**

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

- Understand the concepts of biochemistry of living cells
- Understand the concepts of metabolism of carbohydrates •
- Understand the concepts of protein biochemistry
- Understand the concepts of biochemistry of lipids
- Understand the concepts of investigation of metabolism.
- Understand the structural and functional properties of various organalles and biomolecules

#### UNIT I **BIOCHEMISTRY OF LIVING CELLS**

Biochemistry of living cells, sub cellular fractionation using the differential centrifugation method. Functions of each organelles, redox potential, oxidative phosphorylation, Transport of substances across biological membranes.

#### **UNIT II CARBOHYDRATES**

Carbohydrates: Definition, classification, biological functions; glycolysis, TCA cycle, glycogenesis, glycogenolysis, Diabetes Mellitus – Blood Sugar analysis and glucose tolerance test.

#### UNIT III **PROTEINS**

Proteins: Definition, classification, architecture, biological functions; Classification of amino acids, Oxidative and non oxidative deamination, transamination, decarboxylation, urea cycle, Purification of proteins.

#### **UNIT IV** LIPIDS

Lipids: Definition, classification, biological functions; biosynthesis of long chain fatty acids, degradation of fatty acids - oxidation of fatty acids.

#### METHODS OF INVESTIGATION OF METABOLISM UNIT V (9)

# (9)

3003

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Liver function tests, Real function tests, Gastric function tests. Diagnostic tools: Principles and applications of photometry, spectrophotometry, flurometry, flame photometry, automation in clinical laboratory. Uses of isotopes in biochemistry.

#### **TEXT BOOKS**

#### Total: 45

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
		Fundamentals of	Karthick	
1	. Ambiga Shanmugam	Biochemistry for	Printers,	1997
		Medical Students	Madras	

#### **REFERENCE BOOKS**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Lehninger.A .L., Nelson D.L., Cox .M.M.,	Principles of Biochemistry	CBS Publications	1993
2	Varley	Clinical Biochemistry	CBS Publications	1988

#### 17BEBME306

#### ANATOMY AND HUMAN PHYSIOLOGY 3003100

#### **OBJECTIVE**

The goal of this course is for students

- To provide the students a basic understanding of the structure and function of the human body.
- To perceive structure and functions of the various types of systems of human body.
- To outline about eye, ear and Endocrine glands of human
- To learn organs and structures involving in system formation and functions.
- To understand all systems in the human body.
- To infer basic understanding of the interconnection of various organ systems in human body

#### INTENDED OUTCOMES

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

- Explain basic structure and functions of cells and its organelles
- Demonstrate about anatomy and physiology of various organ systems
- Illustrate eye, ear and Endocrine glands of human
- Explain the interconnect of various organ systems in human body
- Enlighten organs and structures involving in system formation and functions.
- Elucidate special senses in the human body.

#### UNIT I

Structure of Cell – Organelles and description – Function of each component of the cell – Membrane potential – Action Potential – Generation and Conduction – Electrical Stimulation. Blood Cell – Composition – Origin of RBC – Blood Groups – Estimation of RBC, WBC and Platelet.

#### UNIT II

#### CARDIAC AND NERVOUS SYSTEM

CELL

Heart, Major blood vessels – Cardiac Cycle – ECG – Blood Pressure – Feedback Control for Blood Pressure – Nervous Control of Heart - Cardiac output – Coronary and Peripheral Circulation – Structure and function of Nervous tissue – Neuron - Synapse - Reflexes -Receptors -Brain -Brainstem -Spinal cord – Reflex action – Velocity of Conduction of Nerve Impulses - Electro Encephalograph – Autonomic Nervous System.

#### UNIT III RESPIRATORY SYSTEM AND MUSCULO SKELETAL SYSTEM (9) Physiological aspects of respiration – Trachea and lungs – Exchange of gases – Regulation (9)

Physiological aspects of respiration – Trachea and lungs - Exchange of gases – Regulation of Respiration - Disturbance of respiration function - Pulmonary function test - Muscles - tissue - types - structure of skeletal muscle - types of muscle and joints.

# UNIT IV DIGESTIVE AND EXCRETORY SYSTEM (9)

Organisation of GI System, Digestion and absorption – Movements of GI tract – Intestine - Liver - Pancreas - Structure of Nephron – Mechanism of Urine formation – Urine Reflex – Skin and Sweat Gland – Temperature regulation.

#### UNIT V

#### EYE, EAR, ENDOCRINE GLANDS

(9)

Optics of Eye – Retina – Photochemistry of Vision – Accommodation - Neurophysiology of vision – EOG. Physiology of internal ear – Mechanism of Hearing – Auditory Pathway, Hearing Tests - Endocrine glands.

#### Total: 45

#### **TEXT BOOKS**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Sarada Subramanyam, K.Madhavan Kutty and H.D.Singh	Text Book of 'Human Physiology	S.Chand & Company	1996
2	Ranganathan, T.S	Text Book of Human Anatomy	S.Chand &Co. Ltd., Delhi	1996

#### **REFERENCE BOOKS**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Tobin, C.E.,	Basic Human Anatomy	McGraw-Hill Publishing Co. Ltd.,	1997
2	J.Gibson	Modern Physiology and Anatomy for Nurses	Blackwell SC Publishing	1981
3	Arthur.C.Guyton	John E Hall – ,Textbook of Medical Physiology	W.B. Saunders Company	2000

#### 17BEBME311 CIRCUITS AND DEVICES LABORATORY 0 0 3 2 100

The goal of this course is for students :

- To analyze the Biasing network for BJT and FET, transient analysis and frequency response of BJT and FET in single stage and Oscillator
- To develop the ability to analyze and design analog electronic circuits using discrete components.
- To outline the amplitude and frequency responses of electronic circuits
- To simplify the operation of Oscillators and wave form generators.
- Understand the specifications of power supply circuits.
- To understand the concept of AC to DC conversion

#### **COURSE OUTCOME:**

Upon completion of this course, the student will be able to:

- Utilize the fundamental concepts of electronic devices
- Build basic electronic circuits with BJT and FET
- Deduct the circuit defects
- Design oscillator circuits
- Understand wave shaping concepts
- Demonstrate halfwave and full wave rectifier.

#### LIST OF EXPERIMENTS:

- 1. Characteristics of PN diode
- 2. Characteristics of Zener diode
- 3. Input and Output Characteristics of BJT
- 4. Drain and transfer characteristics of JFET
- 5. Design of Current series feedback amplifier
- 6. Design of RC coupled amplifier
- 7. Hartley Oscillator
- 8. Colpitt Oscillator
- 9. Astable Multivibrator
- 10. Clippers and Clampers
- 11. Half wave rectifier- with and without filter
- 12. Full wave rectifier with and without filter

#### 17BEBME312 BIOCHEMISTRY AND HUMAN PHYSIOLOGY LAB 0 0 3 2 100

#### **Course Objectives**

The goal of this course is for students

- To estimate and quantify biomolecules.
- To divide amino acid molecules
- To evaluate and interpret of biochemical parameter
- To understand differential count of WBCs
- To understand the Ishihara chart
- To understand the auditory conduction

#### **COURSE OUTCOMES:**

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

- Solve the quantitative test of different biomolecules
- Label the separation technology of proteins and aminoacids.
- Blood group identification
- Estimate of blood glucose
- Estimaten of Hemoglobin
- Perceive the Biochemistry laboratory functional parameters

#### LIST OF EXPERIMENTS:

- 1. General tests for carbohydrates, proteins and lipids.
- 2. Preparation of serum and plasma from blood.
- 3. Estimation of blood glucose.
- 4. Estimation of serum cholesterol.
- 5. Assay of SGOT/SGPT.
- 6. Estimation of creatinine in urine.
- 7. Electrophoresis of serum proteins.
- 8. Separation of amino acids using thin layer chromatography.
- 9. ESR, PCV, MCH, MCV, MCHC, total count of RBCs and Hemoglobin estimation
- 10. Differential count of different WBCs and Blood group identification

11. Ishihara chart for color blindness and Snellen's chart for myopia and hyperopia – by letters reading and opthalmoscope to view retina.

12. Weber's and Rinnee's test for auditory conduction.

#### **TOTAL: 60**

#### 17BEBME351 SOFT SKILLS FOR BIOMEDICAL ENTREPRENEURS 100-100

#### **Course Objectives :**

- To encourage the all round development of students by focusing on soft skills.
- To make the engineering students aware of the importance, the role and the content of soft skills
- To give instruction, knowledge acquisition, demonstration and practice on soft skills
- To develop and nurture the soft skills of the students through individual and group activities.
- To expose students to right attitudinal and behavioural aspects
- To build the right attitudinal through activities

#### **Course Outcomes:**

On completion of the course, student will be able to

- Effectively communicate through verbal/oral communication and improve the listening skills
- Write precise briefs or reports and technical documents .
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams
- Handle team work, Inter-personal relationships, conflict management and leadership quality.

People skills – social skills – communication skills – character traits – attitudes – career attributes – emotional intelligence coefficient – common sense – cognitive or emotional empathy– interpersonal skills – courtesy – flexibility – integrity – interpersonal skills – positive attitude – professionalism – responsibility – team work – work ethics.

**TOTAL: 15** 

#### 17BEBME401 OBJECTIVES: OBJECTIVES:

- This course aims at providing the required skill to apply the statistical tools in Engineering problems.
- To introduce the basic concepts of probability.
- To introduce the basic concepts of random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To understand the notion of sampling distributions and statistical techniques
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

### **COURSE OUTCOMES:**

- Explain the fundamental concepts of probability and standard distributions which can describe real life phenomenon.
- Explain the basic concepts of one- and two-dimensional random variables and their applications in engineering.
- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- Discuss the notion of sampling distributions and statistical techniques used in engineering and management problems.
- Discuss about the techniques in quality control that model engineering problems.

#### UNIT I RANDOM VARIABLES

Discrete and continuous random variables Properties Moments Moment generating functions and their properties. Binomial, Poisson ,Geometric, Negative binomial, Uniform, Exponential, Gamma, and Weibull distributions.

#### UNIT II TWO DIMENSIONAL RANDOM VARIABLES

Joint distributions Marginal and conditional distributions Covariance Correlation and Regression – function of a random variable Transformation of random variables – Central limit theorem.

#### UNIT- I PROBABILITY

Probability – Definition – Law - conditional probability-Bayes theorem- Probability mass function - Probability density functions.

#### UNIT- II RANDOM VARIABLES

Introduction to one dimensional random variables – Discrete – Continuous - Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Regression.

#### UNIT- III TESTING OF HYPOTHESIS

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions – Tests for independence of attributes and Goodness of fit.

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#### UNIT – IV DESIGN OF EXPERIMENTS

 $Analysis \ of \ variance-one \ way \ classification-CRD-Two-way \ classification-RBD-Latin \ square.$ 

#### UNIT – V RELIABILITY AND QUALITY CONTROL

Concepts of reliability – hazard functions – Reliability of series and parallel systems – control charts for measurement ( $\overline{X}$  and R charts) - Control charts for attributes (p, c and np charts).

#### **REFERENCES:**

S. NO.	AUTHOR(	<b>S</b> )	TITLE OF T	HE		PUBL	ISH	IER		YEAR OF
	NAME		BOOK							PUBLICATION
1	P.S.S.Sundar	Rao	Introduction	to	Prentice	e Hall	of	India,	New	2012
	and J.Richard		Biostatistics	and	Delhi.					
			Research Metho	ods						
2	R.A.Johnson	and	Miller and Freu	nd's	Pearson	Educa	ntion	Asia,	New	2007
	C.B.Gupta		Probability	and	Delhi.					
			Statistics	for						
			Engineers							
3	S.C.Gupta	and	Fundamentals	of	Sultan	Chand	&	Sons,	New	2007
	V.K.Kapoor		Applied Statisti	cs	Delhi					

#### WEBSITES:

- 1. <u>www.cut-theknot.org/probability.shtml</u>
- 2. www.mathcentre.ac.uk
- 3. <u>www.mathworld</u>.

Total: 60

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#### **UNIT I OPERATIONAL AM PLIFIER CHARACTERISTICS** (9)

Op amp symbol, terminals, packages and specifications - Block diagram Representation of op-amp-Ideal op amp & practical op amp - Open loop & closed loop configurations – DC & AC performance characteristics of op-amp – Frequency compensation - Noise – Differential amplifiers -Electrical Characteristics and internal schematic of 741 op - amps.

#### UNIT II OPAMP APPLICATIONS

Basic op-amp circuits: Inverting & Non-inverting voltage amplifiers -Voltage follower -Summing, scaling & averaging amplifiers - AC amplifiers.Linear Applications: Instrumentation Amplifiers-V-to-I and I-to-V converters-Differentiators and Integrators. Non-linear Applications: Precision Rectifiers – Wave Shaping Circuits (Clipper and Clampers) – Log and Antilog Amplifiers – Analog voltage multiplier circuit and its applications - Comparators and its applications.

#### UNIT III WAVEFORM GENERATORS AND PLL

Waveform Generators: Sine-wave Generators – Square / Triangle / Sawtooth Wave generators. IC 555 Timer: Monostable operation and its applications, Astable operation and its applications P LL: Operation of the Basic P LL-Closed loop analysis of P LL-Voltage Controlled Oscillator-PLL Applications

#### UNIT IV ACTIVE FILTERS & VOLTAGE REGULATOR

Filters: Comparison between Passive and Active Networks-Active Network Design – Filter Approximations-Design of LPF, HPF, BPF and Band Reject Filters – State Variable Filters Voltage Regulators: Basics of Voltage Regulator – Linear Voltage Regulators using Op-amp – IC Regulators (78x x, 79xx, LM 317, 723)-Switching Regulators.

#### UNIT V DATA CONVERSION DEVICES

Digital to Analog Conversion: DAC Specifications – DAC circuits – Weighted Resistor DAC-R-2R Ladder DAC- Inverted R-2R Ladder DAC Monolithic DAC Analog to Digital conversion: ADC specifications-ADC circuits-Ramp Type ADC-Successive Approximation ADC-Dual Slope ADC-Flash Type ADC.

(9)

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3003

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#### 17BECC402

3002

#### **OBJECTIVES**

The goal of this course is for students :

- To discuss the basic concepts of linear integrated circuits
- To study the circuit configuration and introduce practical applications of linear integrated circuits.
- To introduce the concept of Passive and Active filters
- To infer the theory and applications of PLL
- To make use of the theory of ADC and DAC using OP AMPS
- To demonstrate the concepts of waveform generation and introduce some special function ICs

#### **INTENDED OUTCOMES:**

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

- Define linear and non linear applications of OP AMPS
- Create waveforms using OP AMP Circuits
- Ability to design new analog linear circuits and develop linear IC based Systems.
- Understand the concept of application of waveform generators
- Design ADC and DAC using OP AMPS
- Analyze special function ICs

#### UNIT I OPERATIONAL AM PLIFIER CHARACTERISTICS (9)

Op-amp - Block diagram Representation of op-amp- Open loop & closed loop configurations – DC & AC performance characteristics of op-amp – Frequency compensation - Noise – Differential amplifiers -Electrical Characteristics and internal schematic of 741 op - amps.

#### UNIT II

#### **OPAMP APPLICATIONS**

(9)

(9)

Inverting & Non-inverting voltage amplifiers -Voltage follower –Summing & averaging amplifiers - AC amplifiers, Instrumentation Amplifiers-V-to-I and I-to-V converters-Differentiators and Integrators. Wave Shaping Circuits - Clipper and Clampers–Comparators and its applications.

#### UNIT III WAVEFORM GENERATORS AND PLL

Waveform Generators: Sine-wave Generators – Square / Triangle / Sawtooth Wave generators. IC 555 Timer: Monostable operation and its applications, Astable operation and its applications P LL: Operation of the Basic P LL-Closed loop analysis of P LL-Voltage Controlled Oscillator-PLL Applications

### UNIT IV ACTIVE FILTERS & VOLTAGE REGULATOR (9)

Filters: Passive and Active Networks – Filter Approximations-Design of LPF, HPF, BPF and Band Reject Filters, Voltage Regulators: Basics of Voltage Regulator – Linear Voltage Regulators using Op-amp – IC Regulators (78x x, 79xx, LM 317, 723)-Switching Regulators.

# UNIT VDATA CONVERSION DEVICES(9)DAC circuits: Weighted Resistor DAC, R-2R Ladder DAC- Inverted R-2R Ladder DAC MonolithicDAC; Analog toDigital conversion: RampType ADC-Successive Approximation ADC-Dual

# **TEXT BOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Roy Choudhur y and Shail Jain	Linear Integrated Circuits	New Age International Publishers	2003
2	Ramakant A.Ga yakwad	Op-Amps and Linear Integrated Circuits	Prentice Hall of India, New Delhi	2000

# **REFERENCES:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Robert F. Coughlin, Frederick F. Driscoll	Operational- Amplifiers and Linear Integrated Circuits	Prentice Hall of India, New Delhi	2001
2	Sergio Franco	Design with operational amplifier and analog integrated circuits	McGraw Hill	2015

#### **OBJECTIVES**

The goal of this course is for students

- To define the basic concepts such as generalized instrumentation system, general properties of input transducers, static and dynamic characteristics of transducers and sensors
- To perceive a thorough understanding of principle of sensors
- To know the principle of transduction, classifications and the characteristics of different transducers
- To create the biomedical applications of the transducers and sensors.
- To discuss working of some of the above transducers and sensors.
- To know the different display and recording devices.

#### **INTENDED OUTCOMES**

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

- Have a clear understanding of generalized medical instrumentation system, general properties of input transducers, static and dynamic characteristics of transducers and sensors.
- Demonstrate various transducers and sensors in the course.
- Describe the purpose and methods of measurements.
- Explain the principle of different sensors and its applications
- Apply the transducers and sensors learnt in the course in suitable medical contexts.
- Implement working knowledge of some of the transducers and sensors

#### UNIT I INTRODUCTION TO TRANSDUCERS AND ITS CHARACTERISTICS (10)

Introduction: Generalized Instrumentation System, General Properties of Input Transducer Static Characteristics: Accuracy, Precision, Resolution, Reproducibility, Sensitivity, Drift, Hysteresis, Linearity, Input Impedance and Output Impedance. Dynamic Characteristics: First Order and Second Order Characteristics, Time Delay, Error Free Instrument, Transfer Functions. Design Criteria, Generalized Instrument Specifications.

#### UNIT II

#### MEASUREMENTS

Displacement, motion and Pressure Measurement: (with applications) Resistive: Potentiometers, Strain Gauges and Bridge Circuits. Inductive: Variable Inductance and LVDT Capacitive type, Piezoelectric Transducers. Types of Diaphragms, Bellows, Bourdon Tubes.

#### UNIT III

#### THERMAL MEASUREMENTS

Temperature Measurement: Thermistor, Thermocouple, Resistive Temperature Detector, IC based Temperature Measurement, Radiation Sensors and Applications

**ELECTRODES** 

#### UNIT IV

Biopotential Electrodes: Electrodes Electrolyte Interface, Half-Cell Potential, Polarization, Polarizable and Non Polarizable, Electrodes, Calomel Electrode, Electrode Circuit Model, Electrode Skin-Interface and Motion Artifact. Body Surface Electrodes. Internal Electrodes: Needle and Wire Electrodes (Different Types). Microelectrodes: Metal, Supported Metal Micropipette (Metal Filled Glass And Glass Micropipette Electrodes)

#### BIOSENSORS

(11)

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Chemical Sensors: Blood gas and Acid- Base Physiology Potentiometric Sensors, Ion Selective Electrodes, ISFETS. Amperometric Sensors, Clark Electrode with examples - pH, pO2, pCO2 Electrodes, Transcutaneous Arterial Oxygen Tension, Carbon Dioxide measurements: capnostat. Fiber Optic Sensors: Design Principles in Fabrication of Fiber Optic Sensors - Temperature, Chemical, Pressure. Biosensor: Classifications: Biological phenomenon, Transduction Phenomenon i.e. Enzyme Sensor and Electrode based: Affinity Sensors (Catalytic Biosensors), Two examples of each Biosensors and Immunosensors.

#### Total: 45

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Richard S.C. Cobbold	Transducers for Biomedical Measurements: Principles and Applications	John Wiley & Sons	1974
2	Hermann K P. Neubert	Instrument Transducer – An Intro to their performance and	Hermann K P. Neubert	2000
3	Harry N, Norton.	Biomedical sensors – fundamentals and application	Harry N, Norton.	2001
4	Tatsuo Togawa, Toshiyo Tamma and P. Ake Öberg	Biomedical Transducers and Instruments	Tatsuo Togawa,	1994
5	Nandini K	Electronics in Medicine and Biomedical Instrumentation	Jog PHI Second Edition	2013

#### **TEXT BOOKS:**

#### **REFERENCE BOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	La Geddes and L.E. Baker	Principles of applied Biomedical Instrumentation	La Geddes and L.E. Baker	1997
2	Leslie Cromwell, Fred. J. Weibell and Pfeiffer	Biomedical instrumentation and measurement	Leslie Cromwell, Fred. J. Weibell and Pfeiffer	2002
3	Richard Aston	Principles of Biomedical Instrumentation and Measurement	Merril Publishing Co., Columbus	1990
4	Ernest O. Doeblin	Measurement Systems, Application and Design	McGraw-Hill	1985
5	Jacob Fraden	Handbook of Modern Sensors – Physics, Design and Application	AIP press	2000

#### **OBJECTIVES:**

The goal of this course is for students :

- To infer processor architecture and its programming
- To discuss interfacing concepts •
- To appraise advanced processor architecture
- To utilize the concepts of Interfacing with Peripherals for building applications
- To demonstrate the concepts Reduced Instruction Set Computer (RISC) architecture and Advanced RISC Machine (ARM) architecture
- To develop skill to explore system design technique.

#### **OUTCOMES:**

Upon Completion of this course students will demonstrate the ability to:

- Design assembly language programming (ALP) for different applications for 8085
- Compile assembly language programming (ALP) for different applications for 8086
- Perceive knowledge on advanced processors and controllers
- Create application by Interfacing memory and I/O device with controllers
- Demonstrate the architectures of Reduced Instruction Set Computer (RISC) and Advanced RISC Machine (ARM) processors
- Design and deploy the Interfacing peripherals in real time scenario.

#### UNIT -I THE 8085 MICROPROCESSOR

Introduction to 8085 - Microprocessor architecture - Instruction set - Programming the 8085 - Code conversion.

# UNIT II

**THE 8086 MICROPROCESSOR** Introduction to 8086 - Microprocessor architecture - Addressing modes - Instruction set and assembler directives - Assembly language programming - Modular Programming - Interrupts and interrupt service routines – Byte and String Manipulation.

#### **UNIT III I/O INTERFACING**

Memory Interfacing and I/O interfacing - Parallel communication interface - Serial communication interface - D/A and A/D Interface - Timer - Keyboard /display controller - Interrupt controller -DMA controller - Programming and applications Case studies: Traffic Light control, LED display, LCD display, Keyboard display interface and Alarm Controller.

#### **UNIT IV** MICROCONTROLLER

Architecture of 8051 - Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

#### UNIT V INTERFACING MICROCONTROLLER

Programming 8051 Timers - Serial Port Programming - Interrupts Programming - LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.

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#### **TEXT BOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Yu-Cheng Liu, Glenn A.Gibson	Microcomputer Systems: The 8086 / 8088 Family Architecture, Programming and Design	Second Edition, Prentice Hall of India	2007
2	Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin	The 8051 Microcontroller and Embedded Systems: Using Assembly and C	Second Edition, Pearson education	2011

#### **REFERENCE:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Doughlas V.Hall	Microprocessors and Interfacing, Programming and Hardware	ТМН	2012

#### **OBJECTIVE**

#### The goal of the course is to:

- To have an overview of structure of bio-materials and bio-compatibility
- To describe the principles of implant design with a case study
- To explain the implant design parameters and solution in use
- To study about various blood interfacing implants
- To study about soft tissue replacement and hard tissue replacement
- To learn about various implants

#### INTENDED OUTCOMES

Upon Completion of this course the student will be able to:

- Understand of structure of bio-materials and bio-compatibility
- Know the principles of implant design with a case study
- Explain the implant design parameters and solution in use
- Know about various blood interfacing implants
- Understand about soft tissue replacement and hard tissue replacement
- Know about various implants

#### UNIT I STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY (9)

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

#### UNIT II IMPLANT MATERIALS

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

#### UNIT III POLYMERIC IMPLANT MATERIALS

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

#### UNIT IV TISSUE REPLACEMENT IMPLANTS

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

#### UNIT V ARTIFICIAL ORGANS

Artificial Heart, Prosthetic Cardiac Valves, Artificial lung (oxygenateor), Artificial Kidney (Dialyzer membrane), Dental Implants.

Total: 45

#### 3003 100

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#### **TEXT BOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Sujata V. Bhatt	Biomaterials	Second Edition ,Narosa Publishing House	2005
2	Joon B.Park Joseph D. Bronzino	Biomaterials - Principles and Applications	CRC Press	2003

#### **REFERENCES:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	PARK J.B.,	Biomaterials Science and Engineering	Plenum Press	1984
2	Myer Kutz	Standard Handbook of Biomedical Engineering & Design	McGraw- Hill	2003
3	John Enderle, Joseph D. Bronzino, Susan M. Blanchard	Introduction to Biomedical Engineering	Elsevier	2005

#### 17BEBME411 MICROPROCESSOR & MICROCONTROLLER LABORATORY 0032 100

#### **OBJECTIVES:**

#### The student should be made to:

- To introduce ALP concepts and features
- To design and implement programs on 8085 microprocessor
- To write ALP for arithmetic and logical operations in 8086 and 8051
- To differentiate Serial and Parallel Interface
- To interface different I/Os with Microprocessors
- To be familiar with MASM

#### **OUT COMES:**

- Write ALP Programmes for fixed and Floating Point and Arithmetic operations
- Interface different I/Os with processor
- Generate waveforms using Microprocessors
- Execute Programs in 8051
- Use Serial and Parallel Interface
- Perform A/D and D/A conversion

#### LIST OF EXPERIMENTS:

#### 8085 Programs using kits

- 1. Basic arithmetic and Logical operations
- 2. Sorting and searching

#### 8086 Programs using kits

- 3. Basic arithmetic and Logical operations
- 4. Code conversion, decimal arithmetic and Matrix operations.
- 5. Floating point operations, string manipulations, sorting and searching

#### **Peripherals and Interfacing Experiments**

- 6. Traffic light control
- 7. Stepper motor control
- 8. Key board and Display
- 9. Serial interface and Parallel interface
- 10. A/D and D/A interface and Waveform Generation

#### 8051 Experiments using kits and MASM

- 11. Basic arithmetic and Logical operations
- 12. Code conversion

**TOTAL: 45**
### 17BEBME412SCIENTIFIC COMPUTING LABORATORY2 0 2 3100

#### **OBJECTIVES:**

- The objective of this course is to familiarize the students with statistical techniques.
- It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.
- To introduce students to numerical methods used to solve engineering problems.
- Fundamentals of numerical methods/algorithms to solve systems of different mathematical equations (e.g. linear/ non-linear algebraic equations, ordinary /partial differential equations), will be introduced.
- The course would enable students to write their own computer programs using programming languages like C and software like Excel.

#### **COURSE OUTCOMES:**

- To solve engineering problems involving Linear and non-linear equations.
- Hands-on experience will be provided to apply these computer programs to solve problems in different areas of engineering.
- To acquire skills in handling situations involving linear/ non-linear algebraic equations, ordinary /partial differential equations
- To solving actual engineering problems through computer programming and coding.
- To solve ordinary and partial differential equations using programming languages like C and software like Excel.
- Student will understand procedure-oriented Excel concepts. Student will be capable of writing C and Excel programs efficiently.

#### LIST OF EXPERIMENTS

- 1. Solution of Transcendental equation
  - i) Newton Raphson Method
  - ii) Bisection method
  - iii) Iterative method by reducing the equation to the form x = f(x)
- 2. Solution of algebraic simultaneous equations
  - i) Gauss Jacobi method
  - ii) Gauss Seidel method
- 3. Numerical integration
  - i) Gauss 2 point and 3 point formulae
  - ii) Trapezoidal method
  - iii) Simpson's 1/3 rule
- 4. Solution of initial value problems governed by ODE
  - i) Runge Kutta 4<sup>th</sup> order method
  - ii) Modified Euler's method
  - iii) Milne's method

iv) Adam – Bashforth method

## 5. Solution of BVP governed by PDE

- i) Laplace Equation
- ii) One dimensional heat equation
  - a) Explicit method : Bender Schmidt's method
  - b) Implicit method : Crank Nicolson's method
- iii) One dimensional wave equation Implicit method

#### **REFERENCES:**

<b>S.</b>	Author(s) Name	Title of the book	Publisher	Year of
No.				Publication
1	Steven C. Chapra,	Numerical Methods	McGraw - Hill Pub. Co.	2014
	Raymond P.	for Engineers	Ltd	
	Canale			
2	Curtis F. Gerald	Applied Numerical	Pearson Education, South	2009
	and Patrick O.	Analysis	Asia	
	Wheatley			

#### **COURSE OBJECTIVES:**

The goal of this course is for students,

- To discuss working principle of op-amp.
- To experiment with basic functions of multivibrators
- To make use of Oscillators.
- To understand the concept of timer circuit
- To analyse timing characteristics of IC555
- To understand about PLL

#### **COURSE OUTCOMES:**

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

- Interpret the characteristics of amplifier
- Illustrate the importance of the sensors and transducers for medical applications.
- Analyse the characteristics frequency filter
- Distinguish amplifier and Oscillator
- Design dc power supply
- Design and Simulate the various frequency filters

#### LIST OF EXPERIMENTS

- 1. Inverting, Non-inverting and differential amplifiers.
- 2. Integrator and Differentiator.
- 3. Instrumentation amplifier.
- 4. Active lowpass, highpass and Bandpass filter.
- 5. Astable, Monostable multivibrators and Schmitt Trigger using op-amp.
- 6. Phase shift and Wienbridge oscillator using op-amp.
- 7. Astable and Monostable using NE555 Timer.
- 8. PLL characteristics and Frequency Multiplier using PLL.
- 9. Study of DC power supply using LM317and LM723 and SMPS control ICSG 3524/SG3525.
- 10. Simulation of Experiments 1, 2, 3, 4, 5 using PSpice / MultiSim

#### 17BEBME451 HANDS ON TRAINING IN ELECTRONIC EQUIPMENTS 001 100

#### **OBJECTIVE:**

- To gain the knowledge on various electronic equipments
- To learn the working principle of voltmeter
- To learn the working principle of digital voltmeter
- To discuss the working principle of Ammeter
- To distinguish analog multimeter digital multimeter
- To understand the operation of function generator

#### **OUTCOME:**

- Understand the working of various electronic equipments
- Analyse the operations of voltmeter and Ammeter
- Use RLC meter and LCR meter
- Understand the applications of EMF meter
- handle analog multimeter digital multimeter
- Demonstrate the operation of function generator

Study of Voltmeter – Ammeter – ohmmeter – capacitance meter – regulated power supply – oscilloscope – function generator – time-domain reflectometer – digital voltmeter – digital counter – Analog multimeter & Digital multimeter – Signal injector – RLC meter – LCR meter – EMF meter – Electrometer – AC and DC Power Supplies – digital pattern generator – pulse generator – Frequency synthesizer – probes – IEEE electronic equipment standards.

**17BEBME452** 

Healthcare Industrial Internship-I0 0 1100

#### 17BEBME501

#### **BIO CONTROL SYSTEM**

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#### **COURSE OBJECTIVES:**

#### The goal of the course is to:

- To study system concept and different mathematical techniques applied in analyzing any given system
- To learn to do the analysis of given system in time domain and frequency domain
- To study the techniques of plotting the responses in both domain analysis
- To apply these analysis to study the biological systems
- To introduce students to the various bio control systems
- To equip the students with necessary knowledge on analysis and design parameters.

#### **COURSE OUTCOME:**

#### Upon completion of this course the student will be able to:

- Knowledge about the application of various mathematical techniques in designing a bio control system
- Ability to create simple models of the physiological system
- Design biomedical control systems
- Know the various order of control system and design system accordingly
- To learn to do the analysis of given system in time domain and frequency domain •
- To learn to do the analysis of given system in time domain and frequency domain

#### UNIT I INTRODUCTION TO BIO CONTROL SYSTEM

Introduction: Technological control system, transfer function, mathematical approaches, system stability, introduction to biological control system, Modeling and block diagram, closed loop dynamics of first order and second order control system, similarities between biological and engineering control system, biological receptors and receptor characteristics.

#### UNIT II

#### **PROCESS REGULATION**

Acid-base balance, extra-cellular water and electrolyte, interstitial fluid volume, blood pressure, blood glucose, CO2.

#### UNIT III MODELING OF HUMAN THERMAL REGULATORY SYSTEM (9)

Parameters involved, control system model etc. Biochemistry of digestion, types of heat loss from body, models of heat transfer between subsystems of human body like skin - core etc. and systems like within body, body environment.

#### UNIT IV

#### **BIOLOGICAL CONTROL I**

Cardiac rate, blood pressure, respiratory rate, mass balancing of lungs, oxygen uptake by RBC and pulmonary capillaries, oxygen and carbon dioxide transport in blood and tissues.

#### UNIT V

#### **BIOLOGICAL CONTROL II**

Urine formation and control, Pupil control systems, skeletal muscle servomechanism and semicircular canal. Free swinging limbs, Endocrine control system.

Total: 45

#### **TEXT BOOKS**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Sujit K.Chaudhuri	Concise Medical Physilogy	New Central Book agency	1997
2	Ogata Katsuhika	Modern control engineering	2nd edition, Prentice Hall of India	_

## **REFERENCE BOOKS**:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Barry R. Dworkin	Learning and Physiological Regulation (Hardcover)	University Of Chicago Press	March 1993
2	E. Carson, E. Salzsieder	Modelling and Control in Biomedical Systems 2000 (including Biological Systems)	Pergamon Publishing	January 2001

3003

#### **OBJECTIVE:**

The goal of this course is for students:

- To illustrate origin of bio potentials and its propagations
- To understand the basic theory of Bio potential Electrodes and Bio potential measurement.
- To appraise the different types of electrodes and its placement for various recordings
- To design bio amplifier for various physiological recordings
- To study the various bio chemical measurements.
- To perceive the different measurement techniques for non-physiological parameters.

#### **INTENDED OUTCOMES:**

Upon completion of this course, the student will be able to:

- Differentiate different bio potentials and its propagations.
- Describe the electrode behaviour and circuit models
- Illustrate different electrode placement for various physiological recordings
- Design bio amplifier for various physiological recordings
- Explain various technique for non-electrical physiological measurements
- Measure various biochemical parameters.

#### UNIT I BIO POTENTIAL ELECTRODES

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

#### UNIT II ELECTRODE CONFIGURATIONS

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

#### UNIT III BIO AMPLIFIER

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

#### UNIT IV MEASUREMENT OF NON-ELECTRICAL PARAMETER

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

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#### UNIT V BIO-CHEMICAL MEASUREMENT

Biochemical sensors - pH, pO2 and pCo2, Ion selective Field effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors - Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

#### 17BEBME502

## MEDICAL INSTRUMENTATION 3003 100

#### **OBJECTIVE**

The goal of this course is for students:

- To illustrate origin of bio potentials and its propagations
- To understand the basic theory of Bio potential Electrodes and Bio potential measurement.
- To appraise the different types of electrodes and its placement for various recordings
- To design bio amplifier for various physiological recordings
- To study the various bio chemical measurements.
- To perceive the different measurement techniques for non-physiological parameters.

#### **INTENDED OUTCOMES**

Upon completion of this course, the student will be able to:

- Differentiate different bio potentials and its propagations.
- Describe the electrode behavior and circuit models
- Illustrate different electrode placement for various physiological recordings
- Design bio amplifier for various physiological recordings
- Explain various technique for non-electrical physiological measurements
- Measure various biochemical parameters.

#### UNIT I BIO POTENTIAL ELECTRODES (9) Origin of bio potential and its propagation. Electrode-electrolyte interface, electrode-skin interface, half-

cell potential, impedance, polarization effects of electrode – nonpolarizable electrodes. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits.

### UNIT II ELECTRODE CONFIGURATIONS (9)

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

#### UNIT III BIO AMPLIFIER

Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. Transformer and optical isolation - isolated DC amplifier and AC carrier amplifier. Chopper amplifier.

#### UNIT IV MEASUREMENT OF NON-ELECTRICAL PARAMETER (10)

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

## UNIT VBIO-CHEMICAL MEASUREMENT(9)Biochemical sensors - pH, pO2 and pCo2, Ion selective Field effect Transistor (ISFET),Immunologically sensitive FET (IMFET), Blood glucose sensors - Blood gas analyzers, colorimeter,flame photometer, spectrophotometer, blood cell counter, auto analyzer

#### **TOTAL : 45**

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S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	Joseph J. Carr and John M. Brown	Introduction to Biomedical Equipment Technology	Pearson Education	2004
2	John G. Webster	Medical Instrumentation Application and Design	John Wiley and sons	2004

#### TEXT BOOKS

#### REFERENCES

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Leslie Cromwell	Biomedical Instrumentation and	Prentice hall of India, New Delhi	2007
2	Khandpur R.S	Handbook of Biomedical Instrumentation	Tata McGraw-Hill, New Delhi	2003

3	Myer Kutz	Standard Handbook of Biomedical Engineering &	McGraw-Hill	2003
		Design		

<b>17BEBME5</b>	)3
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#### BIOMEDICAL SIGNAL PROCESSING 3003 100

#### **OBJECTIVE**

The goal of this course is for students:

- To study the characteristics of different biosignals
- To learn linear and non-linear filtering techniques to extract desired information
- To analyse the characteristics of some of the most commonly used biomedical signals, including ECG, EEG, EOG, and EMG.
- To perceive choice of filters to remove noise and artifacts from biomedical signals.
- To apply established engineering methods to analyse ECG signal problems.
- To discuss established engineering methods to analyse neurological signals.

#### **INTENDED OUTCOME**

UNIT I

Upon completion of this course, the student will be able to:

- Design different types of biomedical signals and identify their spectral components.
- Utilize different filters on biomedical signals and judge filter performance.
- Identify physiological interferences and artifacts affecting ECG signal.
- Assess power and correlation spectra of EEG signal.
- Analyze biosignals in time and frequency domains.
- Perform classification and recognition Biosignals

## DISCRETE – TIME SIGNALS AND SYSTEMS

Sampling of Analogue signals – aliasing – standard discrete time signals – classification – discrete time systems – Linear time invariant stable casual discrete time systems – classification

(9)

methods - linear and circular convolution - difference equation representation - DFS, DTFT, DFT – FFT computations using DIT and DIF algorithms.

#### **UNIT II INFINITE IMPULSE RESPONSE DIGITAL FILTERS** (9) Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain - Design of IIR digital filters using impulse invariance technique - Design of digital filters using bilinear transform – Realization using direct, cascade and parallel forms.

#### UNIT III FINITE IMPULSE RESPONSE DIGITAL FILTERS (9) Symmetric and Asymmetric FIR filters - Linear phase FIR filters - Design using Frequency sampling technique - Window design using Hamming, Hanning and Blackmann Windows -Realisation of FIR filters **UNIT IV ANALYSIS OF BIO – SIGNALS** (9)

Removal of artifacts-ECG, Event detection -ECG, P wave, QRS Complex, T wave, correlation analysis of ECG signals, Averaging of signals-PCG, ECG and EMG.

UNIT V **PROCESSING OF BIO SIGNALS** (9) Heart rate variability Analysis, Analysis of PCG signals, Analysis of Time variant systems, Fixed segmentation –STFT, ACF, SEM and GLR.

**Total : 45** 

#### **TEXT BOOKS**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	John G. Proakis and Dimitris G.Manolakis	Digital Signal Processing, Algorithms and Applications	PHI of India Ltd., New Delhi, 3rd Edition	2000
2	Rangaraj.M.Rangayya n	Biomedical signal processing	-	_

#### REFERENCES

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Sanjit K.Mitra	Digital Signal Processing', A Computer Based Approach	Tata McGraw-Hill, New Delhi	1998

## 17BECC504PROFESSIONAL ETHICS3 0 0 2100PRINCIPLES OF MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

#### **COURSE OBJECTIVES**

The goal of this course is for students:

- To develop managerial and entrepreneurial skills our culture and ethics
- To Distinguish Direct and Preventive Control
- To perceive Knowledge on the principles of management is essential for all kinds of people in all kinds of organisations
- To have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling
- To create an awareness and practice through engineering ethics and human values
- To outline how business ethics works

#### **COURSE OUTCOMES**

Upon completion of this course, the student will be able to:

- Advanced philosophical knowledge of the profession of recreation and leisure
- Synthesis of trends and issues as related to current professional practice
- Evaluate organizational theories and human resource management principles
- Analyse the information competency
- Follow Ethical practice and ethical management
- Understand Models of Professional Roles

#### **ENGINEERING ETHICS**

Senses of 'Engineering Ethics' – variety of moral issued – 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.

#### FACTORS OF CHANGES

Forces that shape culture, social control – Meaning, Agencies, Institution, Customs, Values, Folkways, Norms and Laws.Social changes – Meaning and nature – Theories.

UNIT III HISTORICAL DEVELOPMENT, PLANNING, ORGANISING 9 Definition of Management – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies and Planning Premises– Forecasting – Decision–making – Formal and informal organization – Organization Chart –.

# UNIT IVDIRECTING AND CONTROLLING9Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of<br/>Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job<br/>Enrichment –Process of Communication – System and process of Controlling – Requirements for<br/>effective control – Control of Overall Performance – Direct and Preventive Control – Reporting

# UNIT VENTREPRENEURSHIP AND MOTIVATION9Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur –<br/>Entrepreneurship in Economic Growth– Major Motives Influencing an Entrepreneur – Achievement<br/>Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management,<br/>Entrepreneurship Development Programs – Need, Objectives.9

#### Total: 45

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Harold Kooritz and Heinz Weihrich	Essentials of Management	Tata McGraw Hill, New Delhi	2010
2	Khanka S.S	Entrepreneurial Development	S.Chand and Co. Ltd., NewDelhi	2006
3	Mike Martin and Roland Schinzinger	Ethics in Engineering	McGraw–Hill, NewYork	2005

#### TEXT BOOKS

#### REFERENCES

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Tripathy P.C and Reddy P.N	Principles of Management	Tata McGraw Hill, New Delhi	2008

#### UNIT I

**UNIT II** 

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2	Rabindra N Kanungo	Entrepreneurship and innovation	Sage Publications, New Delhi	1998
3	Charles E Harris, and Michael J Rabins	Engineering Ethics – Concepts and Cases	Wadsworth Thompson Learning, New Delhi	2013

#### WEB REFERENCES

- 1. http://www.managementstudyguide.com/taylor\_fayol.htm
- 2. http://tutor2u.net/business/gcse/people\_motivation\_theories.htm
- 3. http://lfkkb.tripod.com/eng24/gilliganstheory.html
- 4. http://www.developingeyes.com/five-types-of-entrepreneurs/

17BEBME5E	Professional Elective I	3003	100
17BEBME5E	Professional Elective II	3003	100

#### 17BEBME511BIOSENSORS AND TRANSDUCERS LAB0 0 3 2100

#### **OBJECTIVES:**

The goal of this course is for students,

- To discuss working principle of Transducers and various Biomedical sensors.
- To experiment with basic functions of Biosensors.
- To make use of different physiological signals.
- To discuss working principle of Transducers
- To experiment with basic functions of Biosensors.
- To make use of different physiological signals.

#### **INTENDED OUTCOMES:**

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

- Interpret the characteristics of various biosensors
- Illustrate the importance of the sensors and transducers for medical applications.
- Analyse the characteristics of physiological signals
- Measure skin temperature
- Perform data acquisition of physiological signals

• Choose the biosensors for relevant application

## LIST OF EXPERIMENTS

- 1. Study of Biological Sensors
- 2. Displacement measurement using LVDT
- 3. Characteristics of temperature sensors thermistor and RTD.
- 4. Characteristics of thermocouple
- 5. Characteristics of Flow Transducer
- 6. Characteristics of photo diodes, phototransistor
- 7. Characteristics of Piezoelectric Transducer.
- 8. Data acquisition of physiological signals
- 9. Measurement of skin temperature by both contact and non-contact method.
- 10. Study of the characteristics of capacitor level sensor for saline level measurement in a I-V set.

#### 17BEBME512 BIOMEDICAL INSTRUMENTATION & SIGNAL PROCESSING 0032 100 LAB

#### **COURSE OBJECTIVES:**

The goal of this course is for students:

- To discuss the working principle of Biomedical Instrumentation systems.
- To infer the basic acquisition techniques of bioelectric signals.
- To learn about Audiometer
- To understand the concept of Signal Averaging
- To analyse ECG signal
- To experiment with basic signal processing operations such as Linear Convolution, Circular Convolution, Auto Correlation, Cross Correlation and Frequency analysis in MATLAB

## **COURSE OUTCOMES:**

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

- Create coding for different convolution and correlation techniques.
- Develop preamplifiers and amplifiers for various bio signal recordings.
- Measure various non-electrical parameters using suitable sensors/transducers
- Perform biosignal Acquisition
- Analyse ECG signal
- Understand about SNR improvement

#### Laboratory Experiments:

- 1. Acquisition and recording of Electrocardiogram.
- 2. Acquisition of Electromyogram and determining conduction velocity.
- 3. Study of Audiometer and Air conduction thresholds testing; Plotting of Audiogram.
- 4. Study of Blood Pressure meter and Phonocardiograph.
- 5. Design and implementation of circuits with biomedical applications ( like QRS detector, ECG Amplifier, EMG .....etc)
- 6. Study and acquisition of PPG signals.
- 7. Spectral Modeling and Analysis of ECG Signals
- 8. Detection of QRS complex and heart rate measurement.
- 9. Auto-correlation and cross correlation of ECG signals.
- 10. Signal Averaging to improve the SNR.
- 11. Design of 50 Hz notch filter for ECG signal and display PSD.

17BEBME513

#### **Course Oriented project-III**

0 0 2 1 100

#### 17BECC551 FUNDAMENTALS OF MARKETING FOR BIO-MEDICAL 1 0 0 100 ENTREPRENEURS

#### **OBJECTIVE**

- To equip the students with requisite knowledge and skills
- To equip the students with right attitude necessary to provide effective leadership in a global environment.
- To develop competent management professionals with strong ethical values,
- To develop the students with capable of assuming a pivotal role in various sectors of the Indian Economy &Society, aligned with the national priorities.
- To develop proactive thinking so as to perform effectively in the dynamic socio-economic and business ecosystem.
- To harness entrepreneurial approach and skillsets.

#### **OUT COME**

- Competent managers with requisite knowledge, skills and right attitude
- Sustenance in globally competitive environment.
- Management professionals with pro-active thinking and Innovative approach
- Sensitive professionals with ethical values.
- Leaders with concern towards Nation and society at large
- Entrepreneurial approach and skillsets to contribute for socio-economic development

Basic table mannerism – common sense – public behaviour – attitude – genuinity & Uniqueness – roles and functions of marketing executives - Voice modulation - tone and phonetics – Market Analysis – telemarketing – E & Online Marketing – customer support and handling

#### **OBJECTIVE**

The goal of this course is for students:

- To study the formation of an image and its acquisition
- To introduce the use and application of transforms in image processing
- To explain the fundamentals of medical image acquisition, processing and storage.
- To discuss simple image enhancement techniques in Spatial and Frequency domain.
- To appraise the concepts of degradation function and restoration techniques.
- To apply image compression and recognition methods.

#### **INTENDED OUTCOMES**

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

- Explain the image fundamentals and mathematical transforms necessary for image processing.
- Illustrate the image enhancement techniques.
- Preprocess the image using filtering techniques
- Utilize image restoration procedures.
- Segment the region of interest in images.
- Apply the image compression procedures.

#### UNIT I DIGITAL IMAGE FUNDAMENTAL

Elements of digital image processing systems, Elements of Visual perception, Image sampling and quantization, – Some Basic relationships between pixels, Matrix and Singular Value representation of discrete images.

#### UNIT II IMAGE TRANSFORMS

2D DFT, Cosine, Sine Hadamard, Haar, Slant, KL transform and their properties.

#### UNIT III IMAGE ENHANCEMENT

Histogram – Modification and specification techniques, Enhancement by point processing Image smoothening, Image sharpening, generation of spatial masks from frequency domain specification, Homomorphic filtering, and color image processing.

#### UNIT IV IMAGE RESTORATIONAND RECONSTRUCTION OF MEDICAL IMAGES (9)

Image degradation models, Unconstrained and Constrained restoration, inverse filtering, Least mean square filter, Image reconstruction from projections – Radon transforms, Filter back projection algorithm, Fourier reconstruction of MRI Images.

#### UNIT V MEDICAL IMAGE COMPRESSION TECHNIQUES

Run length, Huffman coding, arithmetic coding, Pixel coding, transform coding, JPEG Standard, predictive techniques, Application of image processing techniques in thermography, SPECT, PET images.

#### TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication	
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1	Rafael C., Gonzalez and Richard E. Woods	Digital Image Processing	Pearson Education Asia	2001
2	Anil K. Jain	Fundamentals of Digital Image Processing	Prentice Hall of India	1997

#### **REFERENCE BOOKS**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	William K. Pratt	Digital Image Processing	John Wiley	1987

#### **17BEBME602**

#### **Course Objectives**

The goal of this course is for students

- To discuss heart lung machine and artificial heart
- To analyze some of the cardiac assist devices.
- To explain the need of artificial kidney
- To discuss about the prosthetic and orthodic devices.
- To summarize the need and use of some respiratory and hearing aids
- To explain Materials for Prosthetic and Orthodic devices.

#### **COURSE OUTCOMES:**

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

- Demonstrate about heart lung machine and artificial heart
- Explain about cardiac assist devices, its continuous monitoring and transmission
- Explain about prosthetic and orthodic devices
- Interpret the need and use of the extracorporeal devices.
- Discuss the types of deafness
- Analyse various materials for Prosthetic and Orthodic devices

#### UNIT I HEART LUNG MACHINE AND ARTIFICIAL HEART

Condition to be satisfied by the H/L system. Different types of oxygenators, pumps, pulse and continuous types, monitoring process, shunting, the indication for cardiac transplant, driving mechanism, blood handling system, functioning and different types of Artificial heart, mock test setup for assessing its functions.

#### UNIT II

#### **CARDIAC ASSIST DEVICES**

Synchronous counter pulsation, assisted through respiration right ventricular by-pass pump, left ventricular bypass pump, open chest and closed chest type, Principle and problems --Intra Aortic balloon pumping, Veno Arterial Pumping, Prosthetic Cardio Valves, Biomaterials for purposes, its characteristics and testing.

## UNIT IIIARTIFICIAL KIDNEY9

Indication and principle of Heamodyalisis, Membrane, Dialasate, different types of Heamodialisers, monitoring systems, wearable artificial kidney, implanting type.

#### UNIT IV PROSTHETIC AND ORTHODIC DEVICES

Hand and Arm replacement – Different Types of Models Externally Powered Limb Prosthesis Feedback in Orthodic System, functional Electrical Stimulation, Sensory Assist Devices, Materials for Prosthetic and Orthodic devices.

#### UNIT V RESPIRATORY AND HEARING AIDS

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Intermittent positive pressure, breathing apparatus operating sequence, electronic IPPB unit with monitoring for all respiratory parameters, audiograms, types of deafness, conductive and nervous, hearing aids, constructional and functional characteristics.

#### **REFERENCES:**

#### Total: 45

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Levine S.N.(Ed.)	Advances in Biomedical Engineering and Medical Physics	Inter University Publications, New York	1968
2	Kolff W.J.	Artificial Organs	John Wiley and Sons, New York	1979
3	Andreas.F. Von racum	"Hand book of Bio material Evaluation,"	Mc.Millan Publishers	1980
4	Albert M.Cook and WebsterJ.G.,	Therapeutic Medical Devices	Prentice Hall Inc., New Jersey	1992
5	R.S.Khandpur	Handbook of Biomedical Instrumentation	Tata McGraw Hill, 2nd Edition	2003

#### **17BEBME603 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT – I 3003** 100

#### **OBJECTIVES**

The goal of this course is for students:

- To perceive the medical devices applied in measurement of parameters related to cardiology, neurology and the methods of continuous monitoring and transmitting them.
- To analyze some of the cardiac assist devices. •
- To understand the principle of diathermy •
- To discuss about the measurement of the signals generated by muscles. •
- To summarize the need and use of some of the extracorporeal devices. •
- To learn the patient safety measures

#### OUTCOMES

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

- Utilize different medical devices applied in measurement of parameters related to cardiology, neurology
- Explain about cardiac assist devices, its continuous monitoring and transmission
- Measure signals generated by muscles •
- Analyze different types of diathermy units. •
- Identify the electrical hazards and Implement methods of patient safety •
- Interpret the need and use of the extracorporeal devices.

#### **UNIT I**

#### **CARDIAC EOUIPMENT**

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

#### **UNIT II**

#### NEUROLOGICAL EQUIPMENT

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

#### UNIT III SKELETAL MUSCULAR EQUIPMENT 9

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

#### PATIENT MONITORING AND BIOTELEMETRY **UNIT IV**

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

#### UNIT V **SPECIAL DIAGNOSTIC TECHNIQUES** 9 Principles technique application, Endoscopy, Lithotripsy, of Cryogenic and Laproscopy. Thermography – Recording and clinical application, ophthalmic instruments.

#### 9

## TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Khandpur R.S	Handbook of Biomedical Instrumentation	Tata McGraw Hill	2003

## **REFERENCES:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Myer Kutz	Standard Handbook of Biomedical Engineering & Design	Mc Graw Hill	2003
2	L.A Geddes and L.E.Baker	Principles of Applied Biomedical Instrumentation	Mc Graw Hill	2008
3	Leslie Cromwell	Biomedical Instrumentation and Measurement	Pearson Education, New	2007
4	Antony Y.K.Chan	Biomedical Device Technology, Principles and design	Charles ThomasPublisher Ltd	2008
5	Joseph J. Carr and John M. Brown	Introduction to Biomedical Equipment Technology	Pearson education	2004
6	John G.Webster	Medical Instrumentation Application and Design	John Wileyand Sons	2006

#### **17BECC604 HEALTHCARE & HOSPITAL MANAGEMENT** 3002

#### **OBJECTIVE**

The goal of this course is for students:

- To discuss the fundamentals of hospital administration.
- To learn about Bio-Medical Waste Management.
- To analyze the market related research process. •
- To summarize the quality and safety aspects in hospital.
- To perceive knowledge about human resource management in hospital
- To explain about hospital information systems

#### **INTENDED OUTCOMES**

Upon completion of this course, the student will be able to:

- Explain various information management systems and relative supportive services.
- Interpret market related research processes in healthcare and hospital sectors.
- Illustrate the quality and safety aspects in hospital.
- Demonstrate about human resource management in hospital
- Understand about NABH and NABL
- Explain the importance of supportive services

#### UNIT I HEALTH SYSTEM

Health organisation of the country, the state, the cities and the region, Health Financing System, Organisation of Technical Section.

#### UNIT II HOSPITAL ORGANISATION AND MANAGEMENT

Management of Hospital organisation, Nursing section Medical Sector, Central Services, Technical Department, Definition and Practice of Management by Objective, Transactional Analysis Human relation in Hospital, Importance to Team Work, Legal aspect in Hospital Management.

#### **UNIT III REGULATORY REQUIREMENT AND HEAITHCARE CODES**

FDA Regulation, joint commission of Accreditation for Hospitals, National Fire Protection Association Standard, IRPC.

#### UNIT IV EQUIPMENTMAINTENANCEMANAGEMENT

Organising Maintenance Operations, Paper Work Control, Maintenance Job, Planning Maintenance Work Measurement and Standards, Preventive Maintenance, Maintenance Budgeting and Forecasting, Maintenance Training, Contract Mainframe.

#### UNIT V TRAINEDTECHNICAL PERSONNEL

Function of Clinical Engineer, Role to be performed in Hospital, Manpower Market, Professional Registration, and Structure in hospital.

#### **REFERENCE BOOKS**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Cesar A.Caceres and Albert Zara	The practice of Clinical Engineering	Academic Press	1977

#### **Total : 45**

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2	Webster, J.G. and Albert M.Cook	Clinical Engineering Principles and Practices	Prentice Hall Inc. Englewood Cliffs	1979
3	Antony Kelly	Maintenance planning and control	Butterworths London	1984
4	Hans P feiff,Vera Dammann(Ed.)	Hospital Engineering in Developing Countries	Zreport Eschborn	1986
5	Jacob Kline	Handbook of Bio Medical Engineering	Academic Press, SanDiego	1988
6	R.C.Goyal	Handbook of Hospital Personal Management	Prentice Hall of India	1993

17BEBME6E	Professional Elective III	3003	100
17BEBME6E	Professional Elective IV	3003	100

#### 17BEBME611BIO-MEDICAL IMAGE PROCESSING LAB0 0 3 2100

#### **COURSE OBJECTIVES:**

The goal of this course is for students to:

- To implement fundamental image processing techniques in Biomedical Images.
- To infer enhancement and Transformation of Medical Images.
- To perceive knowledge about reconstruction of images.
- To learn about pre processing of image
- To understand the CT images
- To study the MATLAB implementation

#### **COURSE OUTCOMES:**

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

- Apply various pre-processing techniques in Medical Images.
- Outline enhancement and transformation of Medical Images.
- Simplify and reconstruct medical images.
- Use MATLAB tool for image processing application
- Perform Image analysis
- Perform image compression

#### LIST OF EXPERIMENTS:

- 1. Digital image Fundamentals.
- 2. Image Enhancement and Transformation.
- 3. Edge detection and boundary tracing techniques.
- 4. Removal of noise in medical images.
- 5. Image compressions.
- 6. Restoration of CT images.
- 7. Reconstruction of images.
- 8. Image Analysis.
- 9. Matlab implementation.

## 17BEBME612DIAGNOSTIC AND THERAPEUTIC EQUIPMENT0 0 3 2100LABORATORY

#### COURSE OBJECTIVES:

The goal of this course is for students:

- To learn about Electrical safety measurements
- To understand the concept the ultrasonic diathermy
- To understand the concept of biotelemetry
- To provide practice on recording and analysis of different Bio potentials
- To learn different non-electrical parameters using various methods.
- To study the function of different Therapeutic equipment.

#### COURSE OUTCOMES:

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

- Measure different bioelectrical signals using various methods
- Assess different non-electrical parameters using various methodologies
- Illustrate various diagnostic and therapeutic techniques.
- Handle therapeutic equipment
- Design ECG amplifier
- Design and simulate by using Lab View

#### LIST OF EXPERIMENTS:

- 1. Simulation of ECG detection of QRS complex and heart rate
- 2. Study of shortwave and ultrasonic diathermy
- 3. Study of biotelemetry
- 4. Electrical safety measurements.
- 5. Measurement of Respiratory parameters using spirometry.
- 6. Study of medical stimulator.
- 7. Study of ESU cutting and coagulation modes
- 8. Recording of Audiogram
- 9. Design of ECG amplifier, recording and analysis using Lab View

Total: 45

17BEBME651	Mini Project	001-	100
17BEBME652	Healthcare Industrial Internship-II	001-	100

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#### **OBJECTIVE**

The goal of this course is for students:

- To introduce virtual instrumentation concepts and applications.
- To discuss about programming structure in LabVIEW.
- To analyze data acquisition hardware.
- To infer knowledge on VI programs for specific applications.
- To perceive the basics of virtual instrumentation.
- To program virtual instrumentation software for biomedical applications

#### **INTENDED OUTCOMES**

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

- Illustrate programming concepts of virtual instruments.
  - Compile programming structure in LabVIEW.
  - Understand the use of VI for data acquisition.
  - analyze different types of interfaces.
  - Choose data from hardware systems.
- Develop VI programs for specific applications.

#### UNIT I

#### **REVIEW OF VIRTUAL INSTRUMENTATION**

Historical perspectives, Need of VI, advantages, Define VI, block diagram and architecture of a virtual instrument, data -flow techniques, graphical programming in data flow, comparison with conventional programming.

#### UNIT II

#### VI PROGRAMMING TECHNIQUES

VIS and sub-VIS loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Graphical programming in data flow, comparison with conventional programming.

#### UNIT III DATA ACQUISITION BASICS

ADC, DAC, DIO, Counters & timers, PC Hardware structure, timing, interrupts, DMA, Software and Hardware Installation. GPIB/IEEE 488 concepts, and embedded system buses - PCI, EISA, CPCI, and USB & VXI. A

## UNIT IV COMMON INSTRUMENT INTERFACES (9)

Current loop, RS.232C/RS.485, GPIB, System buses, interface buses: USB, PCMCIA, VXI, SCXI, PXI, etc., networking basics for office &.Industrial applications, Visa and IVI, image acquisition and processing. Motion control. ADC, DAC, DIO, DMM, waveform generator.

#### UNIT V USE OF ANALYSIS TOOLS Fourier transforms power spectrum correlation methods windowing &

Fourier transforms, power spectrum correlation methods, windowing & filtering, Major equipments- Oscilloscope, Digital Multimeter, Pentium Computers, Application in Biomedical field

## **TEXT BOOKS**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication	
1	Gary Jonson	Labview Graphical Programming	Second Edition, McGraw Hill, NewYork	1997	
2	Lisa K.wells & Jeffrey Travis	Labview for everyone	, Prentice Hall Inc., New Jersey	1997	
REFERENCE BOOKS					
	Author(s) Name	Title of the book	Publisher	Year of	

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Sokol off	Basic concepts of Labview 4	Prentice Hall Inc., New Jersey	1998
2	S.Gupta, J.P: Gupta	PC interfacing for Data Acquisition & Process Control	g for Data Instrument Society Process Control of America	
3	L.T.Amy	Automation System for Control and Data Acquisition	ISA	1992

#### **17BEBME702 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT – II 3003 100**

#### **OBJECTIVES**

The student should be made to:

- To perceive the medical devices applied in measurement of parameters related to cardiology, neurology and the methods of continuous monitoring and transmitting them.
- To analyze some of the cardiac assist devices.
- To understand the principle of diathermy
- To discuss about the measurement of the signals generated by muscles.
- To summarize the need and use of some of the extracorporeal devices.
- To learn the patient safety measures

#### **OUTCOMES**

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

- Utilize different medical devices applied in measurement of parameters related to cardiology, neurology
- Explain about cardiac assist devices, its continuous monitoring and transmission
- Measure signals generated by muscles
- Analyze different types of diathermy units.
- Identify the electrical hazards and Implement methods of patient safety
- Interpret the need and use of the extracorporeal devices.

#### UNIT I RESPIRATORY MEASUREMENT STSTEM

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

#### UNIT II SENSORY MEASUREMENT

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

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#### UNIT III

#### DIATHERMY

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

#### UNIT IV ULTRASONIC TECHNIQUE 9 Diagnosis: Tissue Peaction Basic principles of Echo technique, display techniques A, B, and

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

Echoencephalogram, abdomen, obstetrics and gynecology, ophthalmology.

UNIT VPATIENT SAFETY9Physiological effects of electricity – important susceptibility parameters – Macro shock – Micro<br/>shock hazards – Patient"s electrical environment – Isolated Power system – Conductive surfaces<br/>– Electrical safety codes and standards – Basic Approaches to Protection against shock,<br/>Protection equipment design, Electrical safety analyzer – Testing the Electric system

#### **Total : 45**

#### **TEXT BOOK:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Khandpur R.S	Handbook of Biomedical Instrumentation	Tata McGraw Hill, New Delhi	2003

#### **REFERENCES:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Leslie Cromwell	Biomedical Instrumentation and Measurement	Prentice Hall of India, NewDelhi	2007
2	John G. Webster	Medical Instrumentation Application and Design	John Willey and Sons	2006
3	Joseph J. Carr and John M. Brown	Introduction to Biomedical Equipment Technology	Pearson Education	2004
4	Richard Aston	Principles of Biomedical Instrumentation and Measurement	Merril Publishing Company	1990
5	L.A Geddas and L.E.Baker	Principles of Applied Biomedical Instrumentation	McGraw-Hill Publisher	2004
6	John G. Webster	Bioinstrumentation	John Willey and sons, New York	2004
7	Myer Kutz	Standard Handbook of Biomedical Engineering &Design	McGraw-Hill Publisher	2003

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 OPEN ELECTIVE - 2
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17BEBME7E--PROFESSIONAL ELECTIVE V3003100

#### 17BEBME711VIRTUAL BIOINSTRUMENTATION LAB0032100

#### **COURSE OBJECTIVE:**

The goal of this course is for students:

- To perceive the basics of virtual instrumentation
- To familiarize the students with Virtual Instrumentation and to do programming for applications
- To understand the D/A acquisition interface
- To analyse timing issues
- To learn about GPIB
- To do program with Lab view software for biomedical applications

#### **COURSE OUTCOME**

Upon completion of this course, the student will be able to:

- study about Programming Techniques
- study about Data Acquisition and inter facing techniques
- do programming for process control and other applications
- use D/A acquisition interface
- use serial communication interface
- use Lab view software for biomedical signal analysis

#### LIST OF EXPERIMENTS

- 1. Getting Started with Lab VIEW Basic operations, controls and indicators.
- 2. Simple programming structures and Timing Issues
- 3. Lab VIEW Debugging a VI, Sub-VI's
- 4. Lab VIEW Traffic Light Programming Structure, Sub-Vis, Clusters
- 5. GPIB-Serial poll Byte
- 6. Communication via RS232/ Serial Port.
- 7. Oscilloscope Attribute Nodes, Menus
- 8. RC Circuit measurement Timing issues
- 9. Lab VIEW Incorporating user written C subroutines
- 10. Digital-to-Analog acquisition interfacing Analog I/O
- 11. The RS232 Interface Function Generator
- 12. Importing pictures, Global/ local variables. Arrays, Clusters

17BEBME712	Hospital Training	0032	100
17BEBME791	Project Work Phase I	0084	100

### 17BEBME801PATIENT MONITORING SYSTEMS3003100

#### UNIT I

INTRODUCTION

Computers in data – computer evolution – structure of medical informatics – hospital information system – security of computer records – sources of data for decision making

## UNIT II COMPUTERIZED SYSTEM DESIGN

Computerized database management system – dialogue of computer method of history taken by computer – computerized medical records evolution –

#### UNIT III COMPUTERS IN PATIENT MONITORING

Computers in clinical laboratory – automated hematology laboratory – information flow in A CLINICAL LAB - physiological monitoring – automated ICU – computerized arrhythmia monitoring – interfacing to hospital information system (HIS)

#### UNIT IV COMPUTERS IN MEDICAL IMAGING & DECISION MAKING

Computer assistant medical imaging – nuclear medicine computer systems – data acquisition modes – X-ray, CT scan, – medical decision making: - Computer assisted decision making – general model, algorithms – fuzzy set theory
UNIT V
RECENT TRENDS
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## UNIT VRECENT TRENDS9Computer aids for handicapped: - computer for deaf - computers for the blind - speech generation and<br/>recognition -Computer assisted instructions:- Introduction - telemedicine, INDONET in medicine -<br/>role of Expert systems

## REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication	
1	R D Lee	Computers in Medicine	Tata McGraw Hill	1997	
2	R.S.Khandpur	Handbook of Biomedical Instrumentation	2nd Edition, Tata McGraw Hill	2003	
3	Tatsuo Togawa	Biomedical Transducers and Instruments	CRC Press	1997	
4	Leslie Cromwell, Fred J. Weibell and Erich A.	Biomedical Instrumentation and Measurement	Prentice-Hall India Pvt. Ltd	1996	

17BEBME8E	<b>PROFESSIONAL ELECTIVE VI</b>	3003	100
17BEBME8E	PROFESSIONAL ELECTIVE VII	3003	100
17BEBME891	PROJECT WORK PHASE II AND VIVAVOCE	0 0 32 16	100

#### Total: 45

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#### FOR SEMESTER V (ELECTIVE-I & II)

#### **17BEBME5E01**

#### **MEDICAL PHYSICS**

#### **OBJECTIVES:**

The Goal of this course is for students:

- To study the complete non-ionizing radiations including light and its effect in human body.
- To demonstrate the principles of ultrasound radiation and its applications in medicine.
- To appraise about radioactive nuclides and also the interactions of radiation with matters and how isotopes are produced.
- To perceive the role of Physics in cardiopulmonary system.
- To analyse the harmful effects of radiation and radiation protection regulations.
- To study the effects of sound and light in human body

#### **OUTCOMES:**

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

- Analyze the low and high frequency effects of non-ionizing radiation and physics of light.
- Define various clinical applications based on ultrasound wave.
- Explain the process of radioactive nuclide production using different techniques.
- Analyze radiation mechanics involved with various physiological systems.
- Apply the concept of physics in the function of cardiopulmonary system.
- Outline the detrimental effects of radiation and regulations for radiation safety.

#### UNIT I NON IONIZING RADIATION AND ITS MEDICAL APPLICATION

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

#### **UNIT II**

#### SOUND IN MEDICINE

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

#### UNIT III PRINCIPLES OF RADIOACTIVE NUCLIDES

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

#### **UNIT IV INTERACTION OF RADIATION WITH MATTER**

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

#### UNIT V **BASIC RADIATION OUANTITIES**

Introduction -exposure- Inverse square law-KERMA-Kerma and absorbed dose -stopping power -

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relationship between the dosimetric quantities - Bremsstrahlung radiation, Bragg's curve- concept of LD 50- Stochastic and Non-stochastic effects, Different radiation Unit, Roentgen, gray, Sievert.

### Total: 45

#### **TEXT BOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	John R Cameran , James G Skofronick	Medical Physics	John-Wiley & Sons	1978
2	W.J.Meredith and J.B. Massey	Fundamental Physics of Radiology	Varghese Publishing house	1992

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	P.Uma Devi, A.Nagarathnam , B S SatishRao	Intorduction to Radiation Biology	B.I ChurChill Livingstone pvt Ltd	2000
2	S.Webb	The Physics of Medical Imaging	Taylor and Francis	1988
3	J.P.Woodcock	Ultrasonic,Medical Physics Handbook series	Adam Hilger,Bristol	2002
4	Hylton B.Meire and Pat Farrant	Basic Ultrasound	John Wiley& Sons	1995

#### **17BEBME5E02**

#### **OBJECTIVES:**

The goal of this course is for students :

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

#### **OUTCOMES:**

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

- Demonstrate knowledge engineering principles underlying biometric systems.
- Analyze design basic biometric system applications.
- To understand the general principles of design of biometric systems and the underlying trade-offs.
- To recognize personal privacy and security implications of biometrics based identification technology.
- identify issues in the realistic evaluation of biometrics based systems.
- Identify the correct advantages and disadvantages of each biometric method

#### UNIT I

#### **INTRODUCTION TO BIOMETRICS**

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

#### UNIT II FINGERPRINT TECHNOLOGY

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

#### UNIT III FACE RECOGNITION AND HAND GEOMETRY

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

#### UNIT IV MULTIMODAL BIOMETRICS AND PERFORMANCE EVALUATION 9

Voice Scan – physiological biometrics –Behavioral Biometrics - Introduction to multimodal biometric system – Integration strategies – Architecture – level of fusion – combination strategy – training and adaptability – examples of multimodal biometric systems – Performance evaluation-

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Statistical Measures of Biometrics – FAR - FRR - FTE - EER – Memory requirement and allocation.

#### UNIT V BIOMETRIC AUTHENTICATION

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

#### Total: 45

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#### **TEXT BOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	James Wayman, Anil Jain, Davide Maltoni	Biometric Systems, Technology Design and Performance Evaluation	Springer	2005
2	S.Y. Kung, S.H. Lin, M.W.Mak	Biometric Authentication: A Machine Learning Approach	Prentice Hall	2005

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Paul Reid	Biometrics for Network Security	Pearson Education	2004
2	Nalini K Ratha, Ruud Bolle	Automatic fingerprint Recognition System	Springer	2003
3	L C Jain, I Hayashi, S B Lee, U Halici	Intelligent Biometric Techniques in Fingerprint and	CRC Press	1999
4	John Chirillo, Scott Blaul	Implementing Biometric Security	John Wiley	2003
5	Arun A. Ross, Karthik Nanda Kumar, Anil K. Jain	Handbook of Multibiometrics	Springer	2006

#### **17BEBME5E03**

#### **ADVANCED BIOCHEMISTRY**

3003 100

#### **COURSE OBJECTIVES**

The goal of this course is for students

- To study about the biochemistry of living cells, metabolism of biomolecules and the methods of investigation and diagnostic tools.
- To summarize the role of these biomolecules by providing basic information on specific metabolic diseases and disorders of these biomolecules.
- To analyse the structural and functional properties of carbohydrates, proteins and lipids
- To discuss about functions of each organelles and Transport of substances across biological membranes
- To infer about the biochemistry of living cells
- Demonstrate the concepts of biochemistry of living cells

#### **COURSE OUTCOMES**

**UNIT I** 

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

- Understanding the concepts of biochemistry of living cells
- Understanding the concepts of metabolism of carbohydrates
- Understanding the concepts of protein biochemistry
- Understanding the concepts of biochemistry of lipids
- Understanding the concepts of investigation of metabolism.
- Understand the structural and functional properties of various organalles and biomolecules

#### METABOLISM OF AMINO ACIDS

Biosynthesis of Gly, Ser and Cys; Biosynthesis of six essential amino acids (Met, Thr, Lys, Ile, Val, Leu) and regulation of branched chain amino acids (concerted inhibition, allosteric regulation and enzyme multiplicity, sequential feed back) from oxaloacetate and pyruvate; Biosynthesis of aromatic amino acids. Metabolic disorders associated with branched chain and aromatic amino acid degradation. Important molecules derived from amino acids (auxins, DOPA, Serotonin, porphyrins, T3, T4, Adrenaline, Noradrenaline, histamine, GABA, polyamines etc).

#### UNIT II PROTEIN TRANSPORT AND DEGRADATION

Protein targeting, signal sequence, secretion; Folding, Chaperons and targeting of organelle proteins, Protein degradation, receptor-mediated endocytosis, turnover.

#### UNIT III METABOLISM OF NUCLEIC ACIDS, POLYSACCHARIDES AND LIPIDS 12

Biosynthesis of nucleotides, denovo and salvage pathways for purines and pyrimidines, regulatory mechanisms:Degradationofnucleicacidbyexoandendonucleases.Biosynthesis and degradation of starch and glycogen. Triacylglycerol and phospholipid biosynthesis and degradation; Cholesterol biosynthesis and regulation and targets and action of cholesterol lowering drugs.

### UNIT IV VITAMINS AND COENZYMES

Fat Soluble Vitamins, provitamins (A, D, E and K). Structure, physiological significance and deficiency symptoms. Water soluble vitamins, structure, coenzyme role and deficiency symptoms. Thiamine, riboflavin, pyridoxine, niacin, folic acid, biotin and Vitamin B12. Recommended dietary intake. Coenzymes: Their role in metabolic pathways. NAD, FAD, TPP, PLP, carboxy biotin

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### UNIT V HORMONES

Introduction, Effects of Hormones, Chemical classification of hormones, Peptide hormone vasopressin, protein hormone- insulin. Lipid and phospholipid derived hormones- prostaglandin and phospholipids. Steroid hormones-testosterone, estrogen, cortisol. Monoamines: thyroxine, adrenaline, Mechanism of action of the different classes of hormones. Total : 45

#### **TEXT BOOKS**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Nelson, D.L et al.,	Lehninger's Principles of Biochemistry	-	-
2	Stryer, Lubert	Biochemistry	4th Edition, W.H Freeman & Co.,	2000
3	Voet, D.J and J.G. Voet and C.W. Pratt	Principles of Biochemistry	3rd Edition, John Wiley & Sons Inc.,	2008
4	Murray, R.K., et al.,	Harper's Illustrated Biochemistry	27th Edition.McGraw- Hill	2006

#### REFERENCES

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Creighton. T.E.,	Proteins: Structure and Molecular Properties	2nd Edition, W.H. Freeman and Co	1993
2	Salway, J.G.,	Metabolism at a Glance	2nd Edition, Blackwell Science Ltd	2000

#### 17BEBME5E04

#### ELEMENTS OF BIOTECHNOLOGY 3003

#### **COURSE OBJECTIVES**

The goal of this course is for students

- To develop skills of the students in the field of biotechnology and its applications in various fields.
- The course will serve as an effective course to understand Socio-economic issues of biotechnology.
- Scope of micro particles in biomedical field
- Ethical issues working with micro particles
- Learn about micro surgical devices
- Benefits and challenges in Molecular manufacturing

#### **COURSE OUTCOMES:**

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

- identify the potential areas where biotechnology can be utilized.
- Expose to the ethical issues regarding the use of biotechnology.
- Explain the Technique Immuno technology
- Distinguish industrial & microbial biotechnology
- Elaborate Patenting of Biological Material

#### UNIT I

#### BIOTECHNOLOGY

General Features of Biotechnology – History, Definition and Scope – Recombinant DNA and Genetic Engineering: Cloning and Expression Vectors Recombinant – DNA and Genetic Engineering: Chimeric DNA, Probes and Genomic/cDNA Libraries – PCR and Microarrays –Isolation and Synthesis of Genes (Including Synthesis of a Bacterial Genome) – Molecular Markers and DNA Sequencing (Including Whole Genome Sequencing).

#### UNIT II

#### ANIMAL BIOTECHNOLOGY

Animal Cell and Tissue Culture – Laboratory Facilities, Culture Media and Procedures – Animal Cell and Tissue Culture – Primary Culture, Cell Lines & Cloning – Animal Cell and Tissue Culture – Tissue and Organ Culture: Primary Explanation Techniques – In Vitro Fertilization and Embryo Transfer in Humans and Livestock – Transfection Methods and Transgenic Animals – Immunotechnology – Immune System, Antibodies, Interferons and Vaccines –. Immunotechnology – Hybridoma and Monoclonal Antibodies (Mabs) – Animal Genomics – Molecular Maps – Animal Genomics – Whole Genome Sequences and Their Annotation – Biotechnology in Medicine.

#### UNIT III PLANT BIOTECHNOLOGY

Plant Cell and Tissue Culture: –Culture Media and Cell Culture; –Plant Cell and Tissue Culture: – Tissue Culture, Micropropagation and Somaclonal Variation; –Plant Cell and Tissue Culture: – Production and Uses of Haploids; – Plant Cell and Tissue Culture: –Protoplast Culture, Regeneration and Somatic Hybridization; –Gene Transfer Methods in Plants; – Transgenic Plants–Chloroplast and Mitochondrion Engineering; –Plant Genomics: –Molecular Maps of Plant Genomes; – Plant Genomics:– Whole Genome Sequences.

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## UNIT IV INDUSTRIAL& MICROBIAL BIOTECHNOLOGY

Enzyme Biotechnology–Protein Engineering – Immunotoxins and Drug Designing –Metabolic Engineering for Overproduction of Metabolites–Microbial Biotechnology –Isolation, Culture and Genetic Manipulation of Microbes–Microbial Biotechnology–Microbes for Production of Chemicals–Microbial Biotechnology–Microbes for Cleaner Technologies–Microbial Biotechnology–Microbes for Agriculture–Microbial Biotechnology–Microbes for Industry

#### UNIT V BIOTECHNOLOGY & INTELLECTUAL PROPERTY RIGHTS ENVIRONMENT

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Pollution Control–Bioremediation (Including Phytoremediation)–Bioenergy and Biofuels–Restoration of Degraded Lands–Biodiversity and its Conservation–Biotechnology & Intellectual Property– Intellectual Property Rights (IPR) & Intellectual Property Protection (IPP)–Biotechnology & Intellectual Property–Patenting of Biological Material: Obligations and Implications.

#### Total: 45

#### TEXT BOOK

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Prof. P. K. Gupta	Elements of Biotechnology	2nd Edition (3rd Reprint)	2015-16

#### FOR SEMESTER VI (ELECTIVE-III & IV)

#### 17BEBME6E01PHYSIOLOGICAL MODELLING3003100

#### **COURSE OBJECTIVES**

The goal of this course is for students:

- To understand properties of systems and electrical analog.
- To discuss about transfer functions.
- To build simple impedance concept.
- To understand feedback systems.
- To develop simulation of biological systems.
- To gain knowledge about the concepts of physiological modelling.

#### **COURSE OUTCOMES:**

Upon completion of this course, the student will be able to:

- Explain the concept of properties of systems and electrical analog
- Analyse various protocols about transfer functions.
- Build simple simple impedance concept
- Apply feedback systems.
- Analyse applications simulation of biological systems.
- Utilize concepts of physiological modelling..

#### UNIT I PROPERTIES OF SYSTEMS AND ELECTRICAL ANALOG

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

#### UNIT II

#### **TRANSFER FUNCTIONS**

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

#### UNIT III

#### **IMPEDANCE CONCEPT**

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

FEEDBACK SYSTEMS

#### UNIT IV

Characteristics of physiological feedback systems, stability analysis of systems.

### UNIT V SIMULATION OF BIOLOGICAL SYSTEMS

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

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S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	William B.Blesser	System approach to Bio- medicine	McGraw-Hill book co., NewYork	1969
2	Manfred Clynes and John H.Milsum	Bio-medical engineering system	McGraw-Hill book co., NewYork	1970
3	Michael C.K. Khoo	Physiological Control Systems - Analysis, Simulation	Prentice Hall of India Pvt. Ltd.,	2001
4	Douglas S.Regs	Control theory and physiological feedback mechanism	TheWilliam & Williams co., Baltimore	1970

#### **17BEBME6E02 TEI**

#### **TELEHEALTH TECHNOLOGY**

#### **COURSE OBJECTIVES:**

The goal of this course is for students:

- To infer the key principles for telemedicine and health.
- To define telemedical technology.
- To know telemedical standards, mobile telemedicine and it applications.
- To State the principles of clinical telehealth
- To understand the scope and benefits of Telemedicine
- To understand the limitations of Telemedicine and security in telemedicine applications

#### **COURSE OUTCOMES**:

Upon completion of this course, the student will be able to:

- Apply multimedia technologies in telemedicine.
  - Explain Protocols behind encryption techniques for secure transmission of data.
  - Utilize telehealth in healthcare.
  - Outline the basic concepts involved in telemetry based transmission and reception
  - Discuss the communication devices and Networks of telemedicine.
  - Describe telehealth systems for secure transmission of medical data and retrieval of telemedicine based information.

#### UNIT I

**UNIT IV** 

#### **TELEMEDICINE AND HEALTH**

History and Evolution of telemedicine, Functional diagram of telemedicine system, Telemedicine, Telehealth, Tele care, Organs of telemedicine, Global and Indian scenario, Ethical and legal aspects of Telemedicine - Confidentiality, Social and legal issues, Safety and regulatory issues, Advances in Telemedicine.

#### UNIT II TELEMEDICAL TECHNOLOGY

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

#### UNIT III TELEMEDICAL STANDARDS

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

#### MOBILE TELEMEDICINE

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

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#### UNIT V TELEMEDICAL APPLICATIONS

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

#### Total: 45

#### **TEXT BOOK**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	.Norris, A.C	Essentials of Telemedicine and Telecare	Wiley	2002

#### **REFERENCES:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Wootton, R., Craig, J., Patterson, V	Introduction to Telemedicine. Royal Society of Medicine	Taylor & Francis	2006
2	O'Carroll, P.W., Yasnoff, W.A., Ward,	Public Health Informatics and Information Systems	Springer	2003
3	Ferrer-Roca, O., Sosa - Iudicissa, M.	Handbook of Telemedicine. Technology and Informatics	IOS Press (Studies in Health) Volume 54	2002
4	Simpson, W.	Video over IP, A practical guide to technology and applications	Focal Press Elsevier	2006
5	Bemmel, J.H. van, Musen, M.A.	Handbook of Medical Informatics	Springer	1997
6	Mohan Bansal	Medical Informatics	Tata McGraw-Hill	2004

#### 17BEBME6E03

#### **CANCER BIOLOGY**

#### **COURSE OBJECTIVES**

The goal of this course is for students:

- To infer the key principles for fundamentals of cancer biology
- To define principles of carcinogenesis technology.
- To know molecular cell biology of cancer.
- To State the principles of cancer metastasis.
- To understand the scope, benefits and limitations of new molecules for cancer therapy.
- To develop skills of the students in the area of Cancer Biology.

#### **COURSE OUTCOMES:**

Upon completion of this course, the student will be able to:

- Learnt about pathogenesis of cancer, identifications of cancer through tools developed by biotechnology research & molecules synthesized for cancer therapy.
- Explain Protocols behind molecular cell biology of cancer.
- Utilize principles of cancer metastasis in healthcare.
- Outline the basic concepts involved in new molecules for cancer therapy
- Discuss the fundamentals of cancer biology.
- Describe the area of Cancer Biology

#### UNIT I FUNDAMENTALS OF CANCER BIOLOGY

Regulation of cell cycle, mutations that cause changes in signal molecules, effects on receptor, signal switches, tumour suppressor genes, modulation of cell cycle in cancer, different forms of cancers, diet and cancer. Cancer screening and early detection, Detection using biochemical assays, tumor markers, molecular tools for early diagnosis of cancer.

#### UNIT II PRINCIPLES OF CARCINOGENESIS

Theory of carcinogenesis, Chemical carcinogenesis, metabolism of carcinogenesis, principles of physical carcinogenesis, x-ray radiation-mechanisms of radiation carcinogenesis.

#### UNIT III PRINCIPLES OF MOLECULAR CELL BIOLOGY OF CANCER 9

Signal targets and cancer, activation of kinases; Oncogenes, identification of oncogenes, retroviruses and oncogenes, detection of oncogenes. Oncogenes/proto oncogene activity, Growth factors related to transformation, Telomerases.

#### UNIT IV PRINCIPLES OF CANCER METASTASIS

Clinical significances of invasion, heterogeneity of metastatic phenotype, metastatic cascade, basement membrane disruption, three step theory of invasion, proteinases and tumour cell invasion.

#### UNIT V NEW MOLECULES FOR CANCER THERAPY

Different forms of therapy, chemotherapy, radiation therapy, detection of cancers, prediction of aggressiveness of cancer, advances in cancer detection. Use of signal targets towards therapy of cancer; Gene therapy.

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### **TEXT BOOKS**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Maly B.W.J	Virology A Practical Approach	"", IRL1 Press, Oxford	1987
2	Dunmock N.J And Primrose S.B	Introduction to Modern Virology	Blackwell Scientific Publications,	1988

### REFERENCE

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Maly B.W.J	An Introduction Top Cellular And Molecular Biology of Cancer	Oxford Medical Publications	1991

#### **17BEBME6E04 BIOSIGNAL CONDITIONING CIRCUITS** 3003 100

#### **COURSE OBJECTIVE**

The goal of this course is for students :

- To gain in depth knowledge of fundamentals of operational amplifier circuits
- To study the various applications using operational amplifiers.
- To analyze the applications of opamp
- To understand A/D conversion
- To study the characteristics of frequency filters
- To learn the need of isolation amplifier

#### **COURSE OUTCOME**

- Elaborate the fundamentals of operational amplifier circuits •
- Apply the various applications using operational amplifiers. •
- Use the applications of opamp
- Distinguish A/D and D/A conversion
- Design the filter circuits for various frequency range
- Explain the need of isolation amplifier •

#### UNIT 1

#### **INTRODUCTION TO OPAMP**

Introduction, Signal conditioning, 741 General purpose OPAMP: ideal characteristics, offset voltages and currents. Open & Closed Loop Configuration. Inverting, Non-Inverting, Summing, Voltage Follower, Integrator, differentiators, Log & Anti-Log Amplifiers, Differential Amplifiers, CMRR.

#### UNIT 2

#### **APPLICATION OF OPAMPS**

Comparator- Zero crossing detector, Inverting and non inverting comparator, Schmitt Trigger, Precision rectifiers- Half wave and Full wave rectifiers, Peak detectors, Monostable, Astable multivibrators, Sawtooth generator, Triangular waveform generator, Sine Wave Generators-RC Phase Shift Oscillator, Wein Bridge oscillator.

#### UNIT 3

Introduction- Analog Filters, Active Filters and Passive Filters, First order and Second order Low Pass Filters, High Pass Filters, Band Pass Filters- Narrow Band Pass, Wide band Pass Filters, Band Reject Filters- Notch Filter, All Pass filters and higher Order filters- Design and applications.

**FILTERS** 

#### UNIT 4 A/D AND D/A CONVERTERS

Sample and Hold circuit - D/A converters: Resistive divider and R-2R ladder networks, A/D converters: Counting type, Successive approximation, parallel comparator, Voltage to Current Converter, 555 Timer and its applications- Astable multivibrators and Monostable Multivibrator.

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### UNIT 5 AMPLIFIERS

Instrumentation amplifiers, Bridge Amplifiers, Bioelectric Amplifiers: - Properties desired, Isolation Amplifiers: - Battery Powered, Carrier, Optically Coupled, Current Loading, Chopper Stabilized amplifier, Input Guarding.

#### Total: 45

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Ramakant A Gayakwad	Operational Amplifiers & Linear Integrated Circuits	Prentice Hall	2000
2	Joseph J. Carr & John M. Brown	Introduction to Biomedical Equipment Technology	Pearson Education Pvt. Ltd, 4 <sup>th</sup> edition	2001
3	Roy Choudhary	Linear Integrated Circuits	New Age International (P) Ltd,	2004
4	John P.Bentley	Principles of Measurement System	Longman Science & Technology	1995
5	Jacob Mill man	Micro Electronics	McGraw-Hill	1987
6	Robert Coughlin and Fredrer	Operational Amplifiers & Linear Integrated Circuits	Prentice Hall	2001

# TEXT / REFERENCE BOOKS

#### FOR SEMESTER VII (ELECTIVE-V)

#### **17BEBME7E01 REHABILITATION ENGINEERING** 3003 100

#### **COURSE OBJECTIVE:**

The goal of this course is for students :

- To perceive the rehabilitation concepts and Rehabilitation team for future development and applications.
- To understand the Primary & secondary Disabilities
- To discuss various Principles of Rehabilitation Engineering.
- To infer the various orthotic devices and prosthetic devices to . overcome orthopedic problems.
- To explain the need for medical aids.
- To explain about different types of models of Hand and arm replacement

#### **COURSE OUTCOME:**

- Elaborate about the needs of rehabilitations and its future development.
- Understand the terminologies used by the rehabilitation team
- Demonstrate Engineering Concepts in Sensory & Motor rehabilitation.
- Apply the different types of Therapeutic Exercise Technique to benefit the society.
- Understand the need of virtual reality based rehabilitation
- Simplify about different types of models of Hand and arm replacement.

#### UNIT I

#### MEDICAL X-RAY EQUIPMENT

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

#### UNIT II **COMPUTED TOMOGRAPHY**

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

#### UNIT III MAGNETIC RESONANCE IMAGING

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

#### **UNIT IV** NUCLEAR MEDICINE SYSTEM

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

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#### UNIT V RADIATION THERAPY AND RADIATION SAFETY

Radiation therapy – linear accelerator, Telegamma Machine. SRS –SRT,-Recent Techniques in radiation therapy - 3DCRT – IMRT – IGRT and Cyber knife- radiation measuring instruments-Dosimeter, film badges, Thermo Luminescent dosimeters- electronic dosimeter- Radiation protection in medicine- radiation protection principles.

#### Total: 45

#### **TEXT BOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Steve Webb	The Physics of Medical Imaging	Adam Hilger, Philadelpia	1988
2	R.Hendee and Russell Ritenour	Medical Imaging Physics	Fourth Edition William, Wiley-	2002

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Gopal B. Saha	Physics and Radiobiology of Nuclear Medicine	Third edition Springer	2006
2	B.H.Brown, PV Lawford, R H Small	Medical physics and biomedical Engineering	CRC Press	1999
3	Myer Kutz	Standard handbook of Biomedical Engineering and	McGraw Hill	2003
4	P.Ragunathan	Magnetic Resonance Imaging and Spectroscopy in Medicine	-	-

#### **17BEBME7E02**

#### **OBJECTIVES:**

The goal of this course is for students

- To Understand Biomedical Laser principles and applications.
- To be familiar with optical properties of tissues
- To infer the knowledge of photonics
- To be exposed to Optical Holography
- To explain the various applications of Laser
- To understand photo dynamic therapy.

#### **OUTCOMES:**

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

- 1. Analyse the optical properties of tissues
- 2. Use the Photonics instrumentation
- 3. Apply lasers in different areas of medicine.
- 4. Perceive the lasers in ophthalmology
- 5. Discuss about optical hologram
- 6. Explain the special techniques of Lasers.

#### UNIT I OPTICAL PROPERTIES OF THE TISSUES

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

#### UNIT II INSTRUMENTATION IN PHOTONICS

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

#### UNIT III APPLICATIONS OF LASERS

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

#### UNIT IV OPTICAL HOLOGRAPHY

Wave fronts, interference patterns, principle of hologram, optical hologram, applications.

#### UNIT V SPECIAL TECHNIQUES

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

#### TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Leon Goldman, M.D., & R.James Rockwell,	Lasers in Medicine	Gordon and Breach, Science	1975
2	Abraham Katzir	Lasers and Optical Fibers in Medicine	Academic Press Edition	1998

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**Total : 45** 

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Tuan Vo Dirh	Biomedical Photonics – Handbook	CRC Press, Bocaraton	2003
2	Glasser, O.,	Medical Physics Vol 1, 2, 3	Adam Hilgar Brustol Inc	1987
3	G.David Baxter	Therapeutic Lasers – Theory and practice	Churchill Livingstone Publications	2001

#### **17BEBME7E03**

#### **COURSE OBJECTIVES:**

The goal of this course is for students

- To provide basic knowledge on the concept of Healthcare Quality management towards continuous improvement of patientcare
- To Understand hospital safety. •
- To be familiar with electrical & fire safety. •
- To infer the knowledge of regulatory requirement for healthcare. •
- To be exposed to standardization of quality medical care in hospitals •
- To explain the assessing quality healthcare •

#### **COURSE OUTCOME:**

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

- Make the students aware of the role of biomedical engineer in hospitals, especially in the management of electrical supply, maintenance of electrical safety.
- Analyse the hospital safety. •
- Use the electrical & fire safety. •
- Apply regulatory requirement for healthcare in different areas of medicine.
- Perceive thestandardization of quality medical care in hospitals.
- Discuss about the assessing quality healthcare.

#### UNIT I STANDARDIZATION OF QUALITY MEDICAL CARE IN HOSPITALS 9

Define Quality- Need for Standardization & Quality Management, TQM in Health care organization- Quality assurance methods, QA in (Medical Imaging & Nuclear medicine) Diagnostic services – Classification of equipments

#### **REGULATORY REQUIREMENT FOR HEALTH CARE** UNIT II

FDA regulations, Accreditation for hospitals - JCI, NABH and NABL, Other regulatory Codes.

#### UNIT III HOSPITAL SAFETY

Security & Safety of Hospital -Property, Staff & Patients, Radiation safety, Safety precautions, hazardous effects of radiation, allowed levels of radiation, ICRP regulations for radiation safety, Disposal of Biological waste.

#### **UNIT IV ELECTRICAL & FIRE SAFETY**

Sources of shocks, macro & micro shocks -Hazards, monitoring and interrupting the Operation from leakage current- Elements of fire, causes of fire , Action to be taken in case of fire in a Hospital.

#### UNIT V ASSESSING QUALITY HEALTH CARE

Patient Safety Organization- Governmental & Independent, Measuring Quality care - Evaluation of hospital services - six sigma way, Quality Assurance in Hospitals Sop's - Patient Orientation for Total Patient Satisfaction. 5S techniques.

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#### **Total : 45**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Cesar A. Cacere & Albert Zana	The Practice of Clinical Engg.	Academic press, New York	1977
2	Webster J.G and Albert M.Cook	Clinical Engg, Principles & Practices, Prentice Hall Inc.,	Engle wood Cliffs, New Jersy	1979
3	B.M.Sakharkar	Principles of Hospital administration and Planning	JAYPEE Brothers, Medical Publishers	-

#### **17BEBME7E04**

#### RADIOLOGICAL EQUIPMENTS

#### **COURSE OBJECTIVE:**

The goal of this course is for students :

- To Understand generation of x-rays and its uses in imaging.
- To Learn different types of radio diagnostic techniques.
- To Know techniques used for visualizing different sections of the body.
- To Learn radiation therapy methodologies and the radiation safety.
- To perceive the knowledge of medical devices applied in measurement of parameters related medical imaging and the methods of continuous monitoring and transmitting them.
- To understand Radiation therapy and its safety

#### **COURSE OUTCOME:**

- Utilize different medical devices applied in measurement of parameters related to medical imaging
- Explain about cardiac assist devices, its continuous monitoring and transmission
- Measure signals generated by muscles
- Analyze different types of nuclear medicine systems
- Explain the different radio diagnostic and therapeutic techniques.
- Analyze the safety aspects of Radiation therapy

#### UNIT I MEDICAL X-RAY EQUIPMENT

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

#### UNIT II COMPUTED TOMOGRAPHY

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

#### UNIT III MAGNETIC RESONANCE IMAGING

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

#### UNIT IV NUCLEAR MEDICINE SYSTEM

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

#### UNIT V RADIATION THERAPY AND RADIATION SAFETY

Radiation therapy - linear accelerator, Telegamma Machine. SRS -SRT,-Recent Techniques in

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radiation therapy - 3DCRT – IMRT – IGRT and Cyber knife- radiation measuring instruments-Dosimeter, film badges, Thermo Luminescent dosimeters- electronic dosimeter- Radiation protection in medicine- radiation protection principles.

### **TEXT BOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Steve Webb	The Physics of Medical Imaging	Adam Hilger, Philadelpia	1988
2	R.Hendee and Russell Ritenour	Medical Imaging Physics	Fourth Edition William, Wiley- Liss,	2002

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Gopal B. Saha	Physics and Radiobiology of Nuclear Medicine	Third edition Springer	2006
2	B.H.Brown, PV Lawford, R H Small	Medical physics and biomedical Engineering	CRC Press	1999
3	Myer Kutz,	Standard handbook of Biomedical Engineering and design	McGraw Hill	2003

#### FOR SEMESTER VIII (ELECTIVE-VI & VII)

#### **17BEBME8E01 BIOLOGICAL SPECTROSCOPY** 3003 100

#### **COURSE OBJECTIVE**

- To develop the skills of students in the area of Biological spectroscopy.
- To learn various aspects of mass spectroscopy •
- To Understand NMR Spectroscopy •
- To Know various diffraction methods •
- To Learn about Polarized light •
- To be Familiarised optical rotation •

#### **COURSE OUTCOMES:**

At the end of the course, the student would have learnt about

- To learn various aspects of mass spectroscopy
- Understand NMR Spectroscopy
- Know various diffraction methods
- Learn about Polarized light
- Familiarise optical rotation •
- various kinds spectroscopic techniques to study biological system.

#### UNIT I **OPTICAL ROTATORY DISPERSION**

Polarized light – optical rotation – circular dichroism – circular dichroism of nucleic acids and proteins.

#### NUCLEAR MAGNETIC RESONANCE UNIT II

Chemical shifts - spin - spin coupling - relaxation mechanisms - nuclear overhauser effect multidimensional NMR spectroscopy - determination of macromolecular structure by NMR - magnetic resonance imaging.

#### UNIT III MASS SPECTROMETRY

Ion sources sample introduction - mass analyzers and ion detectors - biomolecule mass sepctrometry peptide and protein analysis – carbohydrates and small molecules – specific applications.

#### **X-RAY DIFFRACTION UNIT IV**

Scattering by x- rays - diffraction by a crystal - measuring diffraction pattern - bragg reflection - unit cell - phase problem - anomalous diffraction - detemination of crystal structure - electron and neutron diffraction.

#### UNIT V SPECIAL TOPICS AND APPLICATIONS

Electron microscopy - transmission and scanning electron microscopy - scanning tunneling and atomic force microscopy - combinatorial chemistry and high throughput screening methods.

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## TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Campbell I.D and Dwek R.A	Biological Spectroscopy	Benjamin Cummins and	1986
2	Atkins P.W	Physical Chemistry	Oxford IV Edition	1990

**17BEBME8E02** 

#### **ROBOTICS AND AUTOMATION**

#### **COURSE OBJECTIVES:**

- To study the various parts of robots and fields of robotics.
- To study the various kinematics and inverse kinematics of robots. •
- To study the Euler, Lagrangian formulation of Robot dynamics. ٠
- To study the trajectory planning for robot.
- To study the control of robots for some specific applications. •
- Use Robots in different applications ٠

#### **COURSE OUTCOMES:**

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

- Explain various kinds robotics techniques, vision, planning and applications.
- Outline the basic concept of robotics •
- Identify and discuss the Robot Vision •
- Describe about manipulators and kinematics.
- Demonstrate Task level programming •
- Discuss the applications of robotic systems in medical field. •

#### **BASIC CONCEPTS** UNIT I

Definition and origin of robotics-different types of robotics-various generations of robots- degrees of freedom-Asimov's laws of robotics-dynamic stabilization of robots.

#### UNITII POWER SOURCESAND SENSORS

Hydraulic, pneumatic and electric drives-determination of HP of motor and gear ingratio-variable speed arrangements-path determination - micro machines in robotics- machine vision - ranginglaser-acoustic -magnetic, fiber optic and tactile sensors.

#### MANIPULATORS, ACTUATORS AND GRIPPERS UNIT III

Construction of manipulators- manipulator dynamics and force control -electronic and pneumatic manipulator control circuits-end effectors-U various types of grippers -design considerations.

#### **UNIT IV** KINEMATICSAND PATH PLANNING

Solution of inverse kinematics problem-multiple solution jacobian work envelop-hill Climbing Techniques-robot programming languages

#### UNIT V **CASE STUDIES**

Multiple robots-machine interface-robots in manufacturing and non-manufacturing applicationsrobot cell design-selection of robot.

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### **TEXT BOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Mikell P.Weiss G.M.,Nagel R.N., Odraj N.G,	Industrial Robotics	McGraw-Hill Singapore	1996
2	Ghosh	Control in Robotics and Automation: Sensor Based Integration	Allied Publishers, Chennai	1998

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Deb.S.R	Robotics Technology and flexible Automation	John Wiley, USA	1992
2	Klafter R.D., Chimielewski T.A., Negin M	Robotic Engineering– An integrated approach	Prentice Hall of India, New Delhi	1994
3	McKerrow P.J	Introduction to Robotics	Addison Wesley, USA,	1991
4	Issac Asimov	Robot	Ballantine Books, NewYork	1986
5	Barry Leatham- Jones	Elements of industrial Robotics	PITMAN Publishing	1987
6	Mikell P.Groover, Mitchell Weiss, Roger N. Nagel Nicholas G. Odrey	Industrial Robotics Technology, Programming and Applications	McGraw Hill Book Company	1986
7	Fu K.S. Gonzaleaz R.C. and Lee C.S.G	Robotics Control Sensing, Vision and Intelligence	McGraw Hill International Editions	1987

## NANOTECHNOLOGY IN MEDICINE 3003 100

#### 17BEBME8E03 COURSE OBJECTIVE:

- To study and gain the knowledge of Nanotechnology in the field of medicine.
- To study and gain the knowledge of Cellular Nano machines and the Building Blocks of Life
- Know the Importance of various nano materials in health and medicine.
- To gain the knowledge of Molecular therapy
- To study Stem cell therapy,
- .Application of nanotechnology in health monitoring systems

#### **COURSE OUTCOMES:**

#### After learning the course the students should be able to understand:

- Applications of nanotechnology health care and medicine.
- Cellular Nano machines and the Building Blocks of Life
- Importance of nanomaterials in drug delivery.
- Application of nanomaterials and nanosystems in Medical Diagnostics and Therapeutics.
- Know Application of nanotechnology in health monitoring systems.
- Familiarise Cellular Nano machines

### UNIT I INTRODUCTION

Cellular Nano machines and the Building Blocks of Life, A New Generation of Nano tools, Importance of various nano materials in health and medicine.

#### UNIT II NANOPARTICLES FOR DIAGNOSTICS

Nanoparticles in Medical Diagnostics and Therapeutics, Targeted drug delivery, Magnetic Nanoparticles as Contrast Agents for Medical Diagnosis, Liposome based delivery, Bio Inspired Nanomaterials for a New Generation of Medicine.

### UNIT III THERAPEUTIC NANO DEVICES

Definition and scope, Synthetic Approaches: top-down versus bottom-up Approaches for Nanotherapeutic Device Components, Applications for Nano therapeutic Devices.

#### UNIT IV NANOSYSTEMS FOR HEALTHCARE MONITORING – I (9)

Single-Molecule Detection Techniques for Monitoring Cellular Activity at the Nano scale Level, Nano probes, Integrated Cantilever-Based Biosensors for the Detection of Chemical and Biological Entities.

### UNIT V NANOSYSTEMS FOR HEALTHCARE MONITORING – II (9)

Nano pore Methods for DNA Detection and Sequencing, Nano tube Based Membrane Systems, micro/nano fluidic systems for bio-object sorting, single chip electrophoresis system.

#### TEXT BOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Tuan Vo-Dinh	Nanotechnology in Biology and Medicine: Methods, Devices and Applications	CRC press	2006

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Total: 45

### **REFERENCE BOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Chala Kumar	Bio functionalization of nanomaterials	Wiley	2005
2	Charles Pooles, Frank J. Ownes	Introduction to Nanotechnology	Wiley	2003
3	Bharat Bhushan	Handbook of Nanotechnology	Springer	2003

#### **17BEBME8E04**

#### **COURSE COBJECTIVES:**

- To learn the fundamentals of tissue engineering and tissue repairing
- To acquire knowledge on clinical applications of tissue engineering
- To understand the basic concept behind tissue engineering focusing on the stem cells, biomaterials and its applications
- Overall exposure to the role of tissue engineering and stem cell therapy in organogenesis
- Ability to understand the components of the tissue architecture
- To learn the fundamentals of tissue engineering and tissue repairing

#### **COURSE OUTCOMES:**

- Ability to understand the components of the tissue architecture
- Opportunity to get familiarized with the stem cell characteristics and their relevance in medicine
- Awareness about the properties and broad applications of biomaterials
- Overall exposure to the role of tissue engineering and stem cell therapy in organogenesis
- To learn the fundamentals of tissue engineering and tissue repairing
- To acquire knowledge on clinical applications of tissue engineering

#### UNIT I INTRODUCTION

Introduction to tissue engineering: Basic definition; current scope of development; use in therapeutics, cells as therapeutic agents, cell numbers and growth rates, measurement of cell characteristics morphology, number viability, motility and functions. Measurement of tissue characteristics, appearance, cellular component, ECM component, mechanical measurements and physical properties.

#### UNIT II TISSUE ARCHITECTURE

Tissue types and Tissue components, Tissue repair, Engineering wound healing and sequence of events. Basic wound healing Applications of growth factors: VEGF/angiogenesis, Basicproperties, Cell-Matrix & Cell-Cell Interactions, telomeres and Selfrenewal, Control of cell migration in tissue engineering.

#### UNIT III BIOMATERIALS

Biomaterials: Properties of biomaterials, Surface, bulk, mechanical and biological properties. Scaffolds & tissue engineering, Types of biomaterials, biological and synthetic materials, Biopolymers, Applications of biomaterials, Modifications of Biomaterials, Role of Nanotechnology.

#### UNIT IV BASIC BIOLOGY OF STEM CELLS

Stem Cells: Introduction, hematopoietic differentiation pathway Potency and plasticity of stem cells, sources, embryonic stem cells, hematopoietic and mesenchymal stem cells, Stem Cell markers, FACS analysis, Differentiation, Stem cell systems- Liver, neuronal stem cells, Types & sources of stem cell with characteristics: embryonic, adult, haematopoetic, fetal, cord blood, placenta, bone marrow, primordial germ cells, cancer stem cells induced pleuripotent stem cells.

#### UNIT V CLINICAL APPLICATIONS

Stem cell therapy, Molecular therapy, In vitro organogenesis, Neurodegenrative diseases, spinal cord injury, heart disease, diabetes, burns and skin ulcers, muscular dystrophy, orthopedic applications, Stem cells and Gene therapy Physiological models, tissue engineered therapies, product characterization, components, safety, efficacy. Preservation –freezing and drying. Patent protection and regulation of tissue engineered products, sethical issues.

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#### **TEXT BOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Bernhard O.Palsson, Sangeeta N.Bhatia	Tissue Engineering	Pearson Publishers	2009
2	Meyer, U.; Meyer, Th.; Handschel, J.; Wiesmann, H.P.	Fundamentals of Tissue Engineering and Regenerative Medicine	-	2009

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Bernard N. Kennedy (editor)	Stem cell transplantation, tissue engineering, and cancer applications	New York: Nova Science Publishers	2008
2	Raphael Gorodetsky, Richard Schäfer	Stem cell based tissue repair	Cambridge: RSC publishing	2011
3	R. Lanza, I. Weissman, J. Thomson, and R. Pedersen	Volume 1-Embryonic Stem Cells; Volume 2-Adult & Fetal Stem Cells	Academic Press	2004
4	R. Lanza, J. Gearhart etal (Eds)	Essential of Stem Cell Biology	Elsevier Academic press	2006
5	J. J. Mao, G. Vunjak- Novakovic et al (Eds)	Translational Approaches In Tissue Engineering & Regenrative Medicine	Artech House, INC Publications	2008
6	Naggy N. Habib, M.Y. Levicar, , L. G. Jiao,.and N. Fisk	Stem Cell Repair and Regeneration	Imperial College Press	2007

#### **17BEBME8E05**

#### SPEECH PROCESSING

#### **COURSE OBJECTIVES:**

- To introduce speech production and related parameters of speech.
- To show the computation and use of techniques such as short time Fourier transform, linear predictive coefficients and other coefficients in the analysis of speech.
- To understand different speech modeling procedures such as Markov and their implementation issues.
- To introduce the models of speech production and acoustic phonetics
- . To teach time and frequency domain techniques for estimating speech parameters
- To teach predictive techniques for speech coding

#### **COURSE OUTCOMES:**

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

- Model speech production system and describe the fundamentals of speech.
- Extract and compare different speech parameters.
- Choose an appropriate statistical speech model for a given application.
- Design a speech recognition system.
- Use different speech synthesis techniques.
- .Analyze application of speech processing in speech compression, speech recognition, and speech synthesis

#### UNIT I BASIC CONCEPTS

Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – Acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

#### UNIT II SPEECH ANALYSIS

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measuresmathematical and perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.

#### UNIT III SPEECH MODELING

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues.

#### UNIT IV SPEECH RECOGNITION

Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-word units; Applications and present status.

#### UNIT V SPEECH SYNTHESIS

Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

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#### **TEXT BOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Lawrence Rabiner and Biing-Hwang Juang	Fundamentals of Speech Recognition	Pearson Education	2003
2	Daniel Jurafsky and James H Martin	Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition	Pearson Education	2002
3	Frederick Jelinek	Statistical Methods of Speech Recognition	MIT Press	1997

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Steven W. Smith	The Scientist and Engineer <sup>*</sup> s Guide to Digital Signal Processing	California Technical Publishing	1997
2	Thomas F Quatier	Discrete-Time Speech Signal Processing – Principles and Practice	Pearson Education	2004
3	Claudio Becchetti and Lucio Prina Ricotti	Speech Recognition	John Wiley and Sons	1999
4	Ben Gold and Nelson Morgan	Speech and audio signal processing, Processing and Perception of Speech and Music	Wiley- India Edition	2006

#### RAPID PROTOTYPING

#### 3003 100

#### 17BEBME8E06 OBJECTIVE:

- Generating a good understanding of RP history, its development and applications.
- To expose the students to different types of Rapid prototyping processes,
- Materials used in RP systems and reverse engineering.
- To provide knowledge on different types of Rapid Prototyping systems and its applications in various fields
- Understand Selective Laser Sintering
- Know Direct shell production casting

### **OUTCOME:**

- To provide knowledge on different types of Rapid Prototyping systems and its applications in various fields
- Generating a good understanding of RP history, its development and applications.
- To expose the students to different types of Rapid prototyping processes,
- Materials used in RP systems and reverse engineering.
- Familiarise Laser Engineered Net Shaping (LENS).
- Know medical data processing

### UNIT I INTRODUCTION

History – Development of RP systems – Applications in Product Development, Reverse Engineering, Rapid Tooling, Rapid Manufacturing- Principle – Fundamental – File format – Other translators – medical applications of RP - On demand manufacturing – Direct material deposition - Shape Deposition Manufacturing.

### UNIT II LIQUID BASED AND SOLID BASED RAPID PROTOTYPING SYSTEMS 9

Classification – Liquid based system - Stereolithography Apparatus (SLA), details of SL process, products, Advantages, Limitations, Applications and Uses. Solid based system - Fused Deposition Modeling, principle, process, products, advantages, applications and uses - Laminated Object Manufacturing

### UNIT III POWDER BASED RAPID PROTOTYPING SYSTEMS

Selective Laser Sintering – principles of SLS process, principle of sinter bonding process, Laser sintering materials, products, advantages, limitations, applications and uses. Three Dimensional Printing – process, major applications, research and development. Direct shell production casting – key strengths, process, applications and uses, case studies, research and development. Laser Sintering System, e-manufacturing using Laser sintering, customized plastic parts, customized metal parts, e-manufacturing - Laser Engineered Net Shaping (LENS).

### UNIT IV MATERIALS FOR RAPID PROTOTYPING SYSTEMS

Nature of material – type of material – polymers, metals, ceramics and composites- liquid based materials, photo polymer development – solid based materials, powder based materials - case study.

### UNIT V REVERSE ENGINEERING and NEW TECHNOLOGIES

Introduction, measuring device- contact type and non-contact type, CAD model creation from point clouds-preprocessing, point clouds to surface model creation, medical data processing - types of medical imaging, software for making medical models, medical materials, other applications – Case study.

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#### **TEXT BOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Rafiq I. Noorani	Rapid Prototyping – Principles and	Wiley & Sons	2006
2	Chua C.K, Leong K.F and Lim C.S	Rapid Prototyping: Principles and Applications	second edition, World Scientific	2003

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	N.HOPKINSON, R.J.M, HAUGE, P M, DICKENS	Rapid Manufacturing – An Industrial revolution for the digital age	Wiley	2006
2	IAN GIBSON	Advanced Manufacturing Technology for Medical	Wiley	2006
3	Paul F.Jacobs	Rapid Prototyping and Manufacturing, "Fundamentals of Stereo lithography	McGraw Hill	1993
4	D.T.Pham and S.S. Dimov	Rapid Manufacturing	Springer Verlog	2001

#### **17BEBME8E07**

#### **BIO MEMS**

3003 100

#### **COURSE OBJECTIVES:**

#### The student should be made to:

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

#### **COURSE OUTCOMES:**

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

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

#### UNIT I MEMS MATERIALS AND FABRICATION

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

#### UNIT II MECHANICAL AND THERMAL SENSORS AND ACTUATORS

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

### UNIT III ELECTROSTATIC AND PIEZOELECTRIC SENSORS AND ACTUATORS 9

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

#### UNIT IV MICROFLUIDIC SYSTEMS

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

### UNIT V APPLICATIONS OF BIOMEMS

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

### Total: 45

### **TEXT BOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Tai Ran Hsu	MEMS and Microsystems Design and Manufacture	Tata McGraw Hill Publishing Company, New Delhi	2002
2	Wanjun Wang, Stephen A.Soper	BioMEMs: Technologies and Applications	CRC Press, New York	2007

### **REFERENCES:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Marc J. Madou	Fundamentals of Microfabrication: the Science of Miniaturization	CRC Press	2002
2	Nadim Maluf, Kirt Williams	An introduction to Microelectro Mechancial Systems Engineering	Second Edition, Artech House Inc, MA,	2004
3	Chang Liu,	Foundations of MEMS	Pearson Education International, New Jersey, USA	2006
4	Nitaigour Premchand Mahalik	MEMS	Tata McGraw Hill Publishing Company, New Delhi	2007

### **COURSE OBJECTIVES:**

### The student should be made to:

- Learn how to value intangible assets, taking into account their commercial potential and legal status.
- Explore the legal & business issues surrounding marketing of new products related to technology.
- Review an intellectual property portfolio and comprehend the extent of their protection.
- Develop a business plan that advances the value of their intellectual property portfolio
- Develop a strategy of marketing their intellectual property and understand some negotiation basics.
- Explain some of the limits of their intellectual property rights and comprehend some basic legal pitfalls.

### **OUTCOMES:**

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

- Review an intellectual property portfolio and comprehend the extent of their protection.
- Develop a business plan that advances the value of their intellectual property portfolio
- Learn how to value intangible assets, taking into account their commercial potential and legal status.
- Explore the legal & business issues surrounding marketing of new products related to technology.
- Develop a strategy of marketing their intellectual property and understand some negotiation basics.
- Explain some of the limits of their intellectual property rights and comprehend some basic legal pitfalls.

### UNIT I INTRODUCTION

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

### UNIT II PATENTS, COPYRIGHTS AND TRADEMARKS

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

### UNIT III INTERNATIONAL STANDARDISATION

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

### UNIT IV INDIAN STRATEGIES

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

### UNIT V CASE STUDIES

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

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### **TEXT BOOK:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
		Handbook of Indian Patent	S. Viswanathan,	
1	Subbaram N.R	Law and Practice	Printers and	1998
		Law and Flactice	Publishers Pvt. Ltd	

### **REFERENCES:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Eli Whitney	United States Patent Number: 72X	Cotton Gin	March 14, 1794
2	Derwent IP Matters	Using the Internet for non- patent prior art searches	-	July 2000.

### **ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS 17BEBME8E09** 3003 100

### **COURSE OBJECTIVES:**

The student should be made to:

The goal of this course is for students

- To impart Adequate knowledge on their presentation and structures of artificial intelligence and to study in depth about the expert systems and its tools.
- To Learn various knowledge representation techniques.
- To Understand different types slot & filler structures •
- To Know the application of expert systems
- To Comprehend the characteristics of tools for building expert systems .
- To Explain the need and use of AI.

### **OUTCOMES:**

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

- Provides a review on artificial intelligence and internal representation. •
- Discuss various knowledge representation techniques..
- Explain different types of slot & filler structures
- Analyse the application of expert systems
- Develop a knowledge representation portfolio
- Develop a strategy of designing expert systems.

### UNIT I **AI & INTERNAL REPRESENTATION**

The AI problem- What is AI technology- Level of the Model-Criteria for Success problems, Problem Spaces & Searches & Heuristic Search Technology Problem as a State Space Search-Production Systems- Production System Characteristics- Generate & Test- Hill Climbing -Best First Search-Constraint Satisfaction-Means End Analysis.

### UNIT2 **KNOWLEDGE REPRESENTATION**

Issues in Knowledge Representation - Using Predicate Logic- Representing Simple Facts in Logic, Representing Instance & Isa Relationship-Computable Functions & I Predicates-Representing Knowledge Using Rules: Procedural Vs. Declarative Knowledge-Forward Vs. Backward Reasoning.

### UNIT3 **SLOT & FILLER STRUCTURES**

Weak Slot & Filler- Semantic Nets- Frames Strong & filler Structures- Scripts- CYC-CYCL

### UNIT4 **EXPERT SYSTEMS**

What are Expert Systems- Knowledge Representation in Expert Systems- Symbolic Computation-Rule based Systems

### UNIT5 TOOLS FOR BUILDING EXPERT SYSTEMS

Using Domain Knowledge- Knowledge Acquisition- Design for Explanation-Black Board Architecture- Truth Maintenance Systems-Machine Learning- Case based Reasoning

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## **TEXT/REFERENCEBOOKS**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Elaine Rich, Kevin Knight	Artifical Intelligence	2 <sup>nd</sup> Edition, Tata McGraw Hill	1992
2	Peter Jackson,	Introduction to Expert Systems	3 <sup>rd</sup> Edition,Addison Wesley,1 <sup>st</sup> Indian Reprint	2000

### **17BEBME8E10 NEURAL NETWORKS AND APPLICATIONS**

### **OBJECTIVES:**

### The student should be made to:

- To understand biological and statistical foundations of neural networks,
- To explain the fundamentals of neural networks. •
- To introduce the basic concepts of neural networks and its applications in various domain
- To educate about supervised and unsupervised learning process
- To have a solid understanding of various neural network model
- To learn the concepts of Self-organizing map (SOM) algorithm

### **OUTCOMES:**

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

- Understand the basic concepts of neural networks and its applications in various domains
- Gain knowledge about learning process in Neural Networks •
- Analyse neural network architectures
- Design using Adaptive Resonance Theory (ART) technique
- Design Back Propagation and Hopfield network.
- Gain knowledge on SOM concepts.

### UNIT I NEURON MODEL NETWORK ARCHITECTURE

Neuron model - single input neuron -activation function - multiple input neuron neural networks viewed as directed graphs -feedback - network architectures - knowledge representation - linear and non- linear separable problem(XOR)

### UNIT II **LEARNING PROCESS**

Error - correction learning - memory based learning - Hebbian learning-competitive learning-Boltzmann learning-credit assignment problem-supervised and unsupervised learning-adaptation statistical learning theory.

### UNIT III PERCEPTRONS

Single layer perceptron-Adaptive filtering-unconstrained optimization-Least-mean square algorithm-Learning curve-Annealing Technique-perception convergence theorem- Relationship between perceptron and Baye's classifier-Back propagation algorithm- Network pruning techniques-supervised learning viewed as an optimization problem convolutional network. Application to Adaptive Prediction and character recognition.

### UNIT IV ATTRACTOR NEURAL NETWORK AND ART

Hopfield model-BAM model-BAM stability-Adaptive BAM -Lyapunov function-effect of gain-Hopfield design-Application to TSP problem-ART- layer 1-layer 2-orienting subsystem-Leaning lawL1-L2- Leaning law L2-L1-ART algorithm-ARTMAP

### UNIT V **PRINCIPAL COMPONENT ANALYSIS AND SELF ORGANIZATION 9**

Principle of self organization-Principle Component analysis-Adaptive PCA using Lateral inhibition-Two classes of PCA algorithm-Two basic feature- mapping model-self organizing map-SOM Algorithm properties of the feature map-LVQ-Hierarchical vector Quantization. Applications of selforganizing maps: The Neural Phonetic Typewriter- Learning Ballistic Arm Movements

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**TEXT BOOKS:** 

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Freeman J.A., Skapura D.M	Neural Networks, Algorithms, Applications, and Programming Techniques	Addition Wesley	2005
2	Laurene Fausett	Fundamentals of Neural Networks: Architectures, Algorithms, and Applications	Pearson/ Prentice Hall	-

### **REFERENCES:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Simon Haykin	Neural Networks and Learning Machines	3rd Edition- Pearson/ Prentice Hall	2009
2	Robert J Schalkoff	Artificial Neural Networks	McGraw Hill	1997

## LIST OF OPEN ELECTIVES OFFERED BY SCIENCE AND HUMANITIES DEPARTMENT

### 17BESHOE01PROBABILITY AND RANDOM PROCESS3003100

### **OBJECTIVES:**

- To gain knowledge in measures of central tendency.
- To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of probability, one- and two-dimensional random variables
- To introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the basic concepts of random processes which are widely used in IT fields.
- To understand the concept of correlation and spectral densities.

### **COURSE OUTCOMES:**

- Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
- To understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- To understand the basic concepts of one- and two-dimensional random variables and apply in engineering applications.
- To apply the concept random processes in engineering disciplines.
- The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable.
- The students will have an exposure of various distribution functions, correlation and spectral densities.

### UNIT I MEASURES OF CENTRAL TENDENCY AND PROBABILITY (9)

Measures of central tendency – Mean, Median, Mode - Standard DeviationProbability – Random variable - Axioms of probability - Conditional probability – Total probability – Baye's theorem.

### UNIT II STANDARD DISTRIBUTIONS

Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma(one Parameter only) and Normal distributions - Moment generating functions, Characteristic function and their properties – *Chebyshev's inequality*.

### UNIT III TWO DIMENSIONAL RANDOM VARIABLES

Joint distributions - Marginal and conditional distributions - Probability mass function - Probability density functions - Covariance - Correlation and regression

### UNIT IV CLASSIFICATION OF RANDOM PROCESS

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

### UNIT V CORRELATION AND SPECTRAL DENSITIES

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Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function - Linear time invariant system - System transfer function –Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

Total: 45

### **TEXTBOOK:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of
				publication
1	Peebles Jr, P. Z	Probability Random Variables and Random Signal Principles	Tata McGraw-Hill Pubishers, New Delhi.	2002

### **REFERENCES:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Ross, S	A first Course in Probability	Pearson Education, New Delhi (Chap 2 to 8)	2012
2	Gupta, S.C.	Fundamentals of	Chand and Sons, New Delhi	2014
	V.K	Statistics		
3	Veerarajan,T	Probabilitiy, Statistics	Tata McGraw-Hill	2008
		and Random process	Education pvt. Ltd., New	
			Delhi	
4	Henry Stark	Probability and	Pearson Education, Third	2002
	and John W.	Random Processes	edition, Delhi	
	Woods	with Applications to		
		Signal Processing		

- 1. www.cut-theknot.org/probability.shtml
- 2. www.mathcentre.ac.uk
- 3. <u>www.mathworld.Wolfram.com</u>

### **17BESHOE02**

### **OBJECTIVES:**

- Be able to understand basic knowledge of fuzzy sets and fuzzy logic •
- Be able to apply basic knowledge of fuzzy operations.
- To know the basic definitions of fuzzy relations
- Be able to apply basic fuzzy inference and approximate reasoning
- To know the applications of fuzzy Technology.
- To understand the concepts of Probability Measures vs Possibility Measures

### **COURSE OUTCOMES:**

- To gain the main subject of fuzzy sets.
- To understand the concept of fuzziness involved in various systems and fuzzy set theory. •
- To gain the methods of fuzzy logic.
- To comprehend the concepts of fuzzy relations. •
- To analyze the application of fuzzy logic control to real time systems.
- The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.

### UNIT I FUZZY SETS

Fuzzy Sets : Basics Classical sets vs Fuzzy Sets - Need for fuzzy sets - Definition and Mathematical representations - Level Sets - Fuzzy functions - Zadeh's Extension Principle

### **UNIT II OPERATIONS ON FUZZY SETS**

Operations on Fuzzy Sets Operations on [0, 1] – Fuzzy negation, triangular norms, tconorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

### **FUZZY RELATIONS UNIT III**

Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations

### **UNIT IV FUZZY MEASURES**

Possibility Theory Fuzzy Measures - Evidence Theory - Necessity and Belief Measures -Probability Measures vs Possibility Measures

### UNIT V **FUZZY INFERENCE**

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference -Compositional rule of Inference - Efficiency of Inference - Hierarchical

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### **TEXTBOOK:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of
				publication
1	George J Klir and	Fuzzy Sets and Fuzzy	Prentice Hall of	2003
	Bo Yuan	Logic: Theory and	India, New Delhi.	
		Applications		

### **REFERENCES:**

S.NO.	Author(s) Name	Title of the	Publisher	Year of
		book		publication
1	Zimmermann H.J.	Fuzzy Set Theory	Kluwer Academic	2001
		and its	publishers, USA.	
		Applications		
2	Michal Baczynski and	Fuzzy Implications	Springer-Verlag	2008
	BalasubramaniamJayara		publishers, Heidelberg	
	m			
3	Kevin M Passino and	Fuzzy Control	Addison Wesley	1998
	Stephen Yurkovich		Longman publishers,	
			USA	

- 1. www.mathcentre.ac.uk
- 2. www.mathworld. Wolfram.com
- 3. www.calvin.edu/~pribeiro/othrlnks/Fuzzy/fuzzysets.htm

### **17BESHOE03**

### **OBJECTIVES:**

- To introduce the basic concepts of vector space
- To know the fundamentals of linear Algebra
- To solve system of linear equations
- To study about the linear transformations
- To introduce the concepts of inner product spaces
- To understand the importance of Linear Algebra and its applications in branches of Mathematics

### **OUTCOMES:**

- To explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- To describe the fundamental concepts of Eigen values and Eigen vectors by using Power method.
- To apply the fundamental concepts in their respective engineering fields
- To visualize linear transformations as matrix form
- To recognize the underlying theory of vector spaces over a field and inner product spaces over real or complex numbers
- To articulate the importance of Linear Algebra and its applications in branches of Mathematics.

### UNIT I VECTOR SPACES

General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space,

### UNIT II EIGEN VALUES AND EIGEN VECTORS

Eigen values and Eigen vectors - Diagonalization - Power method - QR decomposition

### UNIT III SYSTEM OF LINEAR EQUATIONS

Direct methods, Gauss elimination method, Gauss Jordan method, Crout's method, iterative methods, Gauss-Jacobi method, Gauss-Seidel method, convergence criteria.

### UNIT IV LINEAR TRANSFORMATIONS

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigen vectors - Diagonalization

### UNIT V INNER PRODUCT SPACES

The Dot Product on  $R^n$  and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application : Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

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## **TEXTBOOKS:**

S.NO.	Author(s)	Title of the book	Publisher	Year of
	Name			publication
1	Kreyszig,E	Advanced Engineering	John Wiley &	2014
		Mathematics	Sons, New	
			Delhi.	
2	ShahnazBathul	Text book of Engineering	PHI	2009
		Mathematics (Special	Publications,	
		Functions and Complex	New Delhi.	
		Variables)		

### **REFERENCES:**

S.NO.	Author(s) Name	Title of the	Publisher	Year of
		book		publication
1	Kreyszig,E	Advanced	John Wiley & Sons,	2014
		Engineering	New Delhi.	
		Mathematics		
2	Anton and	Elementary Linear	Wiley India Edition,	2012
	Rorres	Algebra,	New Delhi.	
		Applications		
		version		
3	Jim Defranza,	Introduction to	Tata McGraw-Hill,	2008
	Daniel Gagliardi	Linear Algebra	New Delhi.	
		with Application		

- 1. www.sosmath.com
- www.nptel.ac.in
  www.mathworld.wolfram.com

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### **OBJECTIVES:**

**17BESHOE04** 

- To disseminate the fundamentals of acoustic waves. (K)
- To inculcate the characteristics of radiation and reception of acoustic waves. (K)
- To divulge knowledge on the basics of pipe resonators and filters.(S)
- To introduce the features of architectural acoustics.(**S**)
- To impart the basic knowledge of transducers and receivers.(K)
- To introduce the applications of Engineering acoustics

### **COURSE OUTCOMES:**

- Develop the idea of the fundamentals of acoustic waves.
- Apply the concepts of radiation and reception of acoustic waves.
- Explain the basic ideas of pipe resonators and filters.
- Illustrate the basics of architectural acoustics.
- Illustrate the transducers and receivers and its applications in various electronic devices.
- Apply the knowledge inputs of the course for engineering applications.

### UNIT I INTRODUCTION

Acoustics waves – Linear wave equation – sound in fluids – Harmonic plane waves -Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales.Reflection and Transmission:Transmission from one fluid to another normal and oblique incidence – method of images.

### UNIT II RADIATION AND RECEPTION OF ACOUSTIC WAVES

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source radiation impedance - Fundamental properties of transducers. Absorption and attenuation of sound. Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

### UNIT III PIPES RESONATORS AND FILTERS

Resonance in pipes - standing wave pattern absorption of sound in pipes – long wavelength limit – Helmoltz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters – low pass, high pass and band pass. Noise, Signal detection, Hearing and speech. Noise, spectrum level and band level – combing band levels and tones – detecting signals in noise – fundamental properties of hearing – loudness level and loudness – pitch and frequency – voice.

### UNIT IV ARCHITECTURAL ACOUSTICS

Sound in endosure – A simple model for the growth of sound in a room – reverberation time -Sabine, sound absorption materials – measurement of the acoustic output of sound sources in live rooms – acoustics factor in architectural design. Environmental Acoustics: Highway noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design of portions.

### UNIT V TRANSDUCTION

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker– horn loud speaker, receivers – condenser –

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microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers

Total: 45

### **TEXTBOOK:**

S.NO	Author(s) Name	Title of The Book	Publisher	Year of
				Publication
1	LawerenceE.Kinsler,	Fundamentals of	John Wiley &	2000
	Austin R.Frey,	Acoustics	Sons	

### **REFERENCE:**

S.NO	Author(s) Name	Title of The Book	Publisher		Year	of
					Publication	
1	F. AltonEverest &	Master Handbook	McGraw	Hill	2014	
	Ken Pohlmann	of Acoustics	Professional			

- 1. www.acousticalsociety.org
- 2. www.acoustics-engineering.com
- 3. www.nptel.ac.in
- 4. www. ocw.mit.edu

### SOLID WASTE MANAGEMENT

### 17BESHOE05 OBJECTIVES:

- To make the students conversant with basics of Solid waste sand its classification.
- To make the student acquire sound knowledge of different treatments of solid wastes.
- To acquaint the student with concepts of waste disposals.
- To develop an understanding of the basic concepts of Hazardous waste managements.
- To acquaint the students with the basics of energy generation from waste materials.
- To understand the chemical principles in field of engineering and technology

### **COURSE OUTCOMES:**

- Outline the basic principles of Solid waste and separation of wastes (K).
- Identify the concepts of treatment of solid wastes (S).
- Identify the methods of wastes disposals. (S)
- Examine the level of Hazardousness and its management. (S)
- Examine the possible of the energy production using waste materials. (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A).

## UNIT I SOLID WASTE

Definitions – Sources, Types, Compositions, Properties of Solid Waste – Municipal Solid Waste – Physical, Chemical and Biological Property – Collection – Transfer Stations – Waste Minimization and Recycling of Municipal Waste

### UNIT II WASTE TREATMENT

Size Reduction – Aerobic Composting – Incineration – batch type and continuous flow type, Medical/ Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due to Incineration

### UNIT III WASTE DISPOSAL

Sanitary Land Fill Method of Solid Waste Disposal – Land Fill Classification, Types, Methods &Siting Consideration – Layout & Preliminary Design of Land Fills – Composition, Characteristics generation, Movement and Control of Landfill Leachate & Gases – Environmental Monitoring System for Land Fill Gases, Waste landfill Remediation

### UNIT IV HAZARDOUS WASTE MANAGEMENT

Definition & Identification of Hazardous Waste – Sources and Nature of Hazardous Waste – Impact on Environment – Hazardous Waste Control – Minimization and Recycling -Assessment of Hazardous Waste Sites – Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure, Remediaiton, risk assessment.

## UNIT V ENERGY GENERATION FROM WASTE

Thermal conversion Technologies – Pyrolysis systems, Combustion systems, Gasification systems, Environment control systems, Energy recovery systems. Biological & Chemical conversion technologies – Aerobic composting, low solids. Anaerobic digestion, high solids anaerobic digestion, Energy production from biological conversion products, other biological transformation processes.

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### **TEXTBOOK:**

S.NO	Author(s) Name	Title of The BookPublisher	Year of
			Publication
1	Dara.S.S,Mishra.D.D	A Text book of S.Chand and	2011
		Environmental Company Ltd., New	
		Chemistry and Pollution Delhi.	
		Control	

### **REFERENCES:**

S.NO	Author(s) Name	Title of The Book	Publisher	Year of
				Publication
1	Naomi B.	Waste to Energy	Woodhead	2013
	Klinghoffer	Conversion Technology	Publishing Ltd.,	
	and Marco J.	(Woodhead Publishing	Cambridge, UK	
	Castaldi	Series in Energy)		
2	Frank	Hand Book of Solid Waste	McGraw Hill	2002
	Kreith, George	Management- 2 <sup>nd</sup> edition	Publishing Ltd.,	
	Tchobanoglous		Newyork	
3	Shah, L Kanti	Basics of Solid &	Prentice Hall (P)	1999
		Hazardous Waste	Ltd.,	
		Management Technology	New Delhi.	

- 1. www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid\_Waste.
- 2. http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/
- 3. www.alternative-energy-news.info/technology/garbage-energy/
- 4. nzic.org.nz/Chem Processes/environment/

## 17BESHOE06

### **GREEN CHEMISTRY**

### **OBJECTIVES:**

- To make the students conversant about the green chemistry
- To make the student acquire sound knowledge of the atom efficient process and synthesis elaborately.
- To acquaint the student with concepts of green technology.
- To develop an understanding of the basic concepts of renewable energy resources.
- To acquaint the students with the basics information on catalysis.
- To understand the chemical principles in in field of engineering and technology

### **COURSE OUTCOMES:**

- Outline the basic principles of green chemistry (K).
- Examine the different atom efficient process and synthesis elaborately (S).
- Apply the concepts combustion of green technology (S).
- Identify and apply the concepts of renewable energy (S).
- Apply the concepts of green catalysts in the synthesis (S).
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

### UNIT I INTRODUCTION TO GREEN CHEMICAL PRINCIPLES

Definition, tools, and twelve principles of green chemistry, solvent-less reactions and reactions in water, microwaves and fluorous solvents, green resolution of racemic mixtures, materials for a sustainable economy, chemistry of longer wear, agrochemicals: problems and green alternate solutions.

### UNIT II ATOM EFFICIENT PROCESSES

Atom efficient processes, evaluating chemical reagents according to their yield and atom efficiency, examples of efficient stoichiometric and catalytic processes, atom economy and homogeneous catalysis, halide-free synthesis and alternatives to Strecker synthesis.

### UNIT III BIOTECHNOLOGY AND GREEN CHEMISTRY

Bio technology and its applications in environmental protection-Bio informatics-Bio remediation, biological purification of contaminated air.Green chemistry for clean technology-Significance of green chemistry-Basic components of green chemistry, Industrial applications of green chemistry, green fuels-e-green propellants and bio catalysts.

### UNIT IV RENEWABLE RESOURCES

Use of renewable materials, evaluating feedstock and starting materials and their origins, toxicity, sustainability and the downstream implications of the choice of feedstock, commodity chemicals from glucose and biomass conversion.

### UNIT V CATALYSIS IN GREEN CHEMISTRY

Catalysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites, oxidation using molecular oxygen.

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**TEXTBOOKS:** 

S.NO	Author(s) Name	Title of The Book	Publisher	Year of
				Publication
1	Sanjay K. Sharma,	Green Chemistry for	CRC Press,London	2010
	AckmezMudhoo	Environmental		
		Sustainability		
2	Ahluwalia V. K.	New Trends in Green	Anamaya	2007
	and M.Kidwai	Chemistry	publishers, New	
		2 <sup>nd</sup> edition	Delhi.	

### **REFERENCES:**

S.NO	Author(s) Name	Title of The Book	Publisher	Year of
				Publication
1	Dr. SunitaRatan	A Textbook of	S.K. Kataria and	2012
		Engineering Chemistry	Sons., New Delhi.	
2	MukeshDoble. Ken	Green Chemistry and	Academic Press,	2007
	Rollins, Anil Kumar	Engineering, 1 <sup>st</sup> edition	Elesevier., New	
			Delhi.	
3	Desai K. R.	Green Chemistry	Himalaya	2005
			Publishing House,	
			Mumbai.	
4	Matlack A. S.	Introduction to Green	Marcel Dekker:	2001
		Chemistry	New York	

1	1.	http://www.organic-chemistry.org/topics/green-chemistry.shtm
2	2.	http://www.essentialchemicalindustry.org/processes/green-chemistry.html
3	3.	http://www.chm.bris.ac.uk/webprojects2004/vickery/green_solvents.htm
Z	4.	http://www.epa.gov/research/greenchemistry/
5	5.	http://www.amazon.in/Green-Chemistry-Catalysis

**APPLIED ELECTROCHEMISTRY** 

# **OBJECTIVES:**

**17BESHOE07** 

- To make the students conversant with the information on electrochemical material.
- To make the student acquire sound knowledge of conducting polymers.
- To acquaint the student with concepts of Energy storage devices.
- To develop energy storage devices.
- To impart knowledge on basic principles of solar cells and its applications
- To understand about electrochemical material science

### **COURSE OUTCOMES:**

- Outline the basic principles of chemistry in electrochemical material (K).
- Examine the properties of conducting polymers (S).
- Apply the concepts of electrochemistry in storage devices. (S)
- Identify the concepts of storage devices and its applications. (S)
- Apply the suitable materials for the manufacturing of storage devices. (S)
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A)

### UNIT I **METAL FINISHING**

Fundamental principles, surface preparation-Electroplating of copper, nickel, chromium, zinc and precious metals (gold & silver)- Electroplating for electronic industry- Alloy plating, brass plating-Electro less plating of nickel- anodizing – Electroforming – Electro winning.

### CONDUCTING POLYMERS AND ELECTROCHEMICALS UNIT II

Electropolymerization- anodic and cathodic polymerization-effect of reaction parameters on the course of the reaction- Electrochemical preparation of conducting polymers- poly acetylene-Electrolytic production of perchlorates and manganese dioxide- Electro organic chemicals- constant current electrolysis.

### UNIT III BATTERIES AND POWER SOURCES-I

Principles of energy conservation- electrochemical energy conservation- thermodynamic reversibility, Gibbs equation. EMF- battery terminology, energy and power density- Properties of anodes, cathodes, electrolytes and separators- Types of electrolytes.

### UNIT IV **BATTERIES AND POWER SOURCES-II**

Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries, Lithium ion batteries- construction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells- Introduction, types of fuel cells, advantages.

### UNIT V ELECTROCHEMICAL MATERIAL SCIENCE

Solar cells- Preparation of CdS/Cu<sub>2</sub>S solar cells by screen printing techniques and their characteristics - Amorphous silicon solar cells - Photo electrochemical cells(PEC) for conversion of light energy to electrical energy - PEC cells based on Cd/Se and Ga/As characteristics.

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## LTPC

**TEXTBOOKS:** 

S.NO	Author(s) Name	Title of The Book	Publisher	Year of
				Publication
1	Cynthia G. Zoski	Hand Book of	Academic Press,	2007
		Electrochemistry	Elesevier., UK	
2	D.Pletcher and	Industrial	Chapman and Hall,	1990
	F.C.Walsh	Electrochemistry	London	

### **REFERENCES:**

S.NO	Author(s) Name	Title of The Book	Publisher	Year of
				Publication
1	M. Barak	Electrochemical Power	I.EEE series, Peter	1997
		Sources	Peregrinius Ltd,	
			Steverage, U.K.	
2	Bruno Scrosati	Applications of	Chapman & Hall,	1993
		Electroactive Polymers	London	
3	K.L. Chopra and I.	Thin Film Devices and	Plenum Press, New	1983
	Kaur	their Application	York.	
4	M.M.Baizer	Organic Electrochemistry	Dekker Inc. New	1983
			York	

- 1. http://www.anoplate.com/finishes/
- 2. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html
- 3. http://inventors.about.com/od/sstartinventions/a/solar\_cell.htm

### **OBJECTIVES:**

- To make the students conversant with cement and lime and its uses.
- To make the student acquire sound knowledge of abrasives and refractories.
- To acquaint the student with concepts of inorganic chemicals.
- To develop an understanding of the basic concepts explosives.
- To acquaint the students with the basics of agriculture chemicals.
- To understand the chemical principles in in field of engineering and technology

### **COURSE OUTCOMES:**

- Outline the basic chemistry of **cement and lime** (**K**).
- Examine the uses of abrasives and refractories (S).
- Identify the usage of the inorganic chemicals. (S)
- Identify the concepts of explosives and smoke screens (S).
- Identify the usage of the **agriculture** chemicals (S).
- Integrate the chemical principles in the projects undertaken in field of engineering and technology (A).

### UNIT I CEMENT AND LIME

Manufacture of Portland cement – settling of hardening of portland cement – regauging cement – effect of fineness on setting and hardening – freezing – high early strength cement – high alumina cement Lime – raw materials- manufacture – slaking – lime mortar – types of lime – high – calcium or fat lime – calcium lime or lean lime – magnesian lime – dolomitic lime – hydraulic lime.

### UNIT II ABRASIVES AND REFRACTORIES

Abrasives – hard abrasives – siliceous abrasives – soft abrasives – artificial abrasives – uses. Refractories – definition – classification – acid refractories – basic refractories – neutral refractories – properties – uses.

### **UNIT III INORGANIC CHEMICALS**

 $\begin{array}{l} Common \ salt \ and \ soda \ ash \ - \ manufacture \ - \ different \ grades \ - \ products \ - \ alkalis \ - \ Na_2CO_3, \ caustic \ soda \ and \ chlor-alkali \ industry \ - \ manufacture \ principles \ of \ electrolytic \ process \ - \ chlorine \ - \ storage. \ Hydrochloric \ acid \ - \ manufacture \ - \ absorption \ - \ uses, \ sulphur \ and \ sulphuric \ acid \ - \ extraction \ of \ sulphur \ - \ manufacture \ of \ H_2SO_4 \ - \ chamber \ - \ contact \ processes \ - \ industrial \ uses. \end{array}$ 

### **UNIT IV EXPLOSIVES**

Explosives – uses – properties and tests – explosives for war – nitrocellulose – picric acid and T.N.T. – industrial explosives – nitroglycerin and dynamites – black powder – smoke screens – incendiaries – gas mask.

### UNIT V AGRICULTURE CHEMICALS

Fertilizers – organic and inorganic – ammoniated superphosphates, sodium nitrate, solid pellets – potassium salts – pesticides – fungicides – herbicides – their preparations and characteristics – environmental impacts.

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### **TEXTBOOKS:**

S.NO	Author(s) Name	Title of The Book	Publisher	Year of
				Publication
1	Harikrishan	Industrial Chemistry	Goel Publishing	2014
			House, Meerut.	
2	B.K. Sharma	Industrial Chemistry	Goel Publishing	2000
			House, Meerut.	

### **REFERENCES:**

S.NO	Author(s) Name	Title of The Book	Publisher	Year of
				Publication
1	B.N.Chakrabarty	Industrial Chemistry	Oxford and IBH	1998
			Publishing CO. New	
			Delhi.	
2	James A. Kent	Hand Book of Industrial	Van Nostrand	1992
		Chemistry, 9 <sup>th</sup> edition	Reinhold, New	
3	R.N. Sherve	Chemical Process	McGraw-Hill,	1984
		Industries	Kugakuisha Ltd.,	
			Tokyo.	
4	S.D. Shukla and	A Text book of Chemical	Vikas Publishing	1979
	G.N. Pandy	Technology	House (P) Ltd, New	
			Delhi	

- 1. http://en.wikipedia.org/wiki/Cement
- 2. http://www.hon.ch/HONselect/Selection/D01.html
- 3. <u>http://fas.org/man/dod-101/navy/docs/fun/part12.htm</u>
- 4. http://toxics.usgs.gov/topics/agchemicals.html

**ENGLISH FOR TECHNOCRATS** 

# **17BESHOE09**

### **OBJECTIVES:**

- Develop abilities to write technically and expressively.
- Recognize writing as a constructive, meaningful process.
- Practise using reading strategies for effective writing.
- To develop communication skills
- Understand English grammar and usage of various phrases and idioms
- Construct simple sentences, correct common grammatical errors in written English.

### **COURSE OUTCOMES:**

- Construct simple sentences, correct common grammatical errors in written English.
- Develop confidence in English language by imbibing lexical and syntax rules.
- Enrich their reading ability for effective writing.
- Elevate them to minimize word, sentence, and paragraph length without sacrificing clarity or substance
- Familiarize with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.
- Demonstrate the basic components of definitions, descriptions, process explanations, and other common forms of technical writing.

### UNIT I **BASICS OF WRITING**

Introduction to Technical Writing – Importance of Writing – Characteristics of Writing – Audience Recognition/ Analysis - Appropriateness of language -- Conciseness and Flow- Bias free and plain writing – Impersonal and Formal Language -Techniques of Technical Writing– Overcoming writer's block – Prioritizing for effective writing– Avoiding plagiarism.

### PARAGRAPHS AND ESSAYS UNIT II

Expressing Ideas - Paragraph construction - Cohesion and Coherence - Adequate development -Kinds of paragraphs – Writing drafts – Paragraph length and pattern – Types of Essays – Characteristics of Essays - Salient point of sentence constructions.

### UNIT III **LETTERS, MEMOS AND EMAIL**

Formal written correspondence - Types of messages - Business letters - Structure of letters -Language in letters - Tense in letters - Cover letters - Resumes - Curriculum vitae - Memos -Emails – Email Etiquette – Effectiveness and purpose.

### THE ART OF CONDENSATION AND TECHNICAL PROPOSALS 9 UNIT IV

Steps to Effective précis writing - Guidelines - Technical Proposals - Types of Proposals -Characteristics – Body of the Proposals – Style and appearance – Evaluation of proposals – Proof Reading – Book /Film Review – Travelogue – Dialogue Writing.

### UNIT V **REPORTS AND RESEARCH ARTICLES**

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### LTPC 1403

Discussion of newspaper articles -Objectives of Reports – Characteristics of Reports – Structure of Reports – Types of Reports – Writing an article – Writing research articles – Essential features of Dissertation – Organizing the structure of thesis and articles – Writing technical description.

### Total: 45

### **TEXTBOOK:**

S.NO	Author(s) Name	Title of The Book	Publisher	Year of
				Publication
1	V.N. Arora	Improve Your Writing:	OUP	2014
	& Lakshmi	Revised First Edition		

### **REFERENCES:**

S.NO	Author(s) Name	Title of The Book	Publisher	Year of
				Publication
1	Crème, P. and M. Lea.	Writing at University: A guide for students.	OUP	2003
2	Graham King	Collins Improve Your Writing	Collins; First edition	2009
3	David Morley	The Cambridge Intro. To Creative Writing	Cambridge	2008

- 1. http://www.stevepavlina.com/blog/2006/08/10-ways-to-improve-your-technical-skills/
- 2. http://www.nyu.edu/classes/keefer/brain/net2.html
- 3. https://www.udemy.com/technical-writing-and-editing/
- 4. http://techwhirl.com/what-is-technical-writing/

## LIST OF OPEN ELECTIVES OFFERED BY COMPUTER SCIENCE ENGINEERING DEPARTMENT

### 17BECSOE01 INTERNET PROGRAMMING

L T P C

### 3 0 0 3

### **Course Objectives:**

- To introduce the Java programming language and explore its current strengths and Weaknesses
- To study the way that object-oriented concepts are implemented in the Java programming language
- To write working Java code to demonstrate the use of applets for client side programming
- To study the way that exceptions are detected and handled in the Java programming language
- To write working Java code that demonstrates multiple threads of execution
- To understand about various Internet applications

### **Course outcome:**

- Know Java programming language and explore its current strengths and Weaknesses
- Learn about object-oriented concepts
- Learn Java code to demonstrate the use of applets for client side programming
- To study the way that exceptions are detected and handled in the Java programming language
- know Java code that demonstrates multiple threads of execution
- To understand about various Internet applications

### UNIT I INTRODUCTION

Introduction - Network of Networks, Intranet, Extranet and Internet.World Wide Web- Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP. TCP/IP- Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6. IP Sub netting and addressing- Classful and Classless Addressing, Sub netting

### UNIT II HTML

Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, CSS. Form, Iframe, Colors, Color name, Color value. Image Maps- map, area, attributes of image area- Extensible Markup Language (XML)- Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief.CGI Scripts- Introduction-Environment Variable, GET and POST Methods.

### UNIT III PERL

Introduction, Variable, Condition, Loop, Array, implementing data structure, Hash, String, Regular Expression, File handling, I/O handling- JavaScript- Basics, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, reg-ex. Function, Errors, Validation. Cookies- Definition of cookies, Create and Store a cookie with example. Java

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Applets-Container Class, Components, Applet Life Cycle, Update method, Applications.

### UNIT IV CLIENT-SERVER PROGRAMMING

Client-Server programming in Java - Java Socket, Java RMI. Threats - Malicious code-viruses, Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks- Network security techniques- Password and Authentication- VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL), Secure Shell (SSH). Firewall- Introduction, Packet filtering, Stateful, Application layer, Proxy.

### UNIT V INTERNET TELEPHONY

Introduction, VoIP- Multimedia Applications- Multimedia over IP: RSVP, RTP, RTCP and RTSP-Streaming media, Codec and Plugins, IPTV- Search Engine and Web Crawler- Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.

### Total: 45

S.NO	Author(s) Name	Title of The Book	Publisher	Year of
	Paul Deitel Harvey	Internet and World	Dorling	Publication
1.	Deitel and Abby Deitel	Wide Web-How to Program 5 <sup>th</sup> Edition	Kindersley pvt Ltd	2011
2.	N.P. Gopalan and J. Akilandeswari	Web Technology: A Developer's Perspective	PHI Learning	2013

### **TEXTBOOKS:**

### **REFERENCES:**

S.NO	Author(s) Name	Title of The Book	Publisher	Year of	f
				Publication	
1.	Rahul Banerjee	Internetworking Technologies, An Engineering Perspective	PHI Learning, Delhi	2011	
2.	Robert W. Sebesta	Programming the World Wide Web	Pearson Education	2016	

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### **17BECSOE02**

### **COURSE OBJECTIVE:**

- To study the graphics techniques and algorithms
- To study the multimedia concepts and various I/O technologies.
- To enable the students to develop their creativity
- To impart the fundamental concepts of Computer Animation and Multimedia.

**MULTIMEDIA AND ANIMATION** 

- To understand Techniques of Animation
- To Learn about different 3D Animation

### **COURSE OUTCOMES:**

### After the course the student will be able to:

- Get Familiarised With Animation
- Types Of 3D Animation
- Know about motion caption
- Work With The Timeline And Tween-Based Animation
- Learn about 3D Animation
- Master the techniques of computer animation and multimedia

### UNIT I INTRODUCTION

What is mean by Animation – Why we need Animation – History of Animation – Uses of Animation – Types of Animation – Principles of Animation – Some Techniques of Animation – Animation on the WEB – 3D Animation – Special Effects -Creating Animation.

### UNIT II CREATING ANIMATION IN FLASH

Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based Animation - Working with the Timeline and Tween-based Animation – Understanding Layers - Action script.

### UNIT III 3D ANIMATION & ITS CONCEPTS

Types of 3D Animation – Skeleton & Kinetic 3D Animation – Texturing & Lighting of 3D Animation – 3D Camera Tracking – Applications & Software of 3D Animation.

### UNIT IV MOTION CAPTION

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Formats – Methods – Usages – Expression – Motion Capture Software's – Script Animation Usage – Different Language of Script Animation Among the Software.

### UNIT V CONCEPT DEVELOPMENT

Story Developing – Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets- 3D Animated Movies.

### Total: 45

### **TEXTBOOK:**

S.NO	Author(s) Name	Title of The Book	Publisher	Year Publication	of
1.	Malay K. Pakhira	Computer Graphics, Multimedia and Animation	PHI Learning PVT Ltd	2010	

### **REFERENCES:**

S.NO	Author(s) Name	Title of The Book	Publisher	Year of
				Publication
1.	Ranjan Parekh	Principles of Multimedia	ТМН	2007
2.	Ashok Banerji, Ananda Mohan Ghosh	Multimedia Technologies	McGraw Hill Publication	2010
3.	Pankaj Dhaka	Encyclopedia of Multimedia and Animations	Anmol Publications	2011

### **17BECSOE03** PC HARDWARE AND TROUBLE SHOOTING

LTPC 3003

### **COURSE OBJECTIVES:**

- Assemble/setup and upgrade personal computer systems
- Perform installation, configuration, and upgrading of microcomputer hardware and software. •
- Install/connect associated peripherals.
- Diagnose and troubleshoot microcomputer systems hardware and software, peripheral equipment.
- Know Multitasking and Multiprogramming
- Familiarise Various Types of faults

### **COURSE OUTCOMES**

### After the course student will be able to:

- Familiarise Special Peripherals.
- **Know Computer Organization**
- Know about Memory Space
- Familiarise Motherboard Logic
- Know Programmable LSI's
- Know about Data Recovery

### UNIT I **INTRODUCTION**

Introduction - Computer Organization - Number Systems and Codes - Memory - ALU - CU -Instruction prefetch - Interrupts - I/O Techniques - Device Controllers - Error Detection Techniques – Microprocessor – Personal Computer Concepts – Advanced System Concepts – Microcomputer Concepts – OS – Multitasking and Multiprogramming – Virtual Memory – Cache Memory – Modern PC and User.

### **UNIT II PERIPHERAL DEVICES**

Introduction - Keyboard - CRT Display Monitor - Printer - Magnetic Storage Devices - FDD -HDD – Special Types of Disk Drives – Mouse and Trackball – Modem – Fax-Modem – CD ROM Drive – Scanner – Digital Camera – DVD – Special Peripherals.

### PC HARDWARE OVERVIEW UNIT III

Introduction – Hardware BIOS DOS Interaction – The PC family – PC hardware – Inside the System Box – Motherboard Logic – Memory Space – Peripheral Interfaces and Controllers – Keyboard Interface – CRT Display interface – FDC – HDC.

### UNIT IV **INSTALLATION AND PREVENTIVE MAINTENANCE**

Introduction - system configuration - pre installation planning - Installation practice - routine checks - PC Assembling and integration - BIOS setup - Engineering versions and compatibility preventive maintenance – DOS – Virus – Data Recovery.

### **UNIT V** TROUBLESHOOTING

Introduction - computer faults - Nature of faults - Types of faults - Diagnostic programs and tools -Microprocessor and Firmware – Programmable LSI's – Bus Faults – Faults Elimination process – Systematic Troubleshooting – Symptoms observation and analysis – fault diagnosis – fault rectification – Troubleshooting levels – FDD, HDD, CD ROM Problems.

### Total: 45

S.NO.	Author(s) Name	Title of The Book	Publisher	Year	of
				Publication	

# 9

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### 9

1.	B. Govindarajalu	IBM PC Clones Hardware, Troubleshooting and Maintenance	ТМН	2002
		Wantenanee		

### **REFERENCES:**

S	S.NO.	Author(s) Name	Title of The Book	Publisher	Year of
	1.	Peter Abel, NiyazNizamuddin	IMB PC Assembly Language and Programming	Pearson Education	2007
	2.	Scott Mueller	Repairing PC's	PHI	1992

### **17BECSOE04**

### JAVA PROGRAMMING

### L T P C 3003

### **COURSE OBJECTIVES:**

- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Be aware of the important topics and principles of software development.
- Have the ability to write a computer program to solve specified problems.
- Be able to use the Java SDK environment to create, debug and run simple Java programs
- To understand Object oriented programming concepts

### **COURSE OUTCOMES:**

After the course student will be able to:

- Familiar with programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java and work with 2D shapes
- Be familiar with Arrays Strings Packages
- Have the ability to write a computer program to solve specified problems.
- Work on Java SDK environment to create, debug and run simple Java programs
- To understand abstract classes

### UNIT I INTRODUCTION TO JAVA

Object oriented programming concepts – objects – classes – methods and messages –abstraction and encapsulation – inheritance – abstract classes – polymorphism.- Objects and classes in Java – defining classes – methods - access specifiers – static members –constructors – finalize method

### UNIT II PACKAGES

Arrays – Strings - Packages – Java-Doc comments – Inheritance – class hierarchy –polymorphism – dynamic binding – final keyword – abstract classes

### UNIT III I/O STREAMS

The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes.

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#### UNIT IV EXCEPTION HANDLING

Exceptions – Syntax of exception handling code – Multiple catch statements – Using finally statements – Throwing our own exceptions – Using exceptions for debugging

#### UNIT V THREADS

Introduction, Creating Threads, The Life Cycle of a Thread, Thread Methods, Using Threads, Synchronization of Threads, Summary

### **TEXTBOOK:**

<b>Total:</b>	45
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1							
	S.NO.	Author(s) Name	Title of The Book	Publisher	Year of		
					Publication		
	1.	Cay S. Horstmann and Gary Cornell	Core Java: Volume I - Fundamentals	Sun Microsystems Press	2008		

#### **REFERENCES:**

S.NO.	Author(s) Name	Title of The Book	Publisher	Year of
				Publication
1.	K. Arnold and J. Gosling	The JAVA programming language Third edition	Pearson Education	2009
2.	Timothy Budd	Understanding Object- oriented programming with Java Updated Edition	Pearson Education	2002
3.	C. Thomas Wu	An introduction to Object- oriented programming with Java Fourth Edition	TataMcGraw-HillPublishingcompany Ltd	2008

#### **WEBSITES:**

- 1. http://elvis.rowan.edu/~kay/cpp/vc6\_tutorial/
- 2. http://www.winprog.org/tutorial/msvc.html
- 3. http://www.tutorialized.com/tutorials/Visual-C/1
- 4. http://www.freeprogrammingresources.com/visualcpp.html

#### LIST OF OPEN ELECTIVES OFFERED BY ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT

# 17BEEEOE01ELECTRIC HYBRID VEHICLESL T P C3 0 0 3

#### **COURSE OBJECTIVES:**

- To understand the basic concepts of electric hybrid vehicle.
- To gain the knowledge about electric propulsion unit.
- To understand and gain the knowledge about various energy storage devices.
- To know the concept of electric hybrid vehicle
- Understand the various energy storage schemes
- Know about the various fuel efficiency schemes

#### **COURSE OUTCOMES:**

- At the end of the course the student will be understand the concept of electric hybrid vehicle and its energy storage schemes.
- Battery based energy storage and its analysis,
- Familiarise Fuel Cell based energy storage and its analysis
- Super Capacitor based energy storage and its analysis,
- Understand Flywheel based energy storage and its analysis,
- Know Hybridization of different energy storage devices.

#### UNIT I INTRODUCTION

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

#### UNIT II HYBRID ELECTRIC DRIVE-TRAINS

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

#### UNIT III ELECTRIC PROPULSION UNIT

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motr drives, drive system efficiency.

#### UNIT IV ENERGY STORAGE

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis,

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Hybridization of different energy storage devices.

### UNIT V ENERGY MANAGEMENT STRATEGIES

Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

Total: 45

### **TEXTBOOK:**

S. NO.	Author(s) Name	Title of the	Book	Publisher	Year of
					Publication
1	Iqbal Hussein	Electric and	Hybrid	CRC Press – 2 <sup>nd</sup>	2010
		Vehicles:	Design	edition	
		Fundamentals			

#### **REFERENCES:**

S. NO.	Author(s) Nam	ie	Title of the Book	Publisher	Year of
					Publication
1	MehrdadEhsani,		Modern Electric, Hybrid	Standardsmedia – 2 <sup>nd</sup>	2009
	YimiGao, Sebas	stian	Electric and Fuel Cell	edition	
	E. Gay, Ali Emad	li	Vehicles: Fundamentals,		
			Theory and Design		
2	James Larm	inie,	Electric Vehicle	Wiley $-2^{nd}$ edition	2012
	John Lowry		Technology Explained		

### 17BEEEOE02 ENERGY MANAGEMENT AND ENERGY AUDITING L T P C

#### **Course Objectives:**

- To gain the knowledge about energy management.
- To understand the basic concepts in economic analysis in energy management.
- To understand the basic principles of energy audit.
- To gain the knowledge about the basic concept of types of Energy Audit
- To gain and Evaluate the different energy efficient motors
- Understand the concept of Energy conservation.
- To study about the behaviour changes of PF requirement in motor currents

#### **Course Outcomes:**

At the end of this course, students will demonstrate the ability to

- Understand the concept of Energy Management.
- Analyze the different methods for economic analysis
- Knowledge about the basic concept of Energy Audit and types.
- Evaluate the different energy efficient motors
- Understand the concept of Energy conservation.
- Investigate the different methods to improve power factor.

#### UNIT I ENERGY MANAGEMENT

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting –Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

#### UNIT II ECONOMIC ASPECTS AND ANALYSIS

Economics analysis – Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Calculation of simple payback method, net present worth method.

#### UNIT III BASIC PRINCIPLES OF ENERGY AUDIT

Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

#### UNIT IV ENERGY EFFICIENT MOTORS

**Electric Motors:** Factors affecting efficiency - Energy efficient motors - constructional details, characteristics - voltage variation –over motoring – motor energy audit-

**Energy conservation**: Importance-energy saving measures in DG set-fans and blowers pumps- air conditioning system- energy efficient transformers.

#### UNIT V POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY

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3003

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#### **INSTRUMENTS**

Power factor - methods of improvement, location of capacitors, p.f with non linear loads, effect of harmonics on p.f,- p.f motor controllers –Energy efficient lighting system design and practice-lighting control– Measuring Instruments – wattmeter, data loggers, thermocouples, pyrometers, lux meters, tong testers, application of PLCs.

Total: 45

#### **TEXTBOOK:**

S. NO.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	Murphy W.R. and	Energy Management	Heinemann	2007
	G.Mckay Butter worth		Publications	

#### **REFERENCES:**

S. NO.	Author(s) Name	Title of the Book	Publisher	Year of
				Publicatio
				n
1	John.C.Andreas	Energy Efficient Electric Motors	Marcel Dekker Inc Ltd – 3rd edition	2005
2	W.C.Turner Steve Doty	Energy Management Handbook	Lulu Enterprises, Inc 8th Edition Volume II	2013

#### **PROGRAMMABLE LOGIC CONTROLLER 17BEEEOE03**

#### **Course Objectives**

- To understand the basic principles of PLC systems. •
- To gain the knowledge about data handling functions. •
- To gain the knowledge of storage techniques in PLC •
- To acquire the knowledge about how to handle the data and functions •
- To study about flow charts of ladder and spray process system •
- To understand the principles of PID. •

#### **Course Outcome**

- At the end of the course the student will be able to understand the registers and functions in PLC and they are able to do the program.
- To acquire the knowledge of storage techniques in PLC •
- Students know how to handle the data and functions
- Students known about advanced controller in PLC applications •
- Students gather real time industrial application of PLC •
- Students gathered and evaluate the flow charts of ladder and spray process system •

#### UNIT I **INTRODUCTION**

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment Programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

#### UNIT II PLC PROGRAMMING

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

#### UNIT III **REGISTERS AND PLC FUNCTIONS**

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

#### UNIT IV **DATA HANDLING FUNCTIONS**

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

#### UNIT V **PID PRINCIPLES**

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing, analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

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#### LTPC 3003

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### **TEXTBOOK:**

S. NO.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	JR Hackworth and	Programmable Logic Controllers	Pearson	2006
	F.D Hackworth – Jr	– Programming Method and		
		Applications		

### **REFERENCES:**

S. NO.	Author(s) Name	Title of the Book	Publisher	Year of
				Publication
1	John Webb and	Programmable Logic Controllers	Fifth edition, PHI	2004
	Ronald A Reiss	– Principle and Applications		
2	W.Bolton	Programmable Logic controller	Elsevier Newnes	2009
			Publications, 5 <sup>th</sup>	
			Edition	

### **WEBSITE:**

1.	http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,-
	Introduction to programmable Logic controller.

#### 17BEEEOE04RENEWABLE ENERGY RESOURCES

#### L T P C 3003

#### **Course Objectives**

- To gain the knowledge about environmental aspects of energy utilization.
- To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
- To study about solar energy collectors and its storages
- To study about the inter connected system in wind power
- To understand the basic principles fuel cell, Geo thermal power plants.
- To gain the knowledge about hydro energy.

#### **Course Outcomes**

At the end of this course, students will demonstrate the ability to

- Analyze the Energy Scenario in india
- Understand the concept of Solar Energy
- Understand the concept of Wind Energy
- Understand the concept of Hydro Energy
- Analyze the different energy sources
- Students gathered the real time inter connected system modelling in wind power

#### UNIT I INTRODUCTION

Energy scenario - Different types of Renewable Energy Sources - Environmental aspects of energy utilization - Energy Conservation and Energy Efficiency - Needs and Advantages, Energy Conservation Act 2003.

#### UNIT II SOLAR ENERGY

Introduction to solar energy: solar radiation, availability, measurement and estimation– Solar thermal conversion devices and storage – solar cells and photovoltaic conversion – PV systems – MPPT. Applications of PV Systems – solar energy collectors and storage.

#### UNIT III WIND ENERGY

Introduction – Basic principles of wind energy conversion- components of wind energy conversion system - site selection consideration – basic–Types of wind machines. Schemes for electric generation – generator control, load control, energy storage – applications of wind energy – Inter connected systems.

#### UNIT IV HYDRO ENERGY

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes.Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

#### UNIT V OTHER SOURCES

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

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### **TEXTBOOKS:**

S. NO.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rai.G.D	Non-conventional sources of energy	Khanna publishers	2011
2	Khan.B.H	Non-Conventional Energy Resources	The McGraw Hills, Second edition	2009

### **REFERENCES:**

S. NO.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Rao.S. &Parulekar	Energy Technology	Khanna publishers, Eleventh Reprint	2013
2	Godfrey Boyl	RenewableEnergy:Power sustainable future	Oxford University Press, Third edition	2012
3	John W Twidell and Anthony D Weir	Renewable Energy Resources	Taylor and Francis $-3^{rd}$ edition	2015

- WEBSITES:

   1.
   www.energycentral.com

   2.
   www.catelelectricpowerinfo.com

### LIST OF OPEN ELECTIVES OFFERED BY ELECTRONICS AND COMMUNICATION ENGINEERING

#### 17BEECOE01 REAL TIME EMBEDDED SYSTEMS L T P C 100

3003

#### **Course Objectives**

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To study about task management
- To learn about semaphore management and message passing
- To study about memory management
- To imparts knowledge on

#### **Course Outcomes**

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

- Understand overview of embedded systems architecture
- Acquire knowledge on embedded system, its hardware and software.
- Gain knowledge on overview of Operating system
- Discuss about task Management
- Gain knowledge about semaphore management and message passing.
- Gain knowledge about memory management.

### UNIT-I INTRODUCTION TO EMBEDDED SYSTEM

Introduction- Embedded systems description, definition, design considerations &requirements-Overview of Embedded SystemArchitecture (CISC and RISC)-Categories of Embedded Systemsembedded processor selection &tradeoffs- Embedded design life cycle -Product specificationshardware / software partitioning- iterations and implementation- hardware software integration – product testing techniques–ARM7.

### UNIT-II OPERATING SYSTEM OVERVIEW

Introduction–AdvantageandDisadvantageofUsingRTOS–Multitasking–Tasks-RealTimeKernels – Scheduler- Non-Preemptive Kernels – Preemptive Kernels – Reentrancy- ReentrantFunctions– Round Robin Scheduling- Task Priorities- Static Priorities– Mutual Exclusion–Deadlock– Inter task Communication–Message Mailboxes–Message Queues- Interrupts- TaskManagement– Memory Management-Time Management–Clock Ticks.

### UNIT-III TASK MANAGEMENT

Introduction-µ C/OS-II Features-Goals ofµ C/OS-II-Hardware and Software Architecture-Kernel

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Structures: Tasks–Task States–Task Scheduling–Idle Task–Statistics Task–Interrupts Under  $\mu$ C/OS-II–Clock Tick- $\mu$ –C/OS- II Initialization. Task Management: Creating Tasks–Task Stacks– StackChecking–Task'sPriority–SuspendingTask–ResumingTask.TimeManagement: Delaying aTask–Resuming a Delayed Task–System Time. Event Control Blocks-Placing a Task in the ECB Wait List–Removing a Task from an ECB wait List.

#### UNIT-IV SEMAPHORE MANAGEMENT AND MESSAGE PASSING

Semaphore Management: Semaphore Management Overview– Signaling a Semaphore. MessageMailbox Management: Creating a Mailbox –Deleting Mailbox–Waiting for a Message box–Sending Message to a Mailbox- Status of Mailbox. Message Queue Management: Creating Message Queue– Deleting a Message Queue–Waiting for a Message Queue–Sending Message to a Queue– Flushing a Queue.

#### UNIT-V MEMORY MANAGEMENT

Memory Management: Memory Control Blocks–Creating Partition-Obtaining a Memory Block– Returning a Memory Block. Getting Started withµ C/OS-II–Installingµ C/OS-II–Portingµ C/OS-II:Development Tools–Directories and Files– Testing a Port -IAR Workbench withµ C/OS-II-µ C/OS- II Porting on a 8051CPU– Implementation of Multitasking- Implementation of Scheduling andRescheduling –Analyze the Multichannel ADC with help ofµ C/OS-II.

Total: 45

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S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
		Micro C/OS–II The	CMPBOOKS	2009
1	JeanJ. Labrosse	Real Time Kernel		
		ARM Architecture	Addison-Wesley	2008
2	David Seal	Reference Manual.		2000
		ARM System-on-Chip	Addison-Wesley	
3	Steve Furbe,	Architecture,	Professional,	2000
			California	

#### **TEXTBOOKS:**

#### **REFERENCES:**

S.NO.	Author(s) Name	Title of th	ne book	Publisher		Year of publication
	K.V.K.K.Prasad	Embedded Rea	1-Time Systems:	Dream	Tech	2005
1		Concepts,	Design &	Press		
		Programming				

	Sriram V	Iyer,	Embedded Real Time Systems	Tata	McGraw	2004
2	Pankaj Gupta		Programming	Hill		

#### **17BEECOE02 CONSUMER ELECTRONICS** LTPC 100

#### 3003

#### **Course Objectives**

- To study about various speakers and microphone
- To learn the fundamental of television systems and standards
- To learn the process of audio recording and reproduction •
- To study various telephone networks •
- To discuss about the working of home appliances •
- To familiarize with TV services like ISDN. •

#### **Course Outcomes**

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

- Understand working of various type of loud speakers
- Acquire knowledge on various types of picture tubes
- Demonstrate the working of various optical recording systems
- Distinguish various standards for color TV system •
- Acquire knowledge on various telecommunication networks
- Demonstrate the working of various home appliances •

#### UNIT I LOUDSPEAKERS AND MICROPHONES

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters - Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

#### UNITH **TELEVISION STANDARDS AND SYSTEMS**

Components of a TV system-interlacing-composite video signal.Colour TV- Luminance and Chrominance signal; Monochrome and Colour Picture Tubes- Color TV systems- NTSC, PAL, SECAM-Components of a Remote Control.

#### UNITIII **OPTICAL RECORDING AND REPRODUCTION**

Audio Disc- Processing of the Audio signal-readout from the Disc -Reconstruction of the audio signal–Video Disc–Video disc formats- recording systems–Playback Systems.

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### UNITIV TELECOMMUNICATION SYSTEMS

Telephone services-telephone networks-switching system principles-PAPX switching-Circuit, packet and message switching, LAN, MAN and WAN, Integrated Services Digital Network.Wireless Local Loop.VHF/UHF radio systems, Limited range Cordless Phones; cellular modems.

#### UNITV HOME APPLIANCES

Basic principle and block diagram of microwave oven; washing machine hardware and software; Components of air conditioning and refrigeration systems.

#### **TEXTBOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	S.P. Bali	Consumer Electronics	PearsonEducation	2007
2	J.S.Chitode	Consumer Electronics	Technical Publications	2007

#### **REFERENCE:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Philip Hoff,Philip Herbert Hoff.	Consumer Electronics for Engineers.	Cambridge University Press	1998

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Total: 45

#### **NEURAL NETWORKS AND ITS APPLICATIONS 17BEECOE03** LTPC 100

#### 3003

#### **Course Objectives**

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems •
- To have a solid understanding of Basic Neural Network. •
- To provide students with a sound and comprehensive understanding of artificial neural networks • and machine learning.
- To gain exposure in the field of neural networks and relate the human neural system into the • digital world
- To provide knowledge of computation and dynamical systems using neural networks •

#### **Course Outcomes**

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

- Understand the basic concepts of neural networks and its applications in various domains
- Gain knowledge about learning process in Neural Networks
- Apply perception concept in design
- Design using ART phenomena
- Gain knowledge on SOM concepts •
- Ability to develop the use of Soft Computing to solve •

#### **UNIT I INTRODUCTION TONEURAL NETWORKS**

Introduction-biological neurons and their artificial models-learning, adaptation and neural network's learning rules-types of neural networks-single layer, multiple layer-feed forward, feedback networks

#### **UNIT II** LEARNING PROCESS

Error- correction learning- memory based learning- hebbian learning-competitive learning-Boltzmann learning-supervised and unsupervised learning-adaptation-statistical learning theory.

#### UNIT III PERCEPTION

Single layer Perception-Adaptive filtering-unconstrained Optimization-Least-mean square algorithm- Leaning Curve-Annealing Technique-perception convergence Theorem-Relationship between perception and Baye's Classifier-Back propagation algorithm

#### **UNIT IV** ATTRACT OR NEURAL NETWORK AND ART

Hopfield model-BAM model -BAM Stability-Adaptive BAM -Lyapunov function-effect of gain-Hopfield Design-Application to TSP problem-ART-layer 1-layer 2-orienting subsystem- ART algorithm-ARTMAP.

#### UNIT V SELF ORGANIZATION

Self-organizing map-SOM Algorithm-properties of the feature map-LVQ-Hierarchical Vector Quantization. Applications of self-organizing maps: The Neural Phonetic Type Writer Learning Ballistic Arm Movements.

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### **TEXTBOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	SimonHaykin	Neural Networks and Learning Machines	Pearson/Prentice Hall 3 <sup>rd</sup> Edition	2009
2	SatishKumar	Neural Networks: A Classroom Approach	ТМН	2008

### **REFERENCES:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
	Rajasekaran.S,	Neural Networks,	PHI, New Delhi.	2003
1	VijayalakshmiPai.	Fuzzy Logic and		
	G.A	Genetic Algorithms,		
	LaureneFausett	Fundamentals of Neural	Pearson/PrenticeHall	1994
2		Networks: Architectures,		
		Algorithms, and		
		Applications		
2	Wassamman DD	Neural Computing Theory	Van Nortrand	1090
3	wasserman P.D	& Practice	Reinhold	1989
4	Freeman J.A., S kapura D.M	Neuralnetworks, algorithms, applications, and programming techniques.	AdditionWesley	2005

# 17BEECOE04FUZZY LOGIC AND ITS APPLICATIONSL T P C1003003

#### **Course Objectives**

- To introduce the basic concepts of Fuzzy logic and its applications in various domain
- To educate how to use Fuzzy computation to solve real-world problems
- To have a solid understanding of Basic fuzzy models.
- Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
- To learn about applications on Fuzzy based systems
- To familiarize with fuzzy fiction and de fuzzy fiction procedures

#### **Course Outcomes**

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

- Understand the basic concepts of Fuzzy logic and its applications in various domain
- Gain knowledge on theory of Reasoning
- Develop fuzzy controllers
- Understand concepts of adaptive fuzzy control
- Ability to develop how to use Fuzzy computation to solve real- world problems
- Design fuzzy based model for any application

#### UNITI

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Basics of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

#### UNIT II

Theory of Approximate Reasoning: Linguistic variables, Fuzzy proportions, Fuzzy if-then statements, inference rules, compositional rule of inference-fuzzy models

#### UNIT III

Fuzzy Knowledge Based Controllers (Fkbc): Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzy fiction and de fuzzy fiction procedures–Design of Fuzzy

Logic Controller

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#### UNIT IV

Adaptive Fuzzy Control: Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

### UNIT V

Fuzzy based systems: Simple applications of FKBC-washing machines-traffic regulations-lift control-fuzzy in medical Applications-Introduction to ANFIS.

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	D .Diankar ,H. Hellendoom and M .Rein frank	An Introduction to Fuzzy Control	Narosa Publishers India	1996
2	G.J. KlirandT.A. Folger	Fuzzy Sets Uncertainty and Information	PHI IEEE	1995

#### **REFERENCES:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Timothy J. Ross	Fuzzy Logic with Engineering Applications	McGraw Hill	1997
2	George. J Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic	Prentice Hall, USA	1995

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## LIST OF OPEN ELECTIVES OFFERED BY BIO TECHNOLOGY DEPARTMENT

<b>17BTBTO</b>	E01 BIOREACTOR DESIGN	L T P C 3003
COURSE OB	BJECTIVES:	
• To un	derstand the basic design of bioreactors	
• To un	derstand the principle of heat transfer inside a bioreactor	
• Desig	n of various reactors	
• Study	various mass transfer equipments	
• Learn	about cylindrical storage tnks and various applications	
• Desig	n of plate and frame filters	
COURSE OU	JTCOMES:	
After comp	letion of this course students will be able to	
• Desig	n bioreactors for various operations.	
• Select	the appropriate separation equipment based on the nature of the product.	
• Famil	iarise mass transfer equipments	
• Work	with cylindrical storage tnaks and know various applications	
• Desig	n of plate and frame filters in reactors	
• Know	varius separation equipments	
UNIT I	ENGINEERING PROPERTIES AND STORAGE TANK	9
Introduction designofcy	ntovariousmechanicalpropertiesofmaterialtobeusedmaterialofconstruction, lindricalstoragetank.	
UNIT II	REACTOR DESIGN	9
DesignofAi	rliftfermentor,BubblecolumnreactorandContinuousstirredtankreactor.	
UNIT III	HEAT TRANSFER EQUIPMENTS	9
DesignofSh	nellandtubeHeatexchanger,Doublepipeheatexchanger,longtube	
verticaleva	poratorandforcedcirculation evaporator.	
UNIT IV	MASS TRANSFER EQUIPMENTS	9
DesignofBo	ollmannextractor,fractionatingcolumn,packedtowerandspraytrayabsorber	
UNIT V	SEPARATIONEQUIPMENTS	9
Designof	plate and frame filter press, leaf filter, rotary drum filter, discbowlcentrifug	e, rotary
drumdriera	ndSwenson-walkercrystallizer.	

Total:45

#### **TEXTBOOKS:**

S.NO.	Author(s)Name	Titleofthebook	Publisher	YearofPublication
1	James Edwin Bailey,	Biochemical	McGraw-	2007
	DavidF.Ollis	Engineering	Hill	
		Fundamentals		
2	DonW.Green,RobertH.Perry	Chemical	The	2008
		Engineer	McGraw-	
		Handbook	HillCompanies,	
			Inc.	

### **REFERENCE:**

S.NO	Author(s)Name	Titleofthebook	Publisher	Year of Publications
1	Pauline.M.Doran	BioprocessEngineering Principles	Academic Press	2013

**17BTBTOE02** 

#### FOOD PROCESSING AND PRESERVATION LTPC

3003

#### **OBJECTIVES:**

- To understand the importance of food processing
- To make the students learn the various processing and preservation techniques.
- Understand various Pasteurization and Freezing techniques
- Learn about Infrared radiation processing-
- Concepts and equipment used. In various food processing methods
- Learn about preservation of fruits and vegetables

#### **INTENDED OUTCOMES:**

#### The students are exposed to

- Properties off Food materia
- Various methods used for preserving Fruits and vegetables
- Learn about chemical preservation
- Know food preservation by cooling methods
- Learn about Food irradiation
- Understand fermentation techniques

#### UNIT I SCOPE AND IMPORTANCE OF FOOD PROCESSING

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Properties of food- Physical, thermal, mechanical, sensory.Raw material Preparation - Cleaning, sorting, grading, peeling.

#### UNIT II **PROCESSING METHODS**

Heating-Blanching and Pasteurization.Freezing- Dehydration- canningadditivesfermentationextrusion cooking- hydrostatic pressure cooking- dielectric heatingmicrowave processingandasepticprocessing-Infraredradiationprocessing-Conceptsandequipmentused.

#### UNIT III FOOD CONVERSION OPERATIONS

Fibrous foods, Size reductiondry foods and liquid foods-Theory and equipments- membrane separation-filtration-equipmentandapplication.

#### UNITIV FOODPRESERVATION BY COOLING

Refrigeration, Freezing-Theory, freezing time calculation, methods of freezing, freezing equipments, freeze drying, freeze concentration, thawing, effect of low temperature on food. Wateractivity, methods to controlwateractivity.

#### UNITV **PRESERVATIONMETHODSFORFRUITSANDVEGETABLES** 9

Preprocessing operations - preservation by reduction of water content: drying / dehydration and concentration – chemical preservation – preservation of vegetables by acidification, preservation with sugar - Heat preservation- Food irradiation- Combined preservation techniques.

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Total: 45

## **TEXTBOOKS:**

S.NO	Author(s)Name	Titleofthebook	Publisher	Year of Publication
1	R.PaulSingh, DennisR.Heldman	Introduction to food engineering.	Academic Press	2001
2	P.Fellows.	FoodProcessing Technology, Principles and practice.	Woodhead Publishing Ltd	2000
3	MirceaEnachescuD authy	Fruit and Vegetable Processing	FAOagricultural services bulletin no.119	1995

### **REFERENCES:**

S.NO	Author(s)Name	Titleofthebook	Publisher	Yearof
				Publications
1	M.A. Rao, Syed S.H. Rizvi,AshimK.Datta	Engineering properties offoods	CRCPress	2005
2	B.Sivasankar	Food processing and preservation	PHILearning Pvt. Ltd	2002

#### **BASIC BIOINFORMATICS**

#### **Course Objectives**

- •To understand the available tools and databases for performing research in bioinformatics.
- To expose students to sequence alignment tool inbioinformatics.
- To construct the phylogenetic trees forevolution.
- To get familiar with the 3D structure of protein and classification.
- To acquire basic knowledge in protein secondary structureprediction.
- To extend the brief knowledge in Micro array dataanalysis.

#### **Course Outcomes**

- Summarize the basic concepts and importance of Bioinformatics in varioussectors.
- Demonstrate the sequence alignment tool inbioinformatics.
- Construct the phylogenetic trees forevolution.
- Analyze the three dimensional protein structure and classification using varioustools.
- Illustrate the protein secondary structure prediction by comparativemodeling.
- Extend the knowledge in micro array technology and applications of bioinformatics in varioussectors.

#### UNIT I OVERVIEW OF BIOINFORMATICS

Thescopeofbioinformatics; bioinformatics&theinternet;usefulbioinformatics sites.Data acquisition:sequencingDNA,RNA&proteins;determination ofproteinstructure;gene&protein expression data;proteininteractiondata. Databases–contents,structure&annotation:fileformats; annotatedsequencedatabases;miscellaneousdatabases.

#### UNITII RETRIEVALOFBIOLOGICALDATA

DataretrievalwithEntrez&DBGET/LinkDB;dataretrievalwithSRS(sequenceretrievalsystem).Searchingsequencedatabasesbysequencesimilaritycriteria:sequencesimilaritysearches;aminoacidsubstitutionmatrices;databasesearches,FASTA&BLAST;sequencefilters;iterativedatabasesearches&PSI-BLAST.Multiple-sequencealignment,gene&proteinfamilies:multiple-sequencealignment&familyrelationships;proteinfamilies&patterndatabases;proteindomainfamilies.

#### UNITIII PHYLOGENETICS

Phylogenetics, cladistics &ontology; building phylogenetic trees; evolution of macromolecularsequences.Sequenceannotation:principlesofgenomeannotation;annotationtools &resources.

#### UNITIV STRUCTURALBIOINFORMATICS

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Conceptualmodelsofproteinstructure;therelationshipofproteinthree-dimensional structureto proteinfunction;theevolutionofproteinstructure&function;obtaining, viewing&analyzing structural data; structural alignment; classification of proteins of known three-dimensional structure:CATH&SCOP;introduction toproteinstructureprediction;structureprediction;structurepredictionby comparativemodeling;secondary structureprediction;advancedproteinstructureprediction& predictionstrategies.

### UNITV MICROARRAYDATAANALYSIS

Microarraydata,analysismethods;microarraydata,tools&resources;sequencesampling&SAGE.Bioinformaticsinpharmaceuticalindustry:informatics&drugdiscovery;the sequences and the sequences and

Total: 45

### **TEXTBOOKS:**

S.NO.	Author (s) Name	Titleof thebook	Publisher	Year of
				Publication
1	Dan E. Krane, Michael	Fundamental Concepts of Bioinformatics	Pearsoneducation	2004
2	Andreas D. Baxevanis, F. Francis Ouellette	Bioinformatics: A PracticalGuidetotheAnalysisof Genes andProteins	Wiley-Interscience	2004
3	David W. Mount	SequenceandGenomeAnalysis	ColdSpringHarbor Laboratory	2004
4	Jonathan Pevsner	Bioinformatics and FunctionalGenomics	Wiley-Liss	2003

### **REFERENCEBOOK:**

S.NO.	Author (s) Nam	Titleof thebook	Publisher	Year of Publication
1	Michael J. Korenberg	Microarray Data Analysis: MethodsandApplications	Springer Science & BusinessMedia	2007

#### **Course Objectives**

- To impart the skills in the field of nano biotechnology and itsapplications. •
- To acquire knowledge in the nano particles and its significance in variousfields.
- To extend the knowledge in types and application of nano particles insensors. •
- To define the concepts of biomaterials through molecular selfassembly. .
- To equip students with clinical applications of nanodevices.
- To describe deeper understanding of the socio-economic issues innanobiotechnology. .

#### **Course Outcomes**

- Develop skills in the field of nano biotechnology and itsapplications. •
- Summarize the nanoparticles and its significance in variousfields.
- Extend the knowledge in types and application of nano particles insensors. ٠
- Define the concepts of biomaterials through molecular selfassembly. •
- Outline the clinical applications of nanodevices. •
- Describe the socio-economic issues innanobiotechnology. •

#### UNITI **INTRODUCTION**

Introduction, ScopeandOverview,Lengthscales,Importance ofNanoscaleandTechnology, FutureofNanotechnology:NanoTechnologyRevolution,Silicon HistoryofNanotechnology, basedTechnology,BenefitsandchallengesinMolecularmanufacturing: TheMolecular assemblerconcept, Controversies and confusions, Understanding advancedcapabilities, NanotechnologyinDifferent,Fields:Nanobiotechnology,Materials,Medicine,Dentalcare.

#### UNITII NANOPARTICLES

Techniques to Synthesize Nanoparticles, Types of Nanoparticles, Introduction, CharacterizationofNanoparticles, Applications, Toxic effects of Nanomaterials, Significance ofNanoparticlesNanofabrications-MEMS/NEMS,Atomic ForceMicroscopy,Selfassembled monolayers/Dip-penNanolithography, SoftLithography, PDMSMolding, NanoParticles, Nanowires and Nanotubes.

### UNITIII APPLICATIONS

Nanomedicine, Nanobiocensorand Nanofludics. Nanocrystals inbiological detection. ElectrochemicalDNAsensors IntegratedNanolitersystems.Nano-Biodevicesand and Systems.Fabricationof Novel Biomaterialsthrough molecularself assembly- Small scale systemsforinvivodrugdelivery- Futurenanomachine.

### UNITIV NANOBIOTECHNOLOGY

Clinicalapplicationsofnanodevices.Artificialneurons.Real-timenanosensors-Applicationsin cancerbiology.Nanomedicine.Syntheticretinyl chipsbasedonbacteriorhodopsins.High throughputDNAsequencingwithnanocarbontubules.Nanosurgicaldevices.

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#### UNITV ETHICALISSUESINNANOTECHNOLOGY

Introduction,Socioeconomic Challenges,EthicalIssuesinNanotechnology: WithEspecial ReferencetoNanomedicine, RelatingtoNanomedicine. SocialandEthicalIssues,EconomicImpacts,OtherIssues, Nanotechnologyand FutureSocio-economicchallenges.

Total: 45

#### **TEXTBOOKS:**

S.NO.	Author (s) Name	Titleof thebook	Publisher	Year of
				Publication
1	Niemeyer,C.M.	Nanobiotechnology:Con	Wiley-	2004
	andMirkin,C.A	cepts,	VCH	
		Applicationsand		
2	Goodsell,D.S.	Bionanotechnology	JohnWiley	2004
			andSons, Inc	

#### **REFERENCES:**

S.No.	Author(s)	Title of the book	Publisher	Year of
	Name			Publication
	Shoseyov,O.	Nanobiotechnology:	Humana	2007
1	and Levy,I	BioinspiredDevicesand	Press	
1		Materialsof theFuture		
			a :	2004
	Bhushan,B.	SpringerHandbookof	Springer-	2004
2		Nanotechnology	VerlagBerlin	
_			Heidelberg	
2	FreitasJrR.A	Nanomedicine	Landes	2004
3			Biosciences	
	Kohler, M. and	Nanotechnology-An	Wiley-	2004
4	Fritzsche,W.	IntroductiontoNanostructuring	VCH	
		Techniques		

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### LIST OF OPEN ELECTIVES OFFERED BY **MECHANICAL ENGINEERING DEPARTMENT**

#### **17BEMEOE01** COMPUTER AIDED DESIGN

LTP3003

#### **Course Objective**

- To apply basic concepts to develop construction (drawing) techniques.
- To ability to manipulate drawings through editing and plotting techniques. •
- To understand geometric construction and Produce template drawings.
- To understand and demonstrate dimensioning concepts and techniques. •
- To understand Section and Auxiliary Views.
- To become familiar with Solid Modelling concepts and techniques.

#### **Course Outcome**

- Apply basic concepts to develop construction (drawing) techniques. •
- Ability to manipulate drawings through editing and plotting techniques. •
- Understand geometric construction and Produce template drawings. •
- Understand and demonstrate dimensioning concepts and techniques •
- Understand Section and Auxiliary Views •
- Become familiar with Solid Modelling concepts and techniques. •

#### UNIT I **OVERVIEW OF CAD SYSTEMS**

Conventional and computer aided design processes-advantages and disadvantages. Subsystems of CAD-CAD hardware and software, analytical and graphics packages, CAD workstations. Networking of CAD systems.

#### **INTERACTIVE COMPUTER GRAPHICS AND GRAPHICS UNIT II TRANSFORMATIONS**

Generative, cognitive and image processing graphics. Static and dynamic data graphics. Transport of graphics data. Graphic standards. Generation of graphic primitives - display transformation in Two- and Three - Dimensional graphics concepts, Graphical input technique, Geometric transpformations, Visual Realism, Computer animation, customizing graphics software.

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#### UNIT III GEOMETRIC MODELING

Wireframe, surface, NURBS and solid modeling-applications and advantages. Creating primitive solids, sweeping solids, boolean operations. Extracting entities from a solid. Filleting of edges of solids. Boundary representation (B-rep) Constructive Solid Geometry(CSG) and Analytical Solid Modeling(ASM)

#### UNIT IV PARAMETRIC DESIGN AND OBJECT REPRESENTATION

Types of co-ordinate systems. Parametric design - definition and advantages. Parametric representation of analytic and synthetic curves. Parametric representation of surfaces and solids - manipulations.

#### UNIT V PRODUCT DESIGN AND DEVELOPMENT

Automated 2D drafting - basics, mechanical assembly - bill of materials generation. Mass property calculations.

Total: 45

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#### **TEXTBOOKS:**

S. NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Vera B Anand	Computer Graphics and Geometric Modeling for Engineers	John Wiley & Sons, New York	2000
2	Radhakrishnan P and Subramanyan S	CAD/CAM/CIM	New Age International Pvt. Ltd	2004

#### **REFERENCES:**

S. NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Radhakrishnan P and Kothandaraman C P	Computer Graphics and Design	DhanpatRai& Sons, New Delhi	2002
2	Ibrahim Zeid	CAD/CAM Theory and Practice	McGraw Hill Inc., New York	2003
3	Barry Hawhes	The CAD/CAM Process	Pitman Publishing, London	1998
4	WilliamMNewmanandRobert Sproul	Principles of Interactive Computer Graphics	McGraw Hill Inc., New York	1994

5	Sadhu Singh	Computer-Aided Design and Manufacturing	Khanna Publishers, New Delhi	1998
6	Rao S S	Optimisaiton Techniques	Wiley Eastern, New Delhi	2003

#### 17BEMEOE02 INDUSTRIAL SAFETY AND ENVIRONMEN

L T P C 3003

#### **Course Objective**

- To recognize and evaluate occupational safety and health hazards in the workplace.
- To determine appropriate hazard controls following the hierarchy of controls.
- To analyse the effects of workplace exposures, injuries and illnesses, fatalities.
- To prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
- To teach student the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
- To prevent or mitigate harm or damage to people, property, or the environment.

#### **Course Outcome**

- Recognize and evaluate occupational safety and health hazards in the workplace.
- Determine appropriate hazard controls following the hierarchy of controls.
- Analyse the effects of workplace exposures, injuries and illnesses, fatalities.
- Prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.
- Understand the concept of Industrial Safety & provide useful practical knowledge for workplace safety.
- Prevent or mitigate harm or damage to people, property, or the environment

#### UNIT I INTRODUCTION TO LOGISTICS

Logistics - concepts, definitions and approaches, factors influencing logistics - Supply chain: basic tasks, definitions and approaches, influencing supply chain - a new corporate model.

#### UNIT II PHASES OF SUPPLY CHAIN

The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

#### UNIT III EVOLUTION OF SUPPLY CHAIN MODELS

Strategy and structure - Factors of supply chain - Manufacturing strategy stages - Supply chain progress - Model for competing through supply chain management - PLC grid, supply chain redesign - Linking supply chain with customer.

#### UNIT IV SUPPLY CHAIN ACTIVITIES

Structuring the SC, SC and new products, functional roles in SC - SC design frame- work - Collaborative product commerce (CPC).

#### UNIT V SCM ORGANISATION AND INFORMATION SYSTEM

The management task - Logistics organization - The logistics information systems - Topology of SC application - Product Data Management - Warehouse management system MRP- I, MRP - II, ERP,. - Case study, ERP Software's

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### **TEXTBOOKS:**

S. NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Shari.P.B and Lassen.T.S	Managing the global supply chain	Viva books, New Delhi	2000
2	Ayers.J.B	Hand book of supply chain management	The St. Lencie press	2000

### **REFERENCES:**

S. NO.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Nicolas.J.N	Competitivemanufacturingmanagement-improvement,Leanproduction, customer focusedquality	McGrawHill, New York	1998
2	Steudel.H.J and Desruelle.P	Manufacturing in the nineteen - How to become a mean, lean and world class competitor	Van No strand Reinhold, New York	1992

#### 17BEMEOE03 TRANSPORT PHENOMENA

#### **Course Objective**

- To generalized equations for mass, momentum and heat.
- To understand the concepts of Reynolds and Gauss theorems.
- To learn combined diffusive and convective transport.
- To apply Film- and penetration models for mass and heat transfer.
- To apply Stefan-Maxwells equations for multi-component diffusion.
- To Solve the given set of equations either analytically or numerically.

#### **Course Outcome**

- Generalized equations for mass, momentum and heat.
- Understand the concepts of Reynolds and Gauss theorems.
- Learn combined diffusive and convective transport.
- Apply Film- and penetration models for mass and heat transfer.
- Apply Stefan-Maxwells equations for multi-component diffusion.
- Solve the given set of equations either analytically or numerically.

#### UNIT I INTRODUCTION AND BASIC CONCEPTS

General overview of transport phenomena including various applications, Transport of momentum, heat and mass, Transport mechanism, Level of transport, Driving forces, Molecular transport (diffusion), convective transport (microscopic)

#### UNIT II PROPERTIES, UNITS AND OTHER PHYSICAL PARAMETERS 9

Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

#### UNIT III MOMENTUM TRANSPORT

Basic concepts in fluid mechanics, Force, unit and dimensions, pressure in fluid, head of fluid, Molecular transport for momentum, heat and mass transfer, Viscosity of fluids, Newton's law, Momentum transfer, Newtonian and non- Newtonian fluids, Fluid flow and Reynolds number, Overall mass balance, Control volume and Continuity equation, Overall energy balance, Bernoulli's equation, Overall momentum balance, Drag coefficient, Stokes law, Flow in packed beds, Flow in fluidized bed

#### UNIT IV ENERGY TRANSPORT

Basic concepts in heat transfer, Heat transfer mechanisms, Fourier's law of heat conduction, thermal conductivity, convective heat transfer coefficient, Conduction heat transfer - through flat slab/wall and through hollow cylinder, Conduction through solids in series, Forced convection heat transfer inside pipes, Heat transfer outside various geometrics in forced convection, General discussion on natural convection heat transfer, Heat exchangers, General discussion on radiation heat transfer

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#### UNIT V MASS TRANSPORT

Basic concepts in mass transport, Some application examples, Modes of mass transfer, Molecular diffusion- Fick's law, Analogy between mass, heat and momentum transfer, Dispersion, Hydraulic or Darcy's flow in porous media, Chemical kinetics and activation energy, Film theory, Convective mass transfer, Liquid-solid mass transfer, Liquid-liquid mass transport, Gas-liquid mass transfer, Aeration and oxygen transport, Air stripping

Total: 45

#### **REFERENCE:**

S. NO	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Geankoplis, C. J	Transport Processes and Separation Processes Principles	Prentice Hall	2003

#### **WEB REFERENCE:**

1. https://laulima.hawaii.edu/portal

#### 17BEMEOE04 INTRODUCTION TO BIOMECHANICS

#### **Course Objective**

- To describe the principles of the study of human movement.
- To describe the range of factors that influence the initiation, production and control of human movement.
- To identify the body's lever systems and their relationship to basic joint movement and classification.
- To distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
- To explain joint and muscle function and the forces acting upon the human body during various sporting activities.
- To relate the different body systems necessary for human movement to occur.

#### **Course Outcome**

- Describe the principles of the study of human movement.
- Describe the range of factors that influence the initiation, production and control of human movement.
- Identify the body's lever systems and their relationship to basic joint movement and classification.
- Distinguish between biomechanical principles of kinetics and kinematics when applied to the analysis of human movement.
- Explain joint and muscle function and the forces acting upon the human body during various sporting activities.
- Relate the different body systems necessary for human movement to occur.

### UNIT I INTRODUCTION

Biomechanics - Improving Performance – Applications - Preventing And Treating Injury - Qualitative And Quantitative Analysis - Scholarly Societies - Computer Searches – Biomechanical Knowledge versus Information - Kinds of Sources - Evaluating Sources

#### UNIT II KEY MECHANICAL CONCEPTS

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application of Biomechanics

#### UNIT III HUMAN ANATOMY AND SOME BASIC TERMINOLOGY

Gross (Whole-Body) Modeling - Position and Direction Terminology - Terminology for Common Movements - Skeletal Anatomy - Major Joints - Major Muscle Groups - Anthropometric Data

#### UNIT IV ANATOMICAL DESCRIPTION

Key Anatomical Concepts - Directional Terms - Joint Motions - Muscle Actions - Active and Passive Tension of Muscle - Limitations of Functional Anatomical Analysis - Mechanical Method of Muscle Action Analysis - The Need for Biomechanics to Understand Muscle Actions - Sports Medicine and Rehabilitation Applications

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### UNIT V MECHANICS OF THE MUSCULOSKELETAL SYSTEM

Tissue Loads - Response of Tissues To Forces - Biomechanics of The Passive Muscle–Tendon Unit -Biomechanics of Bone - Biomechanics of Ligaments - Three Mechanical Characteristics of Muscle -Stretch-Shortening Cycle (SSC) - Force–Time Principle - Neuromuscular Control

#### Total: 45

#### **REFERENCES:**

S. NO	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Duane Knudson	Fundamentals of Biomechanics	SpringerScience+BusinessMedia,LLC	2007
2	C. Ross Ethier Craig A. Simmons	Introductory Biomechanics	Cambridge University Press	2007

### LIST OF OPEN ELECTIVES OFFERED BY AUTOMOBILE ENGINEERING DEPARTMENT

### 17BEAEOE01AUTOMOBILE ENGINEERINGL T P C 3 0 0 3

#### **COURSE OBJECTIVES**

- To impart knowledge on the constructional details and principle of operation of various automobile components.
- To learn the function and working of various components in transmission and drive lines.
- To study the concept and working of steering and suspension systems in an automobile.
- To give knowledge on the wheels, tyres and brakes of automobiles.
- To provide information on the current and future trends in automobiles.
- Identify and explain the types of steering system..

#### **COURSE OUTCOMES**

Upon successful completion of the course, the students should be able to:

- Demonstrate the operating principles and constructional details of various automobile components.
- Explain the function and working of components in transmission and drive lines.
- Identify and explain the types of steering system.
- Identify and explain the types of suspension system.
- Classify and describe the types of wheels, tyres and brakes of automobiles.
- Discuss the current and future trends in the automobiles

#### UNIT I ENGINE AND FUEL FEED SYSTEMS

Classification of Engine, construction and working of four stroke petrol and diesel engine, firing order and its significance. Carburetor working principle, requirements of an automotive carburetor, Petrol injection Systems (MPFI, TBI), Diesel fuel injection systems (CRDI)

#### UNITII TRANSMISSION SYSTEMS

Requirements of transmission system.Flywheel. Different types of clutches, principle, Construction, torque capacity and design aspects. Objective of the gearbox - Determination of gear ratios for vehicles.Performance characteristics at different speeds. Different types of gearboxes - operation. Function of Propeller Shaft Construction details of multi drive axle vehicles. Different types of final drive. Differential principles. Constructional details of differential unit. Non-slip differential. Differential lock

#### UNITIII SUSPENSION SYSTEM

Need of suspension system - Types of suspension - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs - Independent suspension - Rubber suspension - Pneumatic suspension - Hydro Elastic suspension - Shock absorbers. Vibration and driving comfort.

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#### UNITIV BRAKES

Necessity of brake, stopping distance and time, brake efficiency, weight transfer, shoe brake and disc brake theory, Brake actuating systems - Mechanical, Hydraulic and Pneumatic. Parking and engine exhaust brakes. Power and power assisted brakes. Antilock Braking System (ABS).

#### UNITV ELECTRICAL SYSTEM

Principle and construction of lead acid battery. Lighting system: details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator. Starting System and charging system.

#### Total: 45

S.NO.	Author(s) Name	Title of the book	Publisher	Year of
				n
1.	Young U.P and	Automotive Electrical	ELBS & New Press	1999
	Griffiths L	Equipment		
2.	Ganesan.V	Internal Combustion	Tata McGraw-Hill	2003
		Engines	Publishing Co., New	
			Delhi	
3.	Dr.Kirpal Singh	Automobile Engineering	Standard Publishes	2011

#### **TEXTBOOKS:**

#### **REFERENCES:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of
				publication
1.	Heldt .P.M	The Automotive Chassis	Literary	2012
			Licensing,LLC	
2.	Crouse.W.H	Automobile Electrical	McGraw-Hill	1986
		Equipment", 3 <sup>rd</sup> Edition	Book Co., Inc.,	
			New York.	
3.	N.Newton, W.	The Motor vehicle, 13th	SAEInc	2001
	Steeds and	edition		
	T.K.Garrett			

#### 17BEAEOE02BASICS OF TWO AND THREE WHEELERSL T P C

3003

#### **COURSE OBJECTIVES**

- The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.
- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.

#### **COURSE OUTCOMES**

- Upon successful completion of the course, the students should be able to:
- Construct the frames of two and three wheelers of different layouts.
- Demonstrate the constructional details and principle of operation of various engine components.
- Identify and explain the types of transmission systems.
- Identify and explain the types of steering and suspension systems.
- Classify and describe the types of wheels, tyres and brakes for two and three wheelers.
- Explain the servicing of two and three wheelers.

#### UNIT I INTRODUCTION

Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

## UNIT II POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS

2 stoke and 4 stoke SI engines and CI engines design criteria– design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburetor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

#### UNIT III CLUTCHES AND TRANSMISSION

Types of clutches for 2 and 3 wheelers.Design of clutch system.Gears for two and three wheelers.Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

#### UNIT IV FRAMES, SUSPENSION, WHEELS AND TYRES

Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

#### **UNIT V THREE WHEELERS**

Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

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#### **TEXTBOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of
				publication
1.	Irving P.E.	Motor Cycle	Temple Press Book,	1992
		Engineering.	London.	
2.	Srinivasan.S.	Motor cycle, Scooter	New century book	1988.
		Mobeds.	house.	

S.NO.	Author(s) Name	Title of the book	Publisher	Year of
				publication
1	M M Criffin	Motor cycles from	Prentice Hall Inc,	1978
1.		inside and outside.	New Jersey.	
	Bruce A. Johns,	Motorcycles:		
2.	David	Fundamentals, Service,	Goodheart-Willcox	1999
	D.Edmundson and	Repair		1777
	Robert Scharff			

#### **17BEAEOE03**

#### AUTOMOBILE MAINTENANCE

#### **COURSE OBJECTIVES:**

- The objective of this course is to make the students to know and understand the maintenance and fault diagnosis of basic systems in Automobile.
- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.

#### **COURSE OUTCOMES**

Upon successful completion of the course, the students should be able to:

- Describe and differentiate the types of maintenance.
- List the procedure for dismantling, servicing and assembling of engine components.
- Demonstrate the servicing of transmission and driveline components.
- Discuss the procedure for steering and suspension
- Discuss the procedure for wheel and brake maintenance.
- Explain the fault diagnosis in the electrical and air conditioner systems

#### UNIT I MAINTENANCE OF RECORDS AND SCHEDULES

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

#### UNIT II ENGINE MAINTENANCE

Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

#### UNIT III CHASSIS MAINTENANCE

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

#### UNIT IV ELECTRICAL SYSTEM MAINTENANCE

Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

## UNIT VMAINTENANCEOFFUELSYSTEM,COOLINGSYSTEMS,LUBRICATION SYSTEM AND VEHICLE BODY9

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

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#### **TEXTBOOKS:**

S	S.NO.	Author(s) Name	Title of the book		Publisher		Year	of
							publication	n
	1.	John Doke	Fleet Management		McGraw	Hill	1984	
					Со			
	2.	James D	Advanced	Engine	Prentice	Hall	2011	
		Halderman	Performance Diagno	sis	Publication	S		

#### 17BEAEOE04 INTRODUCTION TO MODERN VEHICLE TECHNOLOGY L T P C 3 0 0 3

#### **COURSE OBJECTIVES**

- To impart knowledge on trends in the vehicle power plants.
- To learn the various advanced driver assistance systems.
- To study the working of advanced suspension and braking systems in an automobile.
- To give information about motor vehicle emission and noise pollution control.
- To provide knowledge of the vehicle telematics.
- To give information about the noise control techniques.

#### **COURSE OUTCOMES**

Upon successful completion of the course, the students should be able to:

- Distinguish and describe the various modern vehicle power plant systems.
- List and explain the various driver assistant mechanisms.
- Identify and describe the working of advanced suspension and braking systems.
- Apply the knowledge of motor vehicle emission and noise pollution control.
- Describe the noise control techniques
- Describe the vehicle telematics and its applications

#### UNIT I TRENDS IN POWER PLANTS

Hybrid vehicles - Stratified charged / learn burn engines - Hydrogen engines - battery vehicles - Electric propulsion with cables - Magnetic track vehicles.

#### UNIT II DRIVER ASSISTANCE SYSTEMS

Collision Avoidance Systems, Adaptive cruise control, adaptive noise control, anti-spin regulation, traction control systems, cylinder cut- off technology, ABS, Driver Drowsiness Detection system

#### UNIT III SUSPENSION BRAKES AND SAFETY

Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passenger comfort.

#### UNIT IV NOISE & POLLUTION

Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

#### UNIT V TELEMATICS

Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition

#### Total: 45

#### **TEXT BOOKS**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of
				publication
1.	LjuboVlacic, Michael Saren and Fumio Harashima	Intelligent Vehicle Technologies	Butterworth- Heinemann publications, Oxford	2001

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2.	Ronald K.Jurgen	Navigation and Intelligent Transportation Systems – Progress in Technology	Automotive Electronics Series,SAE, USA.	1998
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S.NO.	Author(s)	Title of the book	Publisher	Year of
	Name			publication
1.	William B	"Understanding Automotive	Butterworth	1998
	Riddens	Electronics", 5 <sup>th</sup> Edition	Heinemann	
			Woburn.	
2.	Bechhold,	"Understanding Automotive	SAE	1998
		Electronics"		
3.	Robert	"Automotive HandBook", 5 <sup>th</sup>	SAE	2000
	Bosch,	Edition		

#### LIST OF OPEN ELECTIVES OFFERED BY CIVIL ENGINEERING DEPARTMENT

## 17BECEOE01HOUSING, PLAN AND MANAGEMENTL T P C3003

#### **COURSE OBJECTIVE:**

- Teach them introduction to housing
- Make them aware of Formulation of Housing Projects
- Impart knowledge about construction techniques and cost-effective materials
- Learn about Formulation of Housing Projects
- Understand Site analysis
- Learn about Layout design

#### **COURSE OUTCOME**

#### At the end of the this course the students should have learnt

- the basic terms of housing programmes,
- planning and designing of housing projects,
- Know construction techniques and
- Understand cost effective materials and
- familiarise housing finance
- Know Project appraisal techniques.

#### UNIT I INTRODUCTION TO HOUSING

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

#### UNIT II HOUSING PROGRAMMES

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations.

#### UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

## UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

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# UNIT VHOUSING FINANCE AND PROJECT APPRAISAL9Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash FlowAnalysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, RecoveryPattern (Problems).

#### Total: 45

#### **TEXTBOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of
				publication
1	Meera Mehta and	Metropolitan Housing	Sage Publications Pvt.	2002
1.	Dinesh Mehta	Markets	Ltd., New Delhi	2002
2.	Francis Cherunilam and Odeyar D Heggade	Housing in India	Himalaya Publishing House, Bombay	2001

S.NO.	Title of the book	Year of
		publication
1.	Development Control Rules for Chennai Metropolitan Area,CMAM Chennai	2002
2.	UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi	2000

#### 17BECEOE02 BUILDING SERVICES

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#### **COURSE OBJECTIVES**

- Defining and identifying of eng. services systems in buildings.
- The role of eng. services systems in providing comfort and facilitating life of users of the building.
- The basic principles of asset management in a building & facilities maintenance environment
- Importance of Fire safety and its installation techniques
- To Know the principle of Refrigeration and application
- To Understand Electrical system and its selection criteria

#### **COURSE OUTCOME**

The students will be able to

- Machineries involved in building construction
- Understand Electrical system and its selection criteria
- Use the Principles of illumination & design
- Know the principle of Refrigeration and application
- Importance of Fire safety and its installation techniques
- Know the principle behind the installation of building services and to ensure safety in buildings

#### UNIT I MACHINERIES

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

#### UNIT II ELECTRICAL SYSTEMS IN BUILDINGS

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

## UNIT III PRINCIPLES OF ILLUMINATION & DESIGN 9

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

#### UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Subcooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

#### UNIT V FIRE SAFETY INSTALLATION

9

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers

#### Total: 45

#### **TEXTBOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of
				publication
1.	E.R.Ambrose	Heat Pumps and Electric Heating	John and Wiley and Sons, Inc., NewYork	2002
2.	Handbook for Build systems	ing Engineers in Metric	NBC, New Delhi	2005

S.NO.	Author(s) Name	Title of the book	Publisher	Year of
				publication
1.	Philips Lighting in Arc	hitectural Design	McGraw-Hill, New York	2000
2.	A.F.C. Sherratt	Air-conditioning and Energy Conservation	The Architectural Press London	2005
3.	National Building Code			

## 17BECEOE03MANAGEMENT OF IRRIGATION SYSTEMSL T P C3 0 0 3

#### **OBJECTIVES**

- To enable the students for a successful career as water management professionals.
- To create a potential among students in the area of irrigation management with specific enrichment to synthesis of data and their analysis.
- To expose the students the need for an interdisciplinary approach in irrigation water management
- To providing a platform to work in an interdisciplinary team.
- To provide students an ability to understand the applications of mathematical and scientific concepts to analyse intricate technical, social and environmental problems in irrigation water management and finding solutions for them.
- To promote student awareness for a life-long learning process and inculcate professional ethics and codes of professional practice in water management.

#### OUTCOME

At the end of this the students will be in a capacity to

- Understand the concepts of soil-water-plant relationship as well as to expose them to the principles and practices of crop production.
- Exposure to ground water, hydraulics of ground water related to drainage, drainage concepts, planning, design and management of drainage related irrigation system management
- Understand the various principles of irrigation management and to analyse the different types of irrigation systems and their performances based on service oriented approach.
- Gain insight on local and global perceptions and approaches to participatory water resource management
- Learn from successes and failures in the context of both rural and urban communities of water management.
- Exposure on the use of economic concepts in irrigation development and to impart knowledge on economic planning so as to enable viable allocation of resources in the irrigation sector.

#### UNIT I IRRIGATION SYSTEM REQUIREMENTS

Irrigation systems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies.

#### UNIT II IRRIGATION SCHEDULING

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation.

#### UNIT III MANAGEMENT

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

#### UNIT IV OPERATION

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study.

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#### UNIT V INVOLVEMENT OF STAKE HOLDERS

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Farmer's participation in System operation – Water user's associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

#### **TEXTBOOKS:**

#### Total: 45

S.NO.	Author(s) Name	Title of the book	Publisher	Year of
				publication
1.	Dilip Kumar Majumdar	IrrigationWaterManagement – Principlesand Practice	Prentice Hall of India Pvt. Ltd., New Delhi	2000
2.	Hand book on Irrigation Water Requirement R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi			

S.NO.	Author(s) Name	Title of the book	Publisher	Year of
				publication
1.	Maloney, C. and Raju, K.V	Managing Irrigation TogetherPractice	Stage Publication, New Delhi, India	2000

## 17BECEOE04ADVANCED CONSTRUCTION TECHNOLOGYL T P C3003

#### **OBJECTIVE:**

- To give an experience in the implementation of new technology concepts which are applied in field of Advanced construction.
- To study different methods of construction to successfully achieve the structural design with recommended specifications.
- To involve the application of scientific and technological principles of planning, analysis, design and management to construction technology.
- To study of construction equipment's, and temporary works required to facilitate the construction process
- To provide a coherent development to the students for the courses in sector of Advanced construction technology.
- To present the new technology of civil Engineering and concepts related Advanced construction technology.

#### **OUTCOMES:**

- Implementation of new technology concepts which are applied in field of Advanced construction.
- Different methods of construction to successfully achieve the structural design with recommended specifications.
- Application of scientific and technological principles of planning, analysis, design and management to construction technology.
- Will gain the Knowledge of construction equipment's, and temporary works required to facilitate the construction process
- Development to the students for the courses in sector of Advanced construction technology.
- The new technology of civil Engineering and concepts related Advanced construction technology.

#### UNIT - I MODERN CONSTRUCTION METHODS 9

Open Excavation, Shafts and Tunnels- Preparation of foundation, Cofferdams, Caisson, Piled Foundation, Prestressed Concrete Construction, Pre-cast Concrete Construction.

#### UNIT - II CONSTRUCTION METHODS FOR SPECIAL STRUCTURES 9

Construction Methods For Bridges, Construction Methods for Roads, Construction Methods For Special Structures for Railways, Construction Methods for Dams, Construction Methods for Harbour, Construction Methods for River Works Pipelines.

#### UNIT - III MODERN CONSTRUCTION EQUIPEMENTS -I

Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting, Tunneling and hoisting.

#### UNIT - IV MODERN CONSTRUCTION EQUIPEMENTS -II 9

Construction Equipment used for Conveying, Hoisting, Dredging, Dewatering Systems, Paving and concreting Plant.

#### UNIT - V PRINCIPLES AND PRACTICES OF TEMPORARY STRUCTURES 9

Principles and Practices of Temporary structures, Shoring, and Strutting, Underpinning, Principles and Design of Formwork, Scaffolding, Operation and maintenance of construction equipments

#### Total: 45

#### **TEXTBOOKS:**

S.NO.	Author(s) Name	Title of the book	Publisher	Year of
				publication
1.	Peurifoyu , R. L., ,	Construction Planning ,	McGraw Hill Co.	2000
	Ledbette, W.B	Equipment and Methods		
2.	Antill J.M	PWD, Civil Engineering	McGraw Hill Book	2005
		Construction	Со	

S.NO.	Author(s) Name	Title of the book	Publisher	Year of
				publication
1.	Varma, M	Construction Equipment and its Planning & Applications	Metropoltian Book Co	2000
2.	Nunnaly, S.W	Construction Methods and Management	Prentice – Hall	2000
3.	Ataev, S.S	Construction Technology	MIR , Pub	2000