FACULTY OF ENGINEERING
DEGREE OF BACHELOR OF ENGINEERING IN BIOMEDICAL ENGINEERING

DEPARTMENT OF BIOMEDICAL ENGINEERING

(REGULAR PROGRAMME)

CURRICULUM & SYLLABI

(2016-2017)

Enable | Enlighten | Enrich
KARPAGAM
ACADEMY OF HIGHER EDUCATION
(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)

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

SemesterI & II

16BECC101 COMMUNICATIVE ENGLISH 3 0 0 3 100

OBJECTIVES:

- 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

OUTCOMES:

- Use English language for communication: verbal & non –verbal.
- Enrich comprehension and acquisition of speaking & writing ability.
- Gain confidence in using English language in real life situations.
- Improve word power: lexical, grammatical and communication competence.
- Acquire good vocabulary for easy communication.
- Be familiar with sentence structure and sentence formation.

Unit I (9)

Listening–Typesoflistening-Listeningtoclassreading-Videotapes/Audiotapes.**Speaking** –Introductiononself-Introductiononone's friend.**Reading**-Readingfor comprehension– Reading different kind ofpassages likedescriptive, narrative, objective, conversational and argumentative.**Writing**–FormalandInformalletters-Freewritingonany topic–My favorite place,hobbies,dreams,goals,etc--Tofillindifferentapplicationforms.**Grammar**–Articles-WHquestions–Yes/NoQuestion-SubjectVerbagreement.**Vocabulary**-WordFormation– Word expansion (Root word) -Prefix and Suffix.

Unit II (10)

Listening–UnderstandingthepassageinEnglish–Pronunciationpractice.**Speaking**–Asking and answeringquestions - Telephone etiquette. **Reading** –Critical reading – Finding key informationinagiventext(Skimming-Scanning).**Writing**–Coherence andcohesioninwriting –Shortparagraphwriting–Writingshortmessages.**Grammar**–Partsofspeech–Noun–Verb – Adjectives -Adverbs.**Vocabulary**– Compound Nouns/Adjectives–Irregularverbs.

Unit III(10) Listening–Listeningforspecifictask–Fillinthegaps.**Speaking**–Phonemes–Syllables– Role play– Conversation Practice. **Reading** –Reading and Comprehension. **Writing** - Autobiographicalwriting–Biographicalwriting-Instructionwriting.**Grammar**–Preposition– Infinitive–Gerund– Tenses.**Vocabulary**– Foreignwordsusedin English –Britishand American usage.

Unit IV (8)

Listening–Respondingtoquestions–Readinginclassforcompleteunderstandingandfor better pronunciation. **Speaking** –Debate- Presentations in seminars. **Reading** –Making inferencefromthereadingpassage–Predictingthecontentofreadingpassages.**Writing**-Interpretingvisualmaterials(tables,graphs,charts,etc) LetterstotheEditor. **Grammar**– Sentencepattern – Voice(active and passivevoice).**Vocabulary** – Oneword substitution.

Unit V **(8)**

Listening-Listeningtodifferentaccents,speeches/presentations.**Speaking**-Extemporetalk– Just-a-minutetalk.**Reading**-Readingstrategies–Intensivereading–Textanalysis.**Writing**- Creativewriting–Writingcircularsandnotices–Writingproposal.**Grammar**–Directand Indirect speech– Conditional sentences - Auxiliaryverbs. **Vocabulary** –Abbreviations & Acronyms.

Note: Students shall havehands on training in improving listening skill inthe language laboratory@ 2 periods per each unit.

Total-45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OFTHEBOOK	PUBLISHER	YEAROF PUBLICATION
1	Sangeeta Sharma, Meenakshi Raman	Technical Communication:Principles And Practice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OFTHE BOOK	PUBLISHER	YEAROF PUBLICATION
1	Lakshminarayanan, K.R. &Murugavel, T.	Communication Skills forEngineers	SCITECH Publications, Chennai	2009
2	Rizvi Ashraf, M	EffectiveTechnical Communication	Tata McGraw-Hill, New Delhi.	2007
3	Rutherford Andrea, J.	Basic Communication Skills for Technology	Pearson Education, New Delhi.	2006

WEBSITES:

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

16BECC102 ENGINEERING MATHEMATICS I 3 2 0 4 100

Course Objectives

The goal of this course is for the students

- To develop the use of matrix algebra techniques that is needed by engineers forpractical applications.
- To understand geometrical aspects of curvature and elegant application of differential calculus which are needed in Engineeringapplications.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model Engineeringproblems.
- To familiarize the student with functions of several variables which is the foundation for many branches ofEngineering.
- To introduce sequence and series which is central to many applications in Engineering.
- To make the student to solve various engineering problems

Course Outcomes

Upon completion of this course the students will be able

- To solve the rank, Eigen values and eigenvectors, diagonalization of a matrix,Symmetric matrices and the students will be able to use matrix algebra techniques for practical applications.
- Toequipthestudentstohavebasicknowledgeandunderstandinginonefieldofm aterials, differentialcalculus
- To solve simple standard examples using the ideas of differential equations.
- To apply various techniques to solve Partial DifferentialEquations
- To develop the tool of power series for learning advanced EngineeringMathematics.
- To apply the knowledge acquired to solve various Engineeringproblems.

UNIT I MATRICES (12)

ReviewofMatrixAlgebra-Characteristicequation–EigenvaluesandEigenvectorsofareal matrix–Properties–Cayley-Hamiltontheorem(excludingproof)–Orthogonaltransformation ofasymmetricmatrixtodiagonalform–Quadraticforms–Reductiontocanonicalform through orthogonal reduction.

UNIT II DIFFERENTIAL CALCULUS (12)

Overview ofDerivatives-CurvatureinCartesianco-ordinates–Centreandradiusofcurvature–Circleofcurvature–Evolutes–Envelopes-EvolutesasEnvelopeofnormals–Maximaand Minima offunctions of two ormoreVariables–Method ofLagrangianMultipliers

UNIT III DIFFERENTIAL EQUATIONS (11)

LinearDifferentialequationsofsecondandhigherorderwithconstantcoefficients-Euler's form of Differentialequations– Method of variation parameters.

UNIT-IV FUNCTIONSOF SEVERAL VARIABLES (12)

Partial derivatives– Euler's theorem for homogeneous functions – Total derivatives – Differentiationofimplicitfunctions–Jacobians–MaximaandMinimaoffunctionsoftwoor moreVariables -MethodofLagrangian multipliers.

UNIT V SEQUENCESAND SERIES (13)

Sequences: Definitionandexamples–**Series:**TypesandConvergence–Seriesof positive terms–Testsofconvergence:Comparisiontest,IntegraltestandD'Alembert'sratiotest– Alternatingseries–Leibnitz'stest–Seriesofpositiveandnegativeterms–Absoluteand conditional convergence.

Total :60

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OFTHE BOOK	PUBLISHER	YEAROF PUBLICATION
1	Hemamalini. P.T	Engineering Mathematics	McGraw Hill Education (India) Private Limited, New Delhi.	2014
2	Sundaram, V. Lakhminarayan,K.A. &Balasubramanian, R.	Engineering Mathematics forfirstyear.	Vikas Publishing Home, New Delhi.	2006

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OFTHE BOOK	PUBLISHER	YEAROF PUBLICATION
1	Grewel .B. S.	Higher Engineering Mathematics	KhannaPublications, New Delhi.	2014
2	Bhaskar Rao. P. B, Sri RamacharySKV S, Bhujanga Rao. M	Engineering MathematicsI	BS Publications, India.	2010
3	Ramana. B.V	Higher Engineering Mathematics	Tata McGraw Hill Publishing Company, New Delhi.	2007
4	ShahnazBathul	Text book of Engineering Mathematics(Special Functions and Complex Variables)	PHI Publications, New Delhi.	2009
5	Michael D. Greenberg	Advanced Engineering Mathematics	Pearson Education,India	2009

WEBSITES:

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

16BEPH103
16BEPH203 **ENGINEERING PHYSICS** **3 0 0 3 100**

Course Objectives

- To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology
- Understand the basics of laser and optical fiber with appropriate applications.
- Introduce the concepts of quantum mechanics for diverse applications.
- Impart the basic knowledge of crystal and its various crystal structures.
- Disseminate the fundamentals of nuclear physics and their applications.
- To understand about nuclear reactors for energy resources

Course Outcomes

- 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 for nuclear reactors for energy resources

UNITIPROPERTIESOFMATTERANDTHERMODYNAMICS (9)

Threetypesofmodulusofelasticity –basicdefinitions,relationconnectingthemodulii (Derivation), poison ratio- Torsionalpendulum- bendingof beams- bendingmoment–basic assumption ofmoment–uniform and non uniformbending
Concept of entropy-changeof entropyin reversible and irreversible processes– refrigeration.

UNITII LASER ANDFIBER OPTICS (9)

Introduction–emissionandabsorptionprocess-Einstein'scoefficientsderivation.Typesof LASER-CO_2, SemiconductorLASER-Applications ofLASERin industryand medicine.
Totalinternalreflection–modesofpropagationoflightinopticalfibers–numericalaperture andacceptance angle–derivations,typesof opticalfibers(Material,refractive indexandmode)– fiber optical communication system (block diagram)

UNITIII QUANTUMPHYSICS (9)

Introductiontoquantumtheory–Blackbodyradiation-Photoelectriceffect-dualnatureof matterandradiation–deBrogliewavelength,uncertainty principle–physicalsignificanceof wave function, Schrödinger'swave equation–time dependentandtime independentequations– particle in onedimensional box-scanning electronmicroscope.

UNITIV CRYSTAL PHYSICS (9)

Lattice–unitcell–Bravaislattice–lattice planes–Miller indices–calculationofnumber of atomsper unitcell,atomic radius,coordinationnumber,packingfactorfor SC,BCC,FCCand HCPstructures-crystal defects– point, line and surfacedefects

UNITV ULTRASONICS AND NUCLEARPHYSICS (9)

Productionofultrasonicsby piezoelectricmethod–NonDestructiveTesting–pulseecho system through transmission and reflection modes-A,Band C–scan displays,Medicalapplications–Sonogram Introduction – basics about nuclear fission and fusion, nuclear composition – Radiationdetectors–semiconductor detector.Reactors–essentialsofnuclear reactor- power reactor.

Total-45

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAROF PUBLICATION
1	Ganesan.Sand Baskar.T	Engineering PhysicsI	GEMS Publisher, Coimbatore-641	2015

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OFTHE BOOK	PUBLISHER	YEAROF PUBLICATION
1	Serwayand Jewett	Physics for Scientists and Engineerswith Modern Physics	Thomson Brooks/Cole,Indian reprint, NewDelhi	2010
2	Gaur, R.K. and Gupta, S.C	Engineering Physics	DhanpatRai Publications,New Delhi.	2011
3	M.N. Avadhanulu and PG Kshirsagar	A Text book of Engineering Physics	S.Chandand company,Ltd.,New Delhi	2011
4	D.C. Ghosh, N.C. Ghosh, P.K. Haldar	Engineering Physics	UniversityScience, New Delhi	2011
5	P. Khare, A. Swarup	Engineering Physics: Fundamentals and Modern Applications	Jones &Bartlett Learning	2009

WEBSITES:

- www.nptel.ac.in
- www.physicsclassroom.com
- www. oyc.yale.edu
- www.physics.org

16BECH103
16BECH203 ENGINEERINGCHEMISTRY 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To analyze the basics of Periodic properties, Intermolecularforces
- To infer the terminologies of electrochemistry and to analyze aboutenergy storagedevices
- To build the concept of corrosion and itsprevention
- To summarize the basic water technology and itspurification.
- To analyze about spectroscopictechnique
- To analyze the chemical principles in the field of engineering

COURSE OUTCOMES:

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

- Rationaliseperiodicpropertiessuchasionizationpotential,electronegativity,oxidation states and electronegativity.
- Analyse the mechanism of different energy storagedevices.
- Rationalise different types of corrosion and itsprevention.
- List the various methods in the purification ofwater.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopictechniques
- Integrate the chemical principles in the projects undertaken in field of engineeringand technology

UNITI WATER TECHNOLOGY (9)

Sources-Characteristics–Specificationfordrinkingwater,BIS&WHO-Alkalinity–Typesof alkalinity anddetermination–Hardness–Typesandestimationby EDTAmethod(problems)-Domesticwatertreatment–Disinfectionmethods (Chlorination,Ozonation.UVtreatment)– Boiler feedwater–Requirements–Disadvantagesofusinghardwater inboilers–Internal conditioning (Phosphate, Calgonand Carbonate conditioning methods)– Externalconditioning– Demineralization process–Desalination -Reverseosmosis.

UNITII LECTROCHEMISTRYAND STORAGE DEVICES (9)

Electrochemicalcells–EMF–Measurement ofemf–Single electrodepotential–Nernst equation – Reference electrodes –Standard Hydrogenelectrode -Calomel electrode – Ion selective electrode – Glass electrode and measurement ofpH – Electrochemical series – Significance–

Potentiometrictitrations(Redox-Fe^{2+}vsdichromate)–Electrolyticconductance- application (conductometric titration)-Batteries- Primary batteries-Leclanchecell- Secondary batteries-Lead acid battery.An introduction to Fuel Cell-H_2-O_2Fuel Cell.

UNITIII FUELSAND COMBUSTION (9)

Coal-ProximateandUltimateanalysis-Metallurgicalcoke-ManufacturebyOtto-Hoffman method- Petroleumprocessingand fractions-Synthetic petrol- Bergiusand Fischer-Tropsch method-Knocking-Octane number andCetanenumber-Gaseousfuels- Water gas, Producer gas, Combustion offuel-Introduction-GCV-NCV-Flue gas analysis.

UNITIV CORROSIONSCIENCE (9)

ChemicalandElectrochemicalcorrosion-Galvaniccorrosion-Differentialaerationcorrosion-Corrosioncontrol- SacrificialanodeandImpressed current cathodicmethods- Corrosion inhibitors -Protective coatings– Organiccoatings-Paints-Constituents and functions –Inorganic coatings-Metalliccoatings- Electroplating (Au) andElectroless plating (Ni)- Surface conversion coating -Hot dipping.

UNITV SURFACE CHEMISTRYAND PHASE RULE (9)

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

Phase Rule:Definition -Phase diagrams–onecomponentwater system,twocomponentAg-Pb system.

Total:45

TEXT BOOKS:

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

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OFTHEBOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Raman Sivakumar	Engineering Chemistry I&II	McGraw-Hill Publishing Co.Ltd., 3rd Reprint NewDelhi.	2013
2.	Kuriakose. J.C. and Rajaram	ChemistryinEngineeringand Technology.	TataMcGrawHillPublishing Company, New Delhi.	2010
3.	Jain, P.C. and MonikaJain	Engineering Chemistry.	DhanpatRai PublishingCompany(P)Ltd., New Delhi.	2009
4.	Dara.S.S	Text book of Engineering	S.Chand&Co.Ltd., New Delhi	2008
5.	Sharma.B. K	Engineering Chemistry	Krishna PrakasamMedia (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
3. http://www.learnerstv.com/Free-chemistry-Video-lectures-ltv044-Page1.htm
4. http://ocw.mit.edu/courses/#chemistry
5. http://www.chem.qmul.ac.uk/surfaces/sec

16BEBME104 INTRODUCTION TO BIOMEDICAL ENGINEERING 3 0 0 3 100

COURSE 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

COURSE OUTCOMES:

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

- understand the basicsof Bioinstrumentation
- Apply the ethics in their field of work
- Explain basic functions of medical imaging equipment
- Illustrate the HaemodialysisMachines
- Understand the importance and functions of therapeuticeqipment
- Analyze various Ethicalissues

UNIT-I INTRODUCTION(9)

HistoricalPerspective-Evolutionofmodernhealthcare system,Rolesplayedby Biomedical engineers, Professionalstatusof biomedicalengineering, ProfessionalSocieties,Basicsof Anatomyand physiology-Electrical Signals and Conductivity, temperature.

UNIT-IIDIAGNOSTICDEVICES (9)

Sourcesof biomedicalsignals,Basicmedicalinstrumentation system-Generalblockdiagramof a medicalinstrumentationsystem,Diagnostic devices-ECG,EEG, bloodpressuremeasurement, Temperatureand Respiration ratemeasurement, Blood cell counters, General constraints in design of medical instrumentation systems.

UNIT-III DIAGNOSTIC IMAGING (9)

X-rays, Nuclear MedicalImaging-Positron Emission Tomography,MagneticResonanceImaging Scanners, DiagnosticUltrasound, Thermal imaging systems.

UNIT-IV THERAPEUTIC EQUIPMENT (9)

Cardiac Pacemakers,Cardiac Defibrillators,Artificialheart,Instrumentsfor Surgery, HaemodialysisMachines-ArtificialKidney,Dialyzers, Ventilators-Humidifiers, Nebulizers and Aspirators, AnaesthesiaMachine.

UNIT-V ETHICSFOR BIOMEDICAL ENGINEERS (9)

Morality andEthics-A Definitionofterms,HumanExperimentation,Ethicalissuesinfeasibility studies,Ethicalissuesinemergency use,Ethicalissuesintreatmentuse, Codesofethicsforbio engineers, Ethical issues in tissue engineering.

TOTAL: 45

TEXT BOOKS

S. No.	**Author (s) Name**	**Title of the book**	**Publisher**	**Yearof Publication**
1	Enderle,John D., Bronzino, JosephD., Blanchard, SusanM	Introductionto Biomedical Engineering	ElsevierInc	2nd edition, 2005
2.	R. S. Khandpur	HandbookofBiomedical Instrumetation	McGraw-Hill PublishingCompany Limited	2nd edition, 2003
3.	DanielAVallero	Biomedicalethics forEngineers	Elsevierpublication	1st edition, 2007

REFERENCE BOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Yearof Publication
1	Leslie Cromwell, Fred J.Weibell,Erich A. Pfeiffer	BiomedicalInstrumentation and Measurement	Prentice Hallof India, New Delhi	2nd edition2002
2.	John GWebster	MedicalInstrumentation: Applicationand Design	John Wileyand sons, New York	4th edition,2010
3.	JosephJCarr, John M Brown	Introduction to Biomedical EquipmentTechnology	John Wiley& Sons, New	4th edition, 2008

16BEBME105 BASIC ELECTRICALAND ELECTRONICS ENGINEERING 3 0 0 3 100

Course Objectives

- To impart the basic knowledge about the Electric circuits.
- To understand the concept of Electrical Machines and Transformers.
- To understand the basic concepts of star and delta connections
- To understand the operation of AC and DC circuits
- To understand the working of Semiconductor devices and Digital Circuits.
- To impart the basic knowledge of Measuring Instruments and Electrical Installation.

Course Outcomes

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

- Attribute the electric circuits with DC and AC excitation by applying various circuit laws.
- Attribute the electrical machines and transformer.
- To understand the working principle of electronic devices and circuits
- Evaluate the various digital circuits in real time applications.
- Analysis various semiconductor devices in real time applications.
- Reproduce the Measuring Instruments and Electrical Installation.

UNITI ELECTRICCIRCUITS& MEASUREMENTS

Ohm'sLaw–Kirchoff'sLaws–SteadyStateSolutionofDCCircuits–IntroductiontoAC CircuitsWaveformsandRMSValue–PowerandPowerfactor–SinglePhaseandThreePhase balanced Circuits.

UNITII ELECTRICAL MACHINES 9

Construction,PrincipleofOperation,BasicEquationsandApplicationsofDCGenerators,DC Motors, Single PhaseTransformer, single phaseinduction Motor.

UNITIII MEASURING INSTRUMENTS 9

OperatingPrinciplesofMovingCoilandMovingIronInstruments(AmmetersandVoltmeters), DynamometertypeWattmeters and Energymeters.

UNITIV SEMICONDUCTOR DEVICESAND APPLICATIONS 9

Characteristics of PN Junction Diode– Zener Effect– ZenerDiode and itsCharacteristics– Half wave and Fullwave Rectifiers– VoltageRegulation. Bipolar Junction Transistor– CB, CE, CC Configurations and Characteristics

UNITIV-DIGITAL ELECTRONICS 9

Numbersystems–binarycodes-logicgates-Booleanalgebra,laws& theorems-simplification ofBooleanexpression-implementationofBooleanexpressionsusinglogicgates-standard forms of Boolean expression.

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title ofthe book	Publisher	Yearof Publication
1	Mittle,V.M	Basic ElectricalEngineering	Tata McGrawHillEdition,New Delhi	2004
2	SedhaR.S	AppliedElectronics	S.Chand&Co	2006

REFERENCES

S. No	Author(s) Name	Title ofthe book	Publisher	Yearof Publication
1	MuthusubramanianR, andMuraleedharanK A	Basic Electrical,Electronics and Computer Engineering	Tata McGrawHill, SecondEdition	2006
2	NagsarkarTK and Sukhija MS	Basics ofElectricalEngineering	Oxford press	2005
3	MahmoodNahviand JosephA.Edminis	Electric Circuits	Schaum'Outline Series, McGraw Hill	2002
4	PremkumarN	Basic ElectricalEngineering	AnuradhaPublishers	2003

16BEPH111
16BEPH211 ENGINEERING PHYSICS LABORATORY 0 0 4 2 100

OBJECTIVES:

- 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.

OUTCOMES:

- 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 ofv elocity of soundand compressibilityof liquid– Ultrasonic interferometer.
2. Determination of wavelength of mercuryspectrum– spectrometergrating.
3. Determination of Young'smodulusofthematerial–Nonuniformbending(or)Uniform bending.
4. Determination ofViscosityof liquid– Poiseuille's method.
5. Spectrometer Dispersivepower of aprism.
6. Torsional pendulum– Determination of Rigidity modulus.
7. Particle sizedetermination using Diode Laser
8. Determination ofLaser parameters– Wavelength, and angle of divergence.
9. Determination ofacceptance angle inan optical fiber.
10. Determination of thickness of a thin wire– Air wedge method
11. Determination ofBand Gap of asemiconductor material.
12. Determination of Specific resistanceof a given coil of wire – Wheatstone Bridge

16BECH111
16BECH211 ENGINEERING CHEMISTRY LABORATORY 0 0 4 2 100

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 Watersample.
2. Estimation of hardness of Water by EDTA
3. Estimation of chloride in Watersample (Argentometric method)
4. Determination of corrosion rate byweightlossmethod.
5. ConductometricTitration (Simple acid base).
6. ConductometricTitration (Mixtureof weak and strong acids).
7. Conduct metricTitration using $BaCl_2$vs Na_2SO_4.
8. pH Titration (acid&base).
9. PotentiometricTitration (Fe^{2+}/ $KMnO_4$or $K_2Cr_2O_7$).
10. Estimation of Ferricion bySpectrophotometry.
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.

16BEBME112 COMPUTER PRACTICE AND PROGRAMMING LABORATORY 1 0 4 3 100

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 in-depth 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:

Whatiscomputer- ComputerComponents- WhatisC- CCharacterset-Constants,Variablesand Keywords-Generalformof C Program- Relational andLogicalOperators- Selection Structures-If andnestedif-Switch Case-Loops-Definitionandtypes- Functions- Arrays-IntroductiontoStrings-Pointers.

PRACTICALS:

1. Working with word Processing, Spreadsheetandpresentation softwareinLinux

2. Programming in Scratch:

   Practicing fundamental concepts of programminglikesequence, selection decision statements, working of loops and eventdriven programming

3. C Programming:

   Practicingprogramstogetexposuretobasicdatatypes,algebraicexpressions,Conditional statements, Inputand Output Formatting, Decision Statements, Switch Case, Control structures, arrays, Stringsand function, implementation ofpointers.

REFERENCES: **TOTAL: 45**

S. No.	Author(s) Name	Title ofthe book	Publisher	Yearof Publication
1	E.Balagurusamy	ComputingFundamentalsandCProgramming	TMH Education, 5th Edition	2014
2	YashavantKanetkar	Let us “C”	BPB Publications, 13^{th}Edition	2013

16BEBME113 ENGINEERING GRAPHICS 0 0 4 2 100

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, andsustainability
- 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 engineeringpractice

COURSE OUTCOMES:

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

- Understand the engineering drawing and its place insociety.
- gain the knowledge of usage of Drawing instruments
- Expose the visualization of engineering drawing and engineering graphicsstandards.
- Expose the engineeringcommunication.
- Apply dimensions in drawings
- Use various graphic tools

UNIT I INTRODUCTION 9

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 8

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 9

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 8

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 8

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

Introduction to Drafting Software/Package (Not for Exam) 3

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.

16BECC151 HUMANVALUES 1 0 0 -100

OBJECTIVE

- To create an awareness on Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others.
- To create awareness on assessment of safety and risk
- To attain higher level of consciousness.
- To Develop the Self Discipline, and Self Control

OUTCOME

- Articulate what makes a particular course of action ethically defensible
- Assess their own ethical values and the social context of problems
- Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources and the objective presentation of data
- Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
- Possess emotional stability
- Develop good health. and fitness

UNIT I **3**

HumanlifeonEarth-ConceptofHumanValues-ValueEducation-Aimofeducationandvalueeducation-Typesofvalues-Components ofvalues– Attitudes–typesofattitudes

UNIT II **3**

SelfDevelopment:Selfanalysis–GoalSetting-ThoughtAnalysis–GuardingagainstAnger-Respectto age, experience, maturity, family members, neighbors,co-workers

UNIT III **3**

IndividualQualities –Truthfulness –Constructivity–Sacrifice–Sincerity-SelfControl –Altruism–

Tolerance-Scientific Vision– RegulatingDesire

UNIT IV **3**

MindCulture- ModernChallengesofAdolescent-Emotionsandbehavior-Sexandspirituality-Adolescent

Emotions-Meditation

UNIT V **3**

Bodyand Mind Fitness :(a)PhysicalExercises (b)Activities:(i)Moralization ofDesires(ii)Neutralizationof

Anger (iii)Eradication ofWorries (iv)Benefits ofBlessings

TOTAL 15

REFERENCES

S. No	Author(s) Name	Title ofthe book	Publi	Yearof Publication
1	Subramanian.R	ProfessionalEthics	Oxford,NewDelhi	2013
2	Govindarajan. M, Natarajan.	EngineeringEthics	Prentice Hall	2004
3	Tripathi.A.N	HumanValues	NewAge International	2009
4	Pope.G.U.	ThirukkuralwithEnglishTransla	Uma	2002

16BECC201A **BUSINESSCOMMUNICATION** **3 0 0 3 100**

COURSE OBJECTIVES:

The goal of this course is for students :

- To help students comprehend the role oflisteningskills in effective communication.
- To familiarizestudents with verbal andnon-verbalcommunication.
- To exposestudents to neutral accent.
- To develop emotional intelligenceskills in them for enhancing their self-esteem.
- To assist them in settinggoals and developing positive attitude.
- To enable students to acquiredecision making skills, problem solving skillsand assertiveskills.

COURSE OUTCOMES:

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

- Design and deliverapersuasive presentation that convinces the audienceofthe topic's relevanceand
- overcomes resistance,using appropriate visual support and adhering to a specified time limit.
- Useastrategic communication model and critical thinking to identifyobjectives, analyzeaudiences,and choosethe most effectivestructure and style for delivering strategicallysound written and spoken messages.
- Practiceprinciples of effectivebusiness writing and document design in allwritten documents.
- Build an understanding of different organizationalcultures, business practices, and social norms to communicate moreeffectivelyin domestic andcross-cultural business contexts.
- Develop their soft skills and inter personal skills, which willmakethe transition from collegeto
- workplacesmoother andhelp them excel in theirjob.

UNITI

What is Business Communication?-Types of Communication– Formal and informal communication– Process of Communication-modes ofCommunication– Barriers to communication.

UNITII

Written Business Communication– Style-word-usage-organisation ofIdeas– mechanics ofwriting and fill upof forms -CoverLetter-Letter for Job Application-Letter ofComplaint-Memos-Resumes- Email-Reports Revising and proofreading-Advertising slogans-jargons- Description of Graphicsand visual aids-interpretation of graphs using expressions ofcomparison and contrast .

UNITIII

ReadingandUnderstandingthenewsarticles-OralBusinessCommunication-FirstImpressions-Attire– EffectivePresentationstrategies-Nuancesofdelivery –Controllingnervousnessandstagefright-Visual aidsPresentations- CapturingAudience- Tone-Behavior-TelephoneEtiquette-Non-verbal communication -Eye contact - Facial expressions - Posture - Gestures - Bodylangage– Etiquette-Organization ofpresentation– brain storming-Negotiations.

UNIT-IV

Differencebetween goalsand dreams -SMART goal setting -3 Ds ofgoal setting-Determination, DisciplineandDirection-Developingtherightattitude-Motivation-IntrinsicandExtrinsicmotivation- Dealing with change -Dedication-Taking responsibilities-Decision making.

UNIT-V

Intrapersonal skills-Self-analysis-Thought process–Interpersonal skills- Confidencebuilding-Resolving conflicts-Analytical skills-Team Building-Leadership skills- Planning/organizing-Abilityto work independently-Professional ethics -Communicating via e-mail. Ethical perspectives and their implications forresponsible communication-Proposal Presentation

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THEBOOK	PUBLISHER	YEAROF PUBLICATION
1	Meenakshi Raman &Prakash Singh	Business Communication	Oxford University Press	2012

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THEBOOK	PUBLISHER	YEAROF PUBLICATION
1	Murthy, G .R. K.	Soft Skills for Success**.**	TheICFAI University Press, Hyderabad.	2008
2	Jagadeesan, G& Santanakrishnan,R.	Soft Skills Development: Training and Evaluation.	TheICFAI University Press, Hyderabad.	2008
3	Sherfield, Robert M., RhondaJ. Montgomery,&Patricia G. Moody	Developing Soft Skills.	Pearson Education, New Delhi.	2005

WEBSITES

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

16BECC201B TECHNICAL ENGLISH 3 0 0 3 100

COURSE 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 important 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

COURSE OUTCOMES:

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

- Acquire second language: speaking convincingly, expressing their opinions clearly, negotiating and arguing using appropriate communicative strategies.
- Enhance them reading texts critically and analytically
- 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.
- Enrich the ability to face interviews with confidence.
- Enable to write documents and formal written communication
- Admire and appreciate elegancy in communication.

UNIT-1 (10)

Listening-DifferencebetweenHearing&Listening–Listeningtoinformalconversation.**Speaking**-Spokenstructuresondifferentsituations-Introduction,Greeting,Commentsontopicslike Films,Games etc,Excuse,Request,Agreement,Disagreement,etc.,**Reading**–ExtensiveandIntensivereading.**Writing** –Reportwriting-Writinga coveringletter.**Grammar**–Regular&Irregular verbs-Kindsofsentences- Question tags. **Vocabulary**– Homonymsand Homophones.

UNIT-II (8)

Listening–NoteTaking-Improvinggraspingability.**Speaking**–Welcomeaddress-Voteofthanks-Masterofceremony.**Reading**–ActiveandPassivereading- Readingforvocabulary-Readingfora purpose.**Writing**-Writingareview(Filmreview)-Summary ofastory.**Grammar**-Modalverbs– Conjunction-Expression of causeand effect.**Vocabulary**-Phrasal verbs -Idioms.

UNIT– III (9)

Listening-Barrierstolistening(Physical,Psychological,Linguistic&Cultural).**Speaking**–Stress,Pause andIntonation.**Reading**–Rapidreading– Skimming, Scanningand Surveying.(SQ3R)**Writing-** Essay writing-Minutesofmeeting -Agenda–**Grammar**-ActiveandPassivevoice-Purposeexpression. **Vocabulary** -Same words used as noun and verb- Often misspeltand confused words.

UNIT-IV (8)

Listening –Listening to telephone conversation - Viewing model interviews. **Speaking** –Group Discussion - Correlation between verbal &non - verbal communication. **Reading** – Reading comprehension(short&longtext)-Readingjob advertisementsandprofileofacompany.**Writing**– Job application- Resume writing- Checklistpreparation.**Grammar** - Numericalexpressions– Collocations-**Vocabulary** -Singular and Plural (Nouns)

UNIT-V **(10)**

Listening–Typesoflistening-Improvinglisteningcomprehension**.Speaking**-Oralpresentation-Vocal communicationtechniques-Voice,quality,volume,pitchetc.,**Reading**-Notemaking-Makingnotes frombooks/anyformsofwritingmaterials.**Writing**-Describingprocess&products-Recommendation writing–Shortessayswriting-**Grammar**-Transformationofsentences(Simple,Compound&Complex). **Vocabulary** -Collection ofTechnical Vocabularies with their meanings.

Note: Students shall havehands on training in improving listening skill inthe languagelaboratory@ 2 periods per each unit.

Total-45

TEXT BOOK:

S.NO.	AUTHOR(S) NAME	TITLE OF THEBOOK	PUBLISHER	YEAROF PUBLICATION
1	Sangeeta Sharma, Meenakshi Raman	Technical Communication: Principles AndPractice 2nd Edition	OUP, New Delhi.	2015

REFERENCES:

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

WEBSITES:

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

16BECC202 ENGINEERING MATHEMATICS II 3 2 0 4 100

COURSE OBJECTIVES:

The goal of this course is for students :

- 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:

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

- solve problems in FluidDynamics, Theoryof Elasticity, heat and mass transfer etc.
- find the areas and volumes using multiple integrals
- improvetheir abilityinVector calculus
- exposeto the concept ofAnalytical function.
- applyComplex integration in their Engineering problems
- Apply various methods of solving differential equation which arise in many application problems.

UNIT-I MULTIPLE INTEGRALS (11)

Doubleintegral–Cartesiancoordinates–Polarcoordinates–Changeoforderofintegration–Triple integration in Cartesian co-ordinates – Areaas double integrals.

UNIT-II VECTOR CALCULUS (13)

Gradient,DivergenceandCurl–Directionalderivative–IrrotationalandSolenoidalvectorfields–Vector integration– Green's theorem, Gauss divergencetheoremand Stoke'stheorems (StatementOnly)- Surfaces
: hemisphereand rectangularparallelopipeds.

UNIT-III PARTIAL DIFFERENTIAL EQUATIONS (11)

Formationofpartialdifferentialequationsbyeliminationofarbitraryconstantsandarbitraryfunctions– Solutionofstandardtypesoffirstorderpartialdifferentialequations–Lagrange'slinearequation–Linear partial differential equations of second and higherorder with constantcoefficients.

UNIT-IVANALYTIC FUNCTIONS (12)

Analyticfunctions -Cauchy-RiemannequationsinCartesianandpolarforms– Sufficientconditionforan analyticfunction(StatementOnly)-Properties ofanalyticfunctions–Constructionsofananalytic function-Conformal mapping: w=z+a, az, 1/zand bilinear transformation.

UNIT-V COMPLEX INTEGRATION (13)

ComplexIntegration-Cauchy's integral theoremand integralformula(Statement Only)– Taylor series and Laurentseries-Residues–Cauchy'sresiduetheorem(StatementOnly)-ApplicationsofResiduetheorem to evaluatereal integralsaroundunitcircleand semicircle(excluding poles on the real axis).

Total :60

TEXT BOOKS:

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

REFERENCES:

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

WEBSITES:

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

16BECC204 ENVIRONMENTAL SCIENCES 3 0 0 3 100

COURSE 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.

COURSE OUTCOMES:

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)

UNITIINTRODUCTIONTO ENVIRONMENTALSTUDIESANDNATURALRESOURCES (9)

Definition,Scope andImportance–Needfor publicawareness -Forest resources: Use and over-exploitation,deforestation-Waterresources-Use and over-utilization of surface and ground water, floods, drought,conflictsover water-Land resources-Landasa resource,land degradation,maninduced landslides,soilerosionanddesertification–Mineralresources:Use andexploitation,environmentaleffects of extractingandusingmineralresources-Foodresources-Worldfoodproblems,changescausedby agricultureandovergrazing,effectsofmodernagriculture-Energy resources-Growingenergyneeds, renewableandnonrenewableenergysources,useofalternateenergy sources-roleofanindividualin conservation ofnatural resources.

UNITII ECOSYSTEM (9)

Chemistry andEnvironment-Environmental segments, Composition and Structure of atmosphere-Conceptofan ecosystem- Structure,components andfunctionofan ecosystem Energy flow in the ecosystem–Foodchain,FoodwebandEcologicalpyramids,StructureandfunctionofTerrestrial ecosystem (Forest,Desert andGrasslandecosystem) andAquaticecosystem (FreshwaterandMarine ecosystem)

UNITIII BIODIVERSITY (9)

Introductionto biodiversity,Definition-Genetic diversity, Species diversityand Ecosystem diversity,BiogeographicalclassificationofIndia,Importance ofbiodiversity-Value of biodiversity - Hot Spotsofbiodiversity-Threats to biodiversity -Endangered and EndemicSpecies of India – Conservationofbiodiversity-In-SituandEx-Situconservationofbiodiversity.

UNITIV ENVIRONMENTALPOLLUTION (9)

Definition–causes,effectsandcontrolmeasuresofAir pollution, Water pollution, Soil pollution, Marinepollution,NoisepollutionandThermalpollution.Solidwastemanagement-causes,effects and controlmeasures of urban and industrial wastes– Role of an individual in preventionof pollution– Disastermanagement-earthquake,tsunami,cycloneandlandslides.

UNITV SOCIALISSUESANDENVIRONMENT (9)

From UnsustainabletoSustainabledevelopment,Urbanproblemsrelatedtoenergy sources, Water conservation,Rainwaterharvestingand Watershedmanagement,Resettlementandrehabilitationof people,itsproblemsandconcerns,Environmentalethics-Issuesandpossible solutions-Climate change- Green houseeffect and Global warming, Acid rain, Ozone layer depletion, Wasteland reclamation- Environment Protection Act- HumanRights-Valueeducation, Role of Information Technology in EnvironmentandHumanhealth-Populationgrowth,Variationof populationamongnations-Population explosion.

TEXT BOOKS:

S.NO	AUTHOR(S) NAME	TITLE OF	PUBLISHER	YEAROF PUBLICATIO
1	Dr. Ravikrishnan, A	Environmental Science	Sri KrishnaHi tech Publishing CompanyPrivate Ltd., Chennai	2012
2	Anubhaka ushik C.P. Kaushik	Environmental Science and Engineering	New Age International (P) Ltd., New	2010

REFERENCES:

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

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.www.unesco.org/ext/field/beijing/scienceb.htm,www.infinitepower.org/education.htm
5. http://www.sciencedaily.com/news/top/environment/

16BEBME205 MATERIALS SCIENCE 3 0 0 3 100

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

UNITI CONDUCTING MATERIALS (9)

Conductors–classicalfreeelectrontheory ofmetals–Electricalandthermalconductivity–Wiedemann–Franzlaw–Lorentznumber–Drawbacksofclassicaltheory–Quantumtheory –Fermidistribution function–EffectoftemperatureonFermiFunction–Density ofenergystates–carrierconcentrationin metals.

UNITII SEMICONDUCTINGMATERIALS (9)

Intrinsicsemiconductor–carrierconcentrationderivation–Fermilevel–VariationofFermilevelwith temperature–electricalconductivity– bandgapdetermination–extrinsic semiconductors–carrier concentrationderivationinn-type semiconductor–variationof Fermilevelwithtemperature andimpurity concentration– compound semiconductors– Halleffect–Determination ofHallcoefficient– Applications.

UNITIIIMAGNETIC ANDSUPERCONDUCTING MATERIALS (9)

Originofmagneticmoment–Diaandparamagnetism–Ferromagnetism–Domaintheory–Hysteresis–soft and hard magneticmaterials– anti– ferromagneticmaterials– Ferrites– applications. Superconductivity:properties-Typesofsuperconductors–BCStheoryofsuperconductivity(Qualitative) -High Temperaturesuperconductors– Applications of superconductors– Magneticlevitation.

UNITIVDIELECTRIC MATERIALS (9)

Electricalsusceptibility–dielectricconstant–electronic,ionic,orientationalandspacechargepolarization –frequency andtemperaturedependenceofpolarisation–internalfield–Claussius–Mosottirelation (derivation)–dielectric loss–dielectricbreakdown–Applications ofdielectricmaterials–ferroelectricity and applications.

UNIT V ADVANCED MATERIALS (9)

Metallic glasses: preparation, properties and applications.Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, applications. Composite materials, Aircraft materials and non-metallic materials. Nano materials: synthesis – Physical and chemical vapour deposition – ball milling - properties of nanoparticles and applications. Carbon nanotubes: structure – properties and applications.

Total-45

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLEOF THE BOOK	PUBLISHER	YEAROF PUBLICATION
1	Ganesan.S and Baskar.T	Engineering PhysicsII	GEMS Publisher, Coimbatore-641 001	2015

REFERENCES:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAROF PUBLICATION
1	William D Callister Jr	Material Science and Engineering-An	JohnWiley& SonsInc., New York.	2013
2	James F Shackelford	Introduction to Materials Sciencefor Engineers	Macmillan Publication Company, New York	2014
3	Charles Kittel	Introduction to Solid State	JohnWiley& sons, Singapore.	2005

WEBSITES:

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

16BEBME206 ELEMENTS OF MECHANICAL ENGINEERING 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students

- To impart the basic knowledge of various basic fields of mechanical engineering.
- To Study about basic manufacturing processes.
- To study about basic machining process.
- To study about power plants.
- To study about automobile engineering
- To understand the concept of energy engineering

COURSE OUTCOMES:

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

- Infer the basic knowledgeof various basic fields of mechanicalengineering.
- Demonstrate various manufacturing processes.
- Understand the machining process.
- Discuss about power plants.
- Understand simple problems in Powertransmission of automobile engineering
- Explain about energy engineering

INTRODUCTION(Not included for examination)

EngineeringandTechnology-HistoryofMechanicalEngineering-Mechanics-Staticsanddynamics- Broad areas in Mechanical Engineering.

UNITI MANUFACTURING PROCESSES

FOUNDRY- Principles- Patterns- Types,Molding Processes,Cupola andInduction Furnaces.METAL FORMING-Principles-Hotandcoldworking ofmetals-Forging,rolling,extrusionandwiredrawing, sheetmetaloperations. WELDING- Principles-Oxy-Acetylene WeldingandManualMetalArcWelding, Brazing and Soldering.

UNITII MACHINETOOLS

Machiningprinciples-Constructionandworkingprinciplesofbasicmachinetools -Lathe,Drilling, Shaper, Planerand Milling machine.Introduction to CNC machines.

UNIT III AUTOMOBILE ENGINEERING &POWER TRANSMISSION SYSTEMS

Workingprincipleofpetrolanddieselengines-Fourstrokeandtwostrokecycles-Comparisonbetween fourstrokeandtwostrokeengines-Workingprincipleofsimplecarburetor-Lubricationsystemand cooling system. Beltdrives-Flat,V-belts-Rope,Chaindrive.Gears-Spur,Helical,Bevel,WormandwormwheelandRackand Pinion– Simple problems in Powertransmission.

UNIT IV ENERGY ENGINEERING&HYDRAULICMACHINES

IntroductiontoBoilers-WorkingprincipleofThermal,Hydro-ElectricandNuclearPowerPlants-Meritsand demerits.Solar–Wind powerplants.

Turbines-Impulseturbine-Peltonwheel,Reactionturbines-KaplanandFrancisturbines-Pumps-Working principle ofReciprocatingpumps and Centrifugalpumps.

UNIT V REFRIGERATION AND AIR-CONDITIONING

TerminologyofRefrigerationandAirConditioning-BasicprinciplesofVapourCompressionandAbsorption Refrigeration System– Windowand SplitRoomAirConditioners.

TEXT BOOKS:

S.No	Titleofthe book	Author(s) Name	Publisher	Yearof Publication
1	Basic Mechanical	Shanmugam, G	TataMcGrawHill Publishing	2008
2	Basic	Rajput, R.K	Laxmi Publications (P)	2008

16BEBME212 ENGINEERING WORKSHOP PRACTICE 0 0 4 2 100

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
   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

16BEBME251 APTITUDE TRAINING 1 0 0 - 100

OBJECTIVE:

- To achieve the competencies inAnalyticalability, Decisionmaking
- To enhance the employability skills among the students to meet out the corporate expectations.
- To improve the industry – institute selection ratio
- To enhance the students' interest towards Industry expectations
- to enhance the students with reason, model, and draw conclusions or make decisions with mathematical, statistical, and quantitative information.
- To apply probabilistic reasoning to draw conclusions, to make decisions, and to evaluate outcomes of decisions.

OUTCOMES:

- Understand the basic concepts of quantitative ability
- Understand the basic concepts of logical reasoning skills
- Solve campus placements aptitude papers
- Compete in various competitive exams
- Acquire satisfactory competency in use of VERBAL REASONING
- Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability

UNIT I **5**

Introduction,SpeedMath's,ProblemsonNumbers,Averages,RatiosandProportions,Problemson Ages

UNIT II **5**

Percentage, DataInterpretation, Profitand loss, Simple and CompoundInterest

UNIT III **5**

TimeSpeedandDistance,TimeandWork,PipesandCistern,Geometry,Probability,Permutationand Combinati

TOTAL: 15

S. No.	Author(s) Name	Title ofthe book	Publisher	Yearof Publication
1	Agarwal.R.S	Quantitative Aptitude forCompetitive Examinations	S.ChandLimited	2011
2	AbhijitGuha	Quantitative Aptitude forCompetitive Examinations	Tata McGrawHill	2011
3	EdgarThrope	Test OfReasoningforCompetitive Examinations	Tata McGrawHill, 4thEdition	2012

16BEBME301A OPTIMIZATION AND CALCULUS OF VARIABLES 3 2 0 4 100

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

- solve problems in different environments and develop critical thinking
- build and solve Transportation Models
- analyse Assignment Models,
- solve integer programming and Nonlinear programming
- understand Hungarian Algorithm
- Analyse and apply branch bound method in engineering problems

UNIT I LINEAR PROGRAMMING PROBLEM (12)

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 (12)

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

UNIT III INTEGER PROGRAMMING (11)

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

UNIT IV NETWORK ANALYSIS (11)

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

UNIT V CALCULUS OF VARIABLES (14)

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

Total : 60

TEXT BOOKS:

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

WEBSITES:

1. www.mathworld. Wolfram.com
2. www.mit.edu
3. www.nptel.com

16BEBME301B LINEAR ALGEBRA AND SPECIAL FUNCTIONS 3 2 0 4 100

COURSE OBJECTIVES:

- To introduce the basic concepts of vector space
- To study about the linear transformations
- To introduce the concepts of inner product spaces
- To learn about the concepts of hyperbolic, beta and gamma functions
- To learn about the concepts of Bessel functions
- To provide a firm basis for further reading and study in the subject.

INTENDED OUTCOMES:

The student will be able to

- To explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
- 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
- To be able to build and solve the special functions

UNIT I VECTOR SPACES (12)

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 ` (12)

Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigen vectors - Diagonalization

UNIT III INNER PRODUCT SPACES (12)

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

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.

UNIT V BESSEL FUNCTIONS (12)

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.

Total : 60

TEXT BOOKS:

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

REFERENCES:

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

WEBSITES:

1. www.sosmath.com
2. www.nptel.ac.in
3. www.mathworld.wolfram.com

16BEBME302 DIGITAL ELECTRONICS 3 2 0 4 100

COURSE OBJECTIVES:

The goal of this course is for students

- To explain the methods for simplifying Booleanexpressions
- Tooutlinetheformalproceduresfortheanalysisanddesignofcombinationalcircuitsandsequential circuits
- To introduce the design of various combinational digital circuits using logic gates
- To illustrate the concept of synchronous sequentialcircuits
- To bring out the analysis and design procedures for asynchronous sequential circuits
- To summarize the concept of memories and programmable logicdevices.

COURSE OUTCOMES:

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

- Demonstrate the methods for simplifying Booleanexpressions
- Design various combinational digital circuits using logic gates.
- Use Boolean algebra and apply it to digital systems.
- Explain the formal procedures for the analysis and design of combinational circuits and sequentialcircuits
- Interpret the concept of synchronous and asynchronous sequentialcircuits
- Apply the concept of memories and programmable logicdevices.

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

Binary, 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 (12)

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- ASM-Excitation table and maps-Circuit implementation - Register – shift registers- Universal shift register – Shift counters – Ring counters.

UNIT-IV ASYNCH RONOUS SEQUENTIAL CIRCUITS (12)

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 (12)

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 –EEPROM – 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

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.htmlhttp://www.educypedia.be/electronics/di gital.html

16BEBME303 C++ AND DATA STRUCTURES 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To analyse Object Oriented Programming concepts and basic characteristics ofC++
- To design problem solutions using Object Oriented Techniques.
- To infer the principles of packages, inheritance andinterfaces
- To define exceptions and use I/Ostreams
- To develop a C++ application with threads and genericsclasses
- To design and build simple Graphical User Interfaces

COURSE OUTCOMES:

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

- Utilize a simple Java programming environment, compile programs and interpret compiler errors.
- Distinguish and use the fundamental datatypes.
- Design classes and organise them intopackages.
- Utilize the basic datastructures.
- Compare the basic search and sortalgorithms.
- Apply appropriate data structure and algorithm to solve aproblem.

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) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	N.S. Kutti and P.Y. Padhye	Data Structures in C++	Prentice Hall of India Pvt., Ltd., New Delhi	2001
2	Liberty & Keogh	C++: An introduction to programming	Prentice Hall of India Pvt., Ltd., New Delhi	2002

REFERENCES:

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

16BEBME304 ELECTRONIC DEVICES AND CIRCUITS 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students :

- To discuss the operational characteristics of a Semiconductor in Equilibrium and Non- Equilibrium conditions.
- To aware with the structure of basic electronic devices.
- To understand the operation and applications of electronic devices.
- To explain the working of PN junction diodes and special purposediodes.
- To define the basic working of BJT and FET both in ideal and non- idealconditions.
- To improve knowledge about the working of Rectifiers and Voltageregulators.

COURSE OUTCOMES:

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

- Demonstrate the fundamental concepts of electronicdevices
- Build an electronic circuits using transistors.
- Analyze any electronic circuits logically
- 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 (10)

Overview on Physics and Properties of Semiconductors: Intrinsic semiconductor – extrinsic semiconductor – Fermi level in an intrinsic semiconductor – conductivity of a metal, intrinsic semiconductor and extrinsic semiconductor. 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–varactor diode – schottky diode, LED.

UNIT II BIPOLAR TRANSISTORS (8)

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

UNIT III FIELD EFFECT TRANSISTORS (9)

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 IV DC POWER SUPPLIES (9)

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

UNIT V OSCILLATORS AND MULTIVIBRATORS (9)

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

TEXT BOOKS:

S.NO	Author(s) Name	Title of the book	Publisher	Year of publication
1	Millman and Halkias	Electronic devices and Circuits	Tata McGraw Hill International	2010
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 Theory	Pearson Education, 9th Edition,	2009.
6	B. Somanathan Nair	Electronic Devices and Applications	PHI,	2006

16BEBME305 ANATOMY AND HUMAN PHYSIOLOGY 3 0 0 3 100

COURSE OBJECTIVES

The goal of this course is for students

- To discuss all the organelles of an animal cell and theirfunction.
- To perceive structure and functions of the various types of systems of humanbody.
- To outline about eye, ear and Endocrine glands ofhuman
- To learn organs and structures involving in system formation and functions.
- To understand all systems in the human body.
- Toinferbasicunderstandingoftheinterconnectionofvariousorgansystemsinhumanbody

COURSE OUTCOMES:

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

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

UNIT I CELL (9)

StructureofCell– Organellesanddescription–Functionofeachcomponentofthecell– Membranepotential– ActionPotential–Generation andConduction –Electrical Stimulation. BloodCell–Composition – OriginofRBC–BloodGroups–EstimationofRBC,WBCandPlatelet.

UNIT II CARDIACANDNERVOUSSYSTEM (9)

Heart,Majorbloodvessels–CardiacCycle–BloodPressure–FeedbackControlforBloodPressure– NervousControlofHeart- Cardiacoutput–CoronaryandPeripheral Circulation – StructureandfunctionofNervous tissue–Neuron -Synapse - Reflexes -Receptors -Brain-Brainstem -Spinal cord–Reflexaction– VelocityofConductionofNerveImpulses–AutonomicNervousSystem.

UNIT III RESPIRATORY SYSTEMANDMUSCULOSKELETALSYSTEM (9)

Physiological aspects ofrespiration –Trachea andlungs -Exchange ofgases –Regulation ofRespiration- Disturbance ofrespirationfunction -Pulmonary function test-Muscles-tissue-types-structure ofskeletalmuscle-typesofmuscleandjoints.

UNIT IV DIGESTIVEANDEXCRETORY SYSTEM (9)

OrganisationofGISystem,Digestionandabsorption –Movements ofGItract–Intestine-Liver-Pancreas- StructureofNephron–Mechanism ofUrineformation–UrineReflex–SkinandSweatGland–Temperature regulation.

UNIT V EYE,EAR,ENDOCRINE GLANDS (9)

Optics ofEye–Retina –Photochemistry ofVision –Accommodation -Neurophysiology ofvision –EOG. Physiologyofinternalear–MechanismofHearing–AuditoryPathway,HearingTests-Endocrineglands.

Total : 45

TEXTBOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	SaradaSubramanyam, K.MadhavanKuttyandH. D.Singh	TextBookof'HumanPhysiology	S.Chand&Company	1996
2	Ranganathan,T.S	TextBookofHumanAnatomy	S.Chand&Co. Ltd.,Delhi	1996

REFERENCEBOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Tobin,C.E.,	BasicHumanAnatomy	McGraw-HillPublishing Co.Ltd.,Delhi	1997
2	J.Gibson	ModernPhysiologyand AnatomyforNurses	BlackwellSCPublishing	1981
3	Arthur.C.Guyton	JohnEHall– ,TextbookofMedicalPhysiology	W.B.Saunders Company	2000

16BEBME306 **BIOCHEMISTRY** **3 0 0 3 100**

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:

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 (9)

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 (9)

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

UNIT III PROTEINS (9)

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 (9)

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

UNIT V METHODS OF INVESTIGATION OF METABOLISM (9)

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.

TOTAL : 45

TEXT BOOKS

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

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

16BEBME311 CIRCUITS AND DEVICES LABORATORY 003 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.

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. Characteristics of UJT
6. Design of RC coupled amplifier
7. Hartley Oscillator
8. Colpitt Oscillator
9. AstableMultivibrator
10. Clippers and Clampers
11. Half wave rectifier– with and without filter
12. Full wave rectifier – with and without filter

.

TOTAL:45

16BEBME3 BIOCHEMISTRY AND HUMAN PHYSIOLOGY LABORATORY 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

1. Generaltestsforcarbohydrates,proteinsand lipids.
2. Preparationofserumandplasmafromblood.
3. Estimationofbloodglucose.
4. Estimationofserumcholesterol.
5. AssayofSGOT/SGPT.
6. Estimationofcreatinineinurine.
7. Electrophoresisofserumproteins.
8. Separationofaminoacidsusingthinlayerchromatography.
9. ESR,PCV,MCH,MCV,MCHC,totalcountofRBCsandHemoglobinestimation
10. Differential count ofdifferentWBCsandBloodgroupidentification
11. IshiharachartforcolorblindnessandSnellen'schartfor myopiaandhyperopia– bylettersreadingandopthalmoscopetoviewretina.
12. Weber'sandRinnee'stestforauditoryconduction.

TOTAL:60

16BEBME313 **Course Oriented project-I** **0 0 2 1 100**

16BEBME351 **SOFT SKILLS** **1 0 0 - 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:15HOURS

16BEBME401 PROBABILITY AND STATISTICS 3 2 0 4 100

COURSE OBJECTIVES:

The goal of this course is for students

- To construct the required skill to apply the statistical tools in engineeringproblems.
- To explain the basic concepts of probability and randomvariables.
- To discuss the basic concepts of two dimensional randomvariables.
- To build the knowledge of testing of hypothesis for small and large samples which plays an important role in real lifeproblems.
- To design an experiment
- To infer the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical qualitycontrol.

COURSE OUTCOMES:

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

- Explain the fundamental concepts of probability and standard distributions which can describe real lifephenomenon.
- Explain the basic concepts of one and two dimensional random variables and their applications inengineering.
- 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 fieldof agriculture and statistical qualitycontrol.
- Discuss the notion of sampling distributions and statistical techniques used in engineering and managementproblems.
- Discuss about the techniques in quality control that model engineeringproblems.

UNIT I RANDOM VARIABLES (9)

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 (9)

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

UNIT III TESTING OF HYPOTHESIS (9)

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.

UNIT IV DESIGN OF EXPERIMENTS (9)

Analysis of variance – One way classification – CRD - Two – way classification – RBD - Latin square.

UNIT V RELIABILTY AND QUALITY CONTROL (9)

Concepts of reliability-hazard functions-Reliability of series and parallel systems- control charts for measurements (x and R charts) – control charts for attributes (p, c and np charts)

TOTAL : 45

REFERENCES

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	P.S.S.Sundar Rao and J.Richard	Introduction to Biostatistics and Research Methods	Prentice Hall of India, New Delhi.	2012
2	R.A.Johnson and C.B.Gupta	Miller and Freund's Probability and Statistics for Engineers	Pearson Education Asia, New Delhi.	2007
3	S.C.Gupta and V.K.Kapoor	Fundamentals of Applied Statistics	Sultan Chand & Sons, New Delhi	2007

16BEBME402 LINEAR INTEGRATED CIRCUITS 3 0 0 3 100

COURSE OBJECTIVES

The goal of this course is for students :

- To discuss the basic concepts of linear integratedcircuits
- To study the circuit configuration and introduce practical applications of linear integrated circuits.
- To introduce the concept of PassiveandActivefilters
- To infer the theory and applications ofPLL
- To make use of the theory of ADC and DAC using OP –AMPS
- To demonstrate the concepts of waveform generation and introduce some special functionICs

COURSE 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 – AMPCircuits
- 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 functionICs

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 (9)

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 (9)

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: Comparison betweenPassive 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 (9)

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.

TOTAL : 45

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.Gayakwad	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

16BEBME403 BIOSENSORS AND TRANSDUCERS 3 0 0 3 100

COURSE 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 andsensors.
- To discuss working of some of the above transducers andsensors.
- To know the different display and recording devices.

COURSE 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 thecourse.
- 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 medicalcontexts.
- Implement working knowledge of some of the transducers andsensors

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 (8)

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 (6)

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

UNIT IV ELECTRODES (10)

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)

UNIT V BIOSENSORS (11)

Chemical Sensors: Blood gas and Acid- Base Physiology Potentiometric Sensors, Ion Selective Electrodes, ISFETS. AmperometricSensors, 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

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	RichardS.C. Cobbold	Transducers forBiomedical Measurements: Principles and Applications	JohnWiley&Sons	1974
2	Hermann K P. Neubert	Instrument Transducer–AnIntro to their performance and design	Hermann K P. Neubert	2000
3	HarryN,Norton.	Biomedical sensors – fundamentals and application	HarryN,Norton.	2001
4	TatsuoTogawa, ToshiyoTamma and P. AkeÖberg	Biomedical TransducersandInstruments	TatsuoTogawa,	1994
5	NandiniK	Electronics inMedicineandBiomedicalInstrumentation	JogPHISecond Edition	2013

REFERENCEBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	LaGeddesandL.E.Baker	Principles of applied BiomedicalInstrumentation	LaGeddesandL.E.Baker	1997
2	LeslieCromwell,Fred. J.WeibellandPfeiffer	Biomedicalinstrumentationand measurement	LeslieCromwell,Fred.J.WeibellandPfeiffer	2002
3	Richard Aston	Principles of Biomedical Instrumentation and Measurement	Merril Publishing Co., Columbus	1990
4	Ernest O. Doeblin	MeasurementSystems,Applicationand Design	McGraw-Hill	1985
5	Jacob Fraden	Handbook ofModern Sensors – Physics, Designand Application	AIP press	2000

16BEBME404 SIGNALS AND SYSTEMS 3 0 0 3 100

COURSE OBJECTIVES

The goal of this course is for students :

- To discuss the basic properties of signal andsystems
- To understand about the continuous time and discrete time signals and systems.
- To analyze continuous timesignals
- To analyze discrete timesignals
- To learn the analysis of CT systems using Fourier and Laplace transform.
- To demonstrate the DTFT and Z –transforms for discretesignals

COURSE OUTCOMES:

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

- Describe the continuous time and discrete time signals and systems.
- Analyze the signals in both continuous time and discrete time
- Apply Laplace and Fourier transform for continuous signals
- Analyze continuous time LTI systems using Fourier and LaplaceTransforms
- Apply DTFT and Z transforms for discretesignals
- Analyze discrete time LTI systems using Z transform and DTFT

UNIT-I REPRESENTATION OF SIGNALS (10)

Classification of Signals – Periodic, aperiodic, even, odd – energy and power signals – Deterministic and random signals – complex exponential and sinusoidal signals – periodicity – unit impulse – unit step impulse functions – Transformation in independent variable of signals: time scaling, time shifting. Determination of Fourier series representation of continuous time and discrete time periodic signals – Explanation of properties of continuous time and discrete time Fourier series.

UNIT-II ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS (12)

Continuous time Fourier Transform and Laplace Transform analysis with examples – properties of the Continuous time Fourier Transform and Laplace Transform basic properties, Parseval's relation, and convolution in time and frequency domains. Basic properties of continuous time systems: Linearity,
Causality, time invariance, stability of frequency response of LT I systems -Analysis and characterization of LT I systems using Laplace transform: Computation of impulse response and transfer function using
Laplace transforms.

UNIT-III SAMPLING THEOREM AND Z-TRANSFORMS (10)

Sampling theorem – Reconstruction of a Signal from its samples, aliasing – sampling of band pass signals. Basic principles of z -transform - z-transform definition – Region of Convergence – Properties of ROC – Properties of z-transform – Poles and Zeros – inverse z-transform using Contour integration - Residue Theorem, Power Series expansion and Partial fraction expansion, Relationship between z - transform and Fourier transform.

UNIT-IV DISCRETE TIME SYSTEMS (9)

Computation of Impulse response & Transfer function using Z Transform. DTFT Properties and examples – LTI-DT systems - Characterization using difference equation – Block diagram representation – Properties of convolution and the interconnection of LTI Systems – Causality and stability of LTI Systems.

UNIT-V FILTER REALIZATION STRUCTURES (4)

Realization structures – Direct Form – I, Direct Form – II, Cascade, Parallel and Transpose forms.

TOTAL : 45

TEXT BOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	AlanV.Oppenheim, Alan S.Willsky and Hamid Nawab.S	Signals and Systems	Pearson Education, New Delhi	2003
2	Roberts.M.J	Signals and Systems Analysis using Transform method and MATLAB	TMH, New Delhi	2003

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	John G.Proakis and Dimitris G.Manolakis	Digital Signal Processing, Principles, Algorithms and Applications	PHI, New Delhi	2000
2	Simon Ha ykin and Barr y Van Veen	Signals and Systems	John Wile y, New York	2002
3	Lindner.K	Signals and Systems	McGraw Hill International, New York	2001
4	Moman .H. Ha ys	Digital Signal Processing	Tata McGraw-Hill Co Ltd., New Delhi	2004
5	Ashok Amhardar	Analog and Digital Signal Processing	PHI,New Delhi	2002

WEBSITES:

www.relisoft.com
www.astro.berkele y.edu
www.dsp guide.com

16BEBME405 PATHOLOGY AND MICROBIOLOGY 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To appraise the concept of cellbiology.
- To analyse the about the structural and functional aspects of livingorganisms.
- To perceive the etiology and remedy in treating the pathological diseases.
- To define the importance of publichealth.
- To understand the structural and functional aspects of living organisms.
- To know the etiology and remedy in treating the pathological diseases.

COURSE OUTCOMES:

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

- Define about the structural and functional aspects of livingorganisms.
- Demonstrate about the function ofmicroscope
- Elaborate about the importance of publichealth.
- Explain about the methods involved in treating the pathologicaldiseases
- Perceive knowledge on Disease caused by bacteria, fungi and protozoal
- Distinguish Natural and artificial immunity

UNIT I NORMAL CELL STRUCTURE (9)

Normal cell structure – Cell degeneration and regeneration – Inflammations. Neoplasia – Classification, Difference between benign and malignant tumours – Ethiology of tumours – Spread of tumours.

UNIT II MICROBIOLOGICAL TECHNIQUES (9)

Tissue processing – Histokinates – Block making – Microtomes and knives. Cryostat – Frozen section. Basic Stain and special stains (fat, iron stains, PAS).

UNIT III DISEASES DIAGNOSIS METHODS (9)

Diagnosis of diseases by immunological and molecular methods – role of computers in disease diagnosis.

UNIT IV MICROSCOPY (9)

Microscope – Light Microscopy, Phase contrast microscopy, Electron microscopy, Bacterial Cell structure, Growth, development and differentiation.

UNIT V MICROBIAL DISEASES (9)

Sterilization, Diseases caused by bacteria, fungi and viruses and their control by using drugs.

TOTAL : 45

TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Robbins.S.L. and Ramzi.S.C.,	Pathologic Basis of Diseases	W.B. Saunders Co	-
2	Prescot, Harley and Klein	Microbiology	Tata McGraw Hill Publications, Fifth Editi	2003

3	. Michael.J.Pelczar.J.R., E.C.S.Chan and Noel.R.Krieg.,	Microbiology	Tata McGraw Hill Publications	-
4	Ananthanarayanan.R and Jayaram	Text Book of Microbiology	Orient Longman	-

16BEBME406 BIOMATERIALS AND ARTIFICIAL ORGANS 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To discuss the overview of artificial organs
- To extend the principles of implant design with a casestudy
- To explain the implant design parameters and solution inuse
- To simplify about various blood interfacingimplants
- To know the biocompatibility of artificial organs
- To learn about the implantable medical devices

COURSE OUTCOMES:

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

- Explain the implant design parameters and solution inuse
- Analyze about various blood interfacing implants
- Evaluate response of biomaterials in living system
- Perceive knowledge about artificial organs
- Demonstrate different types of soft tissue replacement and hard tissuereplacement
- Assess biocompatibility of artificial organs

INTENDED OUTCOMESBIOMATERIALS AND ARTIFICIAL ORGANS

Understanding and gaining the knowledge of various concepts in biomaterials, bio-compatibility, implant materials, polymeric implant materials, tissue replacements and artificial organs.

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

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

UNIT II IMPLANT MATERIALS (9)

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

UNIT III POLYMERIC IMPLANT MATERIALS (9)

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

UNIT IV TISSUE REPLACEMENT IMPLANTS (9)

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 (9)

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

TOTAL : 45

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

16BEBME411 LINEAR INTEGRATED CIRCUITS LAB 0 0 3 2 100

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 medicalapplications.
- 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

16BEBME412 BIOSENSORS AND TRANSDUCERS LAB 0 0 3 2 100

COURSE 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.

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. Measurement of strain using strain gauge for(i) Quarter bridge (ii)Half bridge (iii) Full bridge

2. PlottingcharacteristicsofPhotoelectricTransducer,TemperatureTransducer,Piezo- electric Transducer, and Thermoelectric Transducer.

3. DeterminationofcharacteristicsofPolarizedElectrodes,Non-polarizedElectrodes, Multi Point Electrodes.

4. Determinationofcharacteristicsof(i)DCAmplifier(ii)ChopperAmplifierand(iii) Instrumentation Amplifier.

5. Characteristics of Ultrasound Transducer and Phono Transducer.

6. Measurement of Hearing Threshold using Audiometer and plotting its characteristics.

7. Measurement of Skin Resistance &constructionof a simpleLiedetector.

8. Generation of original sequence along with operation on sequence like shifting, folding, time scaling and multiplication.

9. GenerationofPeriodic,Exponential,Sinusoidal,Dampedsinusoidal,Step,Impulse, Ramp

signals using MATLAB in both discrete and analog form

10. Evaluationofconvolutionintegral,Fouriertransformforperiodic&non-periodic signals and simulation of differential equations using MATLAB

11. Cross correlation, Auto correlation & Spectral content of signals.

16BEBME413 Course Oriented project-II 0 0 2 1 100

16BEBME451 HANDS ON TRAINING IN ELECTRONIC EQUIPMENTS 1 0 0 – 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.

16BEBME501 BIO CONTROL SYSTEM 3 2 0 4 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To provide insights of modelling techniques of physiologicalsystems
- To discuss the concept of different systems of body in mathematicalmodel.
- To demonstrate the working of physiological system in terms ofequations.
- To define the parameters involved in thermal regulatorysystem
- To model dynamically varying physiological system
- To develop differential equations to describe the dynamic models

COURSE OUTCOMES:

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

- Analyze models of physiological system.
- Recall the application of basic physiologicalsystem
- Reproduce the concept of circulatorysystem
- Describe the parameters involved in thermal regulatorysystem
- Discuss the process of ultra-filtrationsystem
- Explain the mechanism ofrespiration

UNIT I INTRODUCTION TO BIO CONTROL SYSTEM (9)

Introduction: Technologicalcontrol system, transfer function, mathematical approaches, system stability,introductiontobiologicalcontrolsystem,Modelingandblockdiagram, closedloop dynamics of first order and secondordercontrolsystem,similaritiesbetween biological and engineering control system, biological receptors and receptor characteristics.

UNIT II PROCESS REGULATION (9)

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

UNIT III MODELINGOF HUMANTHERMALREGULATORYSYSTEM (9)

Parametersinvolved,controlsystemmodeletc.Biochemistryofdigestion,typesofheatlossfrombody,m odelsofheattransferbetween subsystems of human body like skin - core etc. and systems like within body, body environment.

UNIT IV BIOLOGICAL CONTROL I (9)

Cardiac rate,bloodpressure,respiratoryrate,massbalancingoflungs, oxygenuptakebyRBCandpulmonarycapillaries, oxygen and carbon dioxide transport in blood and tissues.

UNITV BIOLOGICAL CONTROL II (9)

Urine formation and control,Pupilcontrolsystems, 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	SujitK.Chaudhuri	ConciseMedicalPhysilogy	NewCentralBookagency	1997
2	Ogata Katsuhika	Modern control engineering	2nd edition, Prentice Hall of	-

REFERENCE BOOKS:

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

16BEBME502A BIOMEDICAL SIGNAL PROCESSING 3 0 0 3 100

COURSE OBJECTIVES:

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 andstorage.
- To discuss simple image enhancement techniques in Spatial and Frequencydomain.
- To appraise the concepts of degradation function and restorationtechniques.
- To apply image compression and recognitionmethods.

COURSE OUTCOMES:

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

- Explain the image fundamentals and mathematical transforms necessary for imageprocessing.
- Illustrate the image enhancementtechniques.
- Preprocess the image using filtering techniques
- Utilize image restorationprocedures.
- Segment the region of interest in images.
- Apply the image compressionprocedures.

UNIT I DISCRETE – TIME SIGNALS AND SYSTEMS (9)

Sampling of Analogue signals – aliasing – standard discrete time signals – classification – discrete time systems – Linear time invariant stable casual discrete time systems – classification 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 – pre warping – Frequency transformation in digital domain – Realization using direct, cascade and parallel forms.

UNIT III FINITE IMPULSE RESPONSE DIGITAL FILTERS (9)

Symmetric and Antisymmetric FIR filters – Linear phase FIR filters – Design using Frequency sampling technique – Window design using Hamming, Hanning and Blackmann Windows – Concept of optimum equiripple approximation – Realisation of FIR filters – Transversal, Linear phase and Polyphase realization structures.

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 SPECIAL TOPICS IN BSP (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.Rangayyan	Biomedical signal processing	-	-
3	SanjitK.Mitra	Digital Signal Processing', A Computer Based Approach	Tata McGraw-Hill, New Delhi	1998

16BEBME502B INSTRUMENTAL METHODS OF ANALYSIS 3 0 0 3 100

OBJECTIVE

- To know about various instrumental techniques and analysis
- To give exposure on the basics of Biomedical engineering to the students.
- To have a basic knowledge on basic measurement
- To be familiarize with instrumental methods
- To analyse he applications of spectroscopy
- To lean about chromatography

OUTCOMES

- To study and understanding the concepts of measurements
- To study and understanding the concepts of optical methods
- To study and understanding the concepts of molecular spectroscopy
- To study and understanding the concepts of thermal methods
- To study and understanding the concepts separation methods
- To analyse various instrumental methods

UNIT I BASICS OF MEASUREMENT (8)

Classification of methods – calibration of instrumental methods – electrical components and circuits – signal to noise ratio – signal – noise enhancement

UNIT II OPTICAL METHODS (8)

General design – sources of radiation – wavelength selectors – sample containers – radiation transducers – types of optical instruments – Fourier transform measurements.

UNIT III MOLECULAR SPECTROSCOPY (11)

Measurement of transmittance and absorbance – beer's law – spectrophotometer analysis – qualitative and quantitative absorption measurements - types of spectrometers – UV – visible – IR – Raman spectroscopy – instrumentation – theory.

UNIT IV THERMAL METHODS (5)

Thermo-gravimetric methods – differential thermal analysis – differential scanning calorimetry.

UNIT V SEPARATION METHODS (13)

Introduction to chromatography – models – ideal separation – retention parameters – van – deemter equation – gas chromatography – stationary phases – detectors – kovats indices – HPLC – pumps – columns – detectors – ion exchange chromatography – size exclusion chromatography – supercritical chromatography – capillary electrophoresis.

TOTAL : 45

REFERNCES & TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Willard and .H. Merrit	Instrumental Methods of Analysis	Phi	1999
2	D. Skoog	Instrumental Methods of Analysis		2000

16BEBME503 BIOMEDICAL INSTRUMENTATION 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

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

COURSE OUTCOMES:

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

- Differentiate different bio potentials and itspropagations.
- Describe the electrode behavior and circuit models
- Illustrate different electrode placement for various physiologicalrecordings
- Design bio amplifier for various physiological recordings
- Explain various technique for non-electrical physiologicalmeasurements
- 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. Recording problems - measurement with two electrodes.

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 (8)

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

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 V BIO-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 (simplified schematic description).

TOTAL : 45

TEXT BOOKS

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	K.Rayand K.M. Bhurchandi,	Advanced Microprocessors and Peripherals–Architectures, Programming and Interfacing	Indian edition. Tata McGraw Hill, New Delhi	2001 Reprint
2	Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. MCKinlay	The8051Microcontrollerand Embedded Systems	Pearson Education, New Jersy.	2008

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

REFERENCE

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

16BEBME504 MICROPROCESSORAND MICROCONTROLLER 3 0 0 3 100

COURSE 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 buildingapplications
- To demonstrate the concepts Reduced Instruction Set Computer (RISC) architecture and Advanced RISC Machine (ARM)architecture
- To develop skill to explore system design technique .

COURSE OUTCOMES:

At the end 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 for8086
- Perceive knowledge on advanced processors andcontrollers
- Create application by Interfacing memory and I/O device withcontrollers
- 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 9

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

UNIT II THE 8086 MICROPROCESSOR 9

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 9

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 9

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

UNIT V INTERFACING MICROCONTROLLER 9

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

TOTAL:45

TEXTBOOKS

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	K.Rayand K.M. Bhurchandi,	Advanced Microprocessors and Peripherals– Architectures, Programming and Interfacing	Indian edition. Tata McGraw Hill, New Delhi	2001 Reprint
2	Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. MCKinlay	The8051Microcontrollerand Embedded Systems	Pearson Education, New Jersy.	2008

REFERENCES

S.NO.	Author(s)Name	Title of the book	Publisher	Year of publication
1	KrishnaKant	Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051and8096	PHI, New Delhi.	2007
2	Kenneth.J.Ayala	The8051Microcontroller	Thompson Delmar Learning, New Delhi	2007
3	Ray.A.K, Bhurchandi.K.M	Advanced Microprocessor and Peripherals	TataMcGraw-Hill, NewDelhi	2007
4	BarryB.Brey	The Intel Microprocessors Architecture, Programming and Interfacing	PearsonEducation, NewDelhi	2007
5	RameshS.Goankar	Microprocessor Architecture, Programming, and Applications withthe8085	PHI, NewDelhi.	2002
6	DouglasV.Hall	Microprocessor and Interfacing, Programming and Hardware	Indianedition.Tata McGrawHill,New Delhi	2007
7	JonathanW Valvano	Introduction to Arm(r)Cortex-M Microcontrollers	Createspace Independent Publisher	2012

16BEBME511 MICROPROCESSOR AND MICROCONTROLLER LAB 0 0 3 2 100

COURSE OBJECTIVES:

The goal of this course is for students,

- 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

COURSE OUTCOMES:

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

- 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

16BEBME512A BIOMEDICALSIGNALPROCESSING LAB 0 0 3 2 100

.

COURSE OBJECTIVES:

The goal of this course is for students:

- To experiment with basic signal processing operations such as Linear Convolution, Circular Convolution, Auto Correlation, Cross Correlation and Frequency analysis in MATLAB
- To analyse FIR and IIR filters in MATLAB and DSPProcessor
- To discuss the architecture of DSPprocessor

COURSE OUTCOMES:

Upon completion of this course, students 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

LIST OF EXPERIMENTS

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

16BEBME512B INSTRUMENTAL METHODS OF ANALYSIS LAB 0 0 3 2 100

OBJECTIVES

- To have a practical hand on experience on absorption spectroscopic methods
- To acquire experience in the purification by performing chromatography
- To validate and analysis using spectrometric and microscopic techniques
- To understand the concept of nephelometry
- To understand the concept of Flourimetry
- To exlain the concept of Chromatography

OUT COMES

- Understand UV spectra of nucleic acids
- Describe the Precision and validity
- Find the molar absorbtivity and stoichiometry
- Estimate SO – by nephelometry
- Estimatie A13+ by Flourimetry
- Understand Chromatography

LIST OF EXPERIMENTS

1. Precision and validity in an experiment using absorption spectroscopy
2. Validating Lambert-Beer'S law using KMnO4
3. Finding the molar absorbtivity and stoichiometry of the Fe(1, 10 Phenanthroline)3 using absorption spectrometry
4. Finding the pKa of-nitrophenol using absorption spectroscopy
5. UV spectra of nucleic acids
6. Chemical actinometry using potassium ferrioxolate
7. Estimation of SO – by nephelometry
8. Estimation of A13+ by Flourimetry
9. Limits of detection using aluminium alizarin complex
10. Chromatography analysis using TLC
11. Chromatography analysis using column chromatography

16BEBME513 BIOMEDICAL INSTRUMENTATION LAB 0 0 3 2 100

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 bioelectricsignals.
- To learn about Audiometer
- To analyse ECG signal
- To explain about patient monitoring system
- To lean about pH measurement

COURSE OUTCOMES:

Upon completion of this course, students 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.

LIST OF EXPERIMENTS

1. Study of Biological Preamplifiers.
2. Recording of ECG signal.
3. Audiometer.
4. Recording of EMG.
5. Recording of various physiological parameters using patient monitoring system and telemetry units.
6. Measurement of pH, pO2 and conductivity.
7. Study and analysis of functioning and safety aspects of surgical diathermy.

16BEBME514 Course Oriented project-III 0 0 2 1 100

16BEBME551 **BasicSimulationLaboratory** **1 0 0 - 100**

COURSE OBJECTIVES:

The goal of this course is for students:

- To learn about MATLAB tool in signal processing application
- To infer the basic simulation techniques for ECG/EMG/EEG
- To apply different Detection, correlation and averaging of various biomedicalsignals.
- To analyse ECG signal
- To dunderstand about Detection of QRS complex
- 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:

- Understand correlation techniques.
- Simulate various biosigmals ECG/EEG/EMG
- Analyse ECG signal
- Use MATLAB tool for biosignal analysis
- Use MATLAB tool for biomedical applications
- Understand about SNR improvement

Laboratory Experiments:

1. Simulation of ECG using MATLAB.
2. Simulation of EEG using MATLAB.
3. Simulation of PPG using MATLAB.
4. Simulation of EGG using MATLAB.
5. Simulation of PCG using MATLAB.
6. Simulation of EMG using MATLAB.
7. Simulation of EOG using MATLAB.
8. Detection of QRS complex and heart rate measurement.
9. Signal Averaging to improve the SNR.
10. Auto-correlation and cross correlation of ECG signals.

16BEBME552 **Inplant training** **0 0 0 - 100**

16BEBME601 IMAGE PROCESSING 3 0 0 3 100

COURSE OBJECTIVES:

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 andstorage.
- To discuss simple image enhancement techniques in Spatial and Frequencydomain.
- To appraise the concepts of degradation function and restorationtechniques.
- To apply image compression and recognitionmethods.

COURSE OUTCOMES:

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

- Explain the image fundamentals and mathematical transforms necessary for imageprocessing.
- Illustrate the image enhancementtechniques.
- Preprocess the image using filtering techniques
- Utilize image restorationprocedures.
- Segment the region of interest in images.
- Apply the image compressionprocedures.

UNIT I DIGITALIMAGEFUNDAMENTAL (9)

Elementsofdigitalimageprocessingsystems,ElementsofVisualperception,Imagesamplingandquantization,SomeBasicrelationshipsbetweenpixels,MatrixandSingularValuerepresentationofdiscreteimages.

UNIT II IMAGE TRANSFORMS (9)

1D DFT, 2D DFT, Cosine, Sine Hadamard, Haar, Slant, KL transform and their properties.

UNIT III IMAGE ENHANCEMENT (9)

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, 3D tomography, Fourier reconstruction of MRI Images.

UNIT V MEDICAL IMAGE COMPRESSION TECHNIQUES (9)

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

TOTAL : 45

TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
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

16BEBME602A BIOMECHANICS 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To perceive about the principles ofbiomechanics.
- To study about the mechanics involved with various physiological systems.
- To gain knowledge about musculoskeletal mechanics
- To infer the mechanics of physiologicalsystems.
- To discuss the mechanics of joints.
- To create mathematical models used in the analysis of biomechanicalsystems

COURSE OUTCOMES:

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

- Explain the principles of biomechanics.
- Discuss the mechanics of physiologicalsystems.
- Demonstrate the mechanics ofjoints.
- Analyze the biomechanical systems using mathematical models.
- Design and develop the models specific to orthopedic applications
- Illustrate the mathematical models used in the analysis of biomechanicalsystems.

UNIT I BIOFLUIDMECHANICS (9)

Introduction:
Newton'slaws,Stress,Strain,NonViscousfluid,NewtonianViscousfluid,Viscoelasticity, BloodCharacteristics, Mechanical Interaction of Red blood cells with solid wall, Thrombousformation and dissolution,Medicalapplicationsofbloodrhelogy

UNIT II BONE&ITSPROPERTIES (9)

Bone structureandComposition, BloodCirculationinBone, Viscoelasticpropertiesof Bone, ElectricalPropertiesofBone,FractureMechanismandCrackPropagationinbones,KineticsandKinematicsofJoints.

UNIT III CARDIACMECHANICS (9)

Cardiovascularsystem,Mechanicalpropertiesofbloodvessels-Arteries,Arterioles, Capillaries, Veins,Bloodflow-Laminar&turbulent,ProstheticHeartValves&replacement.

UNIT IV BIOMECHANICSOFSPINEANDLOWEREXTREMITY (9)

Biomechanics ofSpine-Structure,Movements, LoadsonSpine,ExoskeletalsystemforParaplegics, Structure ofHip-Movements, LoadsonHip,TotalHipProsthesis,StructureofKnee-Movements,loadsonknee,Knee prosthesis,Poweredwheelchair,Crutchesandcanes.

UNIT V GAITANALYSIS (9)

Human Locomotion- Gait Analysis, Foot Pressure measurements- Pedobarograph , Mechanics of Foot- Arthritis,Biomechanicaltreatment.

TOTAL:45

TEXTBOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Y.C.Fung	BasicBiomechanics	Biomechanics-CirculationSpringerVerlang	1997

REFERENCEBOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Alexander.R. Mc.Neill	Biomechanics	ChapmanandHall	1975
2	D.N.Ghista	BiomechanicsofMedicalDevices	MacelDekker	1982
3	VCMowandWCHayes	BasicOrthopedicBiomechanics	Lippineott–RavenPublishers	-

16BEBME602B BIOINFORMATICS 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To enablethestudentsto get awareof availabletools anddatabasesfor performingresearchinbioinformatics.
- To provide the thorough understanding of protein structure in detail.
- To understand the bioinformatics at a level appropriate for biology majors
- To infer the knowledge of chemical principles that underlie biochemistry, molecular biology and genomics,
- To analyse the relational databases
- To constructthe predictive mathematical models of biological systems.

COURSE OUTCOMES:

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

- understand the importance of Bioinformatics in various sectors.
- expose to biological database management and microarray technology.
- Examinethe advanced methods in computational biology
- Be capable of using critical thinking and research methods in Bioinformatics to understand computational and experimental data
- Demonstrate the ability to produce and present original research in Bioinformatics.
- Choose appropriate algorithms forreal time problems.

UNIT I INTRODUCTION (9)

Basic UNIX commands – telnet – ftp – protocols – hardware – topology -search engines – search algorithms – Perl programming.

UNIT II DATABASES (9)

Data management – data life cycle – database technology – interfaces and implementation – biological databases and their uses

UNIT III PATTERN MATCHING & MACHINE LEANING (9)

Pairwise sequence alignment – local vs. global alignment – multiple sequence alignment – dot matrix analysis – substitution matrices – dynamic programming – Bayesian methods – tools – BLAST – FASTA- machine learning – neural networks – statistical methods – Hidden Markov models – Homology Modeling.

UNIT IV PHYLOGENY (9)

Introduction; mutations; irrelevant mutations; controls; mutations as a measure of time; distances; reconstruction; distances between species; estimating time intervals from distances.

UNIT V ADVANCED TOPICS IN BIOINFORMATICS (9)

Biomolecular and cellular computing – micro array analysis – systems biology.

TOTAL:45

TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	B. Bergeron	Bioinformatics Computing	PHI	2002
2	Westhead, D.R., Parish, J.H., Twyman, R.M	Instant Notes In Bioinformatics	BIOS Scientific Publishers	2000

REFERENCE

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	C. Gibas& P. Jambeck	Developing Bioinformatics Skills	O'Reilly	1999

16BEBME603 DIAGNOSTIC EQUIPMENTS 3 0 0 3 100

COURSE 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 transmittingthem.
- To analyze some of the cardiac assistdevices.
- To understand the principle of diathermy
- To discuss about the measurement of the signalsgenerated by muscles.
- To summarize the need and use of some of the extracorporealdevices.
- To learn the patient safety measures

COURSE 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 andtransmission
- Measure signals generated bymuscles
- Analyze different types of diathermy units.
- Identify the electrical hazards and Implement methods of patient safety
- Interpret the need and use of the extracorporealdevices

UNIT I CARDIAC EQUIPMENTS (9)

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

UNIT II NEUROLOGICAL EQUIPMENTS (9)

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

UNIT III SKELETAL MUSCULAR SYSTEM (9)

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

UNIT IV RESPIRATORY MEASUREMENT STSTEM (9)

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

UNIT V SENSORY MEASUREMENT (9)

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

TOTAL:45

TEXT BOOKS:

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	2003
2	John G.Webster	Medical Instrumentation Application and Design	third edition, Wiley India Edition	2007

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Myer Kutz	Standard Handbook of Biomedical Engineering & Design	McGraw Hill	2003
2	KhandpurR.S	Handbook of Biomedical Instrumentation	McGraw Hill	2003
3	L.A Geddes and L.E.Baker	Principles of Applied Biomedical Instrumentation	-	-
4	Leslie Cromwell	Biomedical Instrumentation and Measurement	Pearson Education, New Delhi	2007

16BEBME604 HOSPITAL MANAGEMENT 3 0 0 3 100

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

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

UNIT I HEALTHSYSTEM (9)

Healthorganisationofthecountry,thestate,thecitiesandtheregion,HealthFinancingSystem,OrganisationofTechnicalSection.

UNIT II HOSPITALORGANISATIONANDMANAGEMENT (9)

Management ofHospitalorganisation,NursingsectionMedicalSector,CentralServices,TechnicalDepartment, Definition and Practice of Management by Objective, Transactional Analysis Human relation in Hospital, ImportancetoTeamWork,LegalaspectinHospitalManagement.

UNIT III REGULATORYREQUIREMENTANDHEAITHCARECODES (9)

FDA Regulation, jointcommission ofAccreditation for Hospitals, National Fire Protection AssociationStandard,IRPC.

UNIT IV EQUIPMENTMAINTENANCEMANAGEMENT (9)

OrganisingMaintenanceOperations,PaperWorkControl,MaintenanceJob, PlanningMaintenanceWorkMeasurement andStandards, Preventive Maintenance, Maintenance Budgeting andForecasting, Maintenance Training,ContractMainframe.

UNIT V TRAINEDTECHNICAL PERSONNEL (9)

FunctionofClinicalEngineer,RoletobeperformedinHospital,ManpowerMarket,Professional Registration, Structureinhospital.

TOTAL : 45

REFERENCEBOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Cesar A.Caceresand Albert Zara	The practice of Clinical Engineering	Academic Press	1977
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,VeraDammann(Ed.)	Hospital Engineering in Developing Countries	ZreportEschborn	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

16BEBME6E-- PROFESSIONAL ELECTIVE-II 3 0 0 3 100

16BEBME6E-- PROFESSIONAL ELECTIVE-III 3 0 0 3 100

16BEBME611A BIOMECHANICS LAB 0 0 3 2 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To provide with an overview of the major challenges in movement biomechanics and experience with the engineering tools
- To use to address the challenges in movement biomechanics
- To understand the concept of Fracture Mechanism
- To explain the electrical Properties of Bone
- To learn about Kinetics and Kinematics of Joints.
- To analyse prosthetic devices

COURSE OUTCOMES:

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

- Describe the biological, mechanical, and neurological mechanisms by which muscles produce movement
- Identify and use engineering tools that are used to study movement
- Analyse Kinetics and Kinematics of Joints
- Write and solve equations of motion for simple models of human movement
- Analysis of Knee and spine prosthesis
- Apply biomechanics principles to "real-world" clinical and biomechanical research.

LIST OF EXPERIMENTS

1. Study and Analysis of Newton'slaws,Stress,Strain,NonViscousfluid
2. Study and Analysis of NewtonianViscousfluid,Viscoelasticity,
3. Study of Blood Characteristics
4. Study and Analysis of Thrombous formation and dissolution
5. Study of Blood circulation in bone
6. Study and Analysis of viscoelastic properties of Bone
7. Study of Electrical Properties of Bone
8. Study of Fracture Mechanism and Crack Propagation in bones
9. Analysis of Kinetics and Kinematics of Joints.
10. Analysis of Blood flow-Laminar&turbulent, Prosthetic HeartValves.
11. Analysis of Knee and spine prosthesis
12. Gait analysis,
13. Analysis of Foot Pressure measurements
14. Analysis of Foot Arthritis mechanics

16BEBME611B BIOINFORMATICS LAB 0 0 3 2 100

CourseObjectives

- To explain the sequence retrieving techniques from biologicaldatabases.
- To explain how to utilize the tools such as BLAST, FASTA CLUSTAL OMEGA,EMBOSS, PHYLIPetc.
- To illustrate the basics of pattern matching by pairwise and multiple sequencealignment.
- To explain the molecular visualization tools and impart knowledge on ExPASyServer.
- To understand the basics of Perlprogramming

Course Outcomes

- Outline the techniques to retrieve sequences from different biological databases.
- Discuss the pattern matching by pairwise and multiple sequencealignment
- Construct phylogenetic tree by using distance based and character basedmethods
- Predict and validate 3D structure ofprotein
- Predict the protein parameters using ExPASy proteomicstools.
- Understand the programming using PERLlanguage.

LIST OF EXPERIMENTS

1. Introduction to UNIX basic commands and UNIX Filters.
2. Perl programming and applications to Bioinformatics.
    - Basic scripting.
    - Regular expressions.
    - File i/o& control statement.
    - Subroutines & functions.
    - Writing scripts for automation.
3. Types of Biological Databases and Using it.
    - Genbank.
    - Protein Data Bank .
    - Uniprot.
4. Sequence Analysis Tools
    - Use of BLAST, FASTA (Nucleic Acids &Protiens).
    - Use of Clustal W.
    - Use of EMBOSS.
5. Phylogenetic Analysis
    - Use of Phyllip.
6. Molecular Modeling
    - Homology Modeling – Swissmodeller.
    - Any Open Source Software

16BEBME612 IMAGE PROCESSING LAB 0 0 3 2 100

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.

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

LISTOFEXPERIMENTS:

1. DigitalimageFundamentals.
2. ImageEnhancementandTransformation.
3. Edgedetectionandboundarytracingtechniques.
4. Removalofnoiseinmedicalimages.
5. Imagecompressions.
6. RestorationofCTimages.
7. Reconstruction ofimages.
8. ImageAnalysis.
9. Matlabimplementation.

16BEBME651	**Mini Project**	**0 0 1 -**	**100**
16BEBME652	**Technical Presentation & Seminar**	**0 0 1 -**	**100**

16BECC701 PROFESSIONAL ETHICS PRINCIPLES OF MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT 3 0 0 3 100

COURSE OBJECTIVES

The goal of this course is for students:

- To develop managerial and entrepreneurial skills our culture andethics
- To Distinguish DirectandPreventiveControl
- To perceive Knowledge on the principles of management is essential for all kinds of people inall kinds oforganisations
- To have a clear understanding of the managerial functions like planning, organizing, staffing, leading andcontrolling
- To create an awareness and practice through engineering ethics and humanvalues
- To outline how business ethicsworks

COURSE OUTCOMES

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

- Advanced philosophical knowledge of the profession of recreation andleisure
- Synthesis of trends and issues as related to current professionalpractice
- Evaluate organizational theories and human resource managementprinciples
- Analyse the informationcompetency
- Follow Ethical practice and ethical management
- Understand Modelsof Professional Roles

UNIT I ENGINEERING ETHICS 9

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.

UNIT II FACTORS OF CHANGES 9

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 IV DIRECTING AND CONTROLLING 9

Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment –Process of Communication – System and process of Controlling – Requirements for effective control – Control of Overall Performance – Direct and Preventive Control – Reporting.

UNIT V ENTREPRENEURSHIP AND MOTIVATION 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth– Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

Total : 45

TEXT BOOKS

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

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
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

16BEBME702A VIRTUAL INSTRUMENTATION DESIGN FOR MEDICAL SYSTEM 3 0 0 3 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To introduce virtual instrumentation concepts and applications.
- To discuss about programming structure inLabVIEW.
- To analyze data acquisitionhardware.
- To infer knowledge on VI programs for specificapplications.
- To perceive the basics of virtualinstrumentation.
- To program virtual instrumentation software for biomedical applications

COURSE OUTCOMES:

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

- Illustrate programming concepts of virtual instruments.
- Compile programming structure inLabVIEW.
- Understand the use of VI for data acquisition.
- analyze different types of interfaces.
- Choose data from hardwaresystems.
- Develop VI programs for specificapplications.

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UNIT I REVIEW OF VIRTUAL INSTRUMENTATION (9)

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 (9)

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 (9)

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 lVI, image acquisition and processing. Motion control. ADC, DAC, DIO, DMM, waveform generator.

UNIT V USE OF ANALYSIS TOOLS (9)

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

TOTAL : 45

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, New York	1997
2	Lisa K. wells & Jeffrey Travis	Labview for everyone	Prentice Hall Inc., New Jersey	1997

REFERENCEBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Sokoloff	Basic concepts of Labview 4	Prentice Hall Inc., New Jersey	1998
2	S. Gupta, J.P: Gu.pta	PC interfacing for Data Acquisition & Process Control	Second Edition, Instrument Society of America	1994
3	L.T. Amy	Automation System for Control and Data Acquisition	ISA	1992

16BEBME702B THERAPEUTIC EQUIPMENTS 3 0 0 3 100

COURSE 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 transmittingthem.
- To analyze some of the cardiac assistdevices.
- To understand the principle of diathermy
- To discuss about the measurement of the signalsgenerated by muscles.
- To summarize the need and use of some of the extracorporealdevices.
- To learn the patient safety measures

COURSE 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 andtransmission
- Measure signals generated bymuscles
- Analyze different types of diathermy units.
- Identify the electrical hazards and Implement methods of patient safety
- Interpret the need and use of the extracorporealdevices.

UNIT I ULTRASONIC TECHNIQUESFORDIAGNOSIS (9)

Basic principlesof Echo technique, display techniques A, B, M modes, Echo cardiograms, Echo encephalogram, Ultrasonicappliedasdiagnostictoolinophthalmology, obstetricsandgynecology.

UNIT II PATIENTMONITORING ANDBIOTELEMETRY (9)

Patient monitoring system – ICU, post-operative, ICCU, single channel telemetry, multi-channel telemetry, frequencyallotment,radiopill.TransmissionofBiosignalsovertelephonelines.

UNIT III DIATHERMY (9)

Clinical applications of electrotherapy, shortwave diathermy, ultrasonic diathermy, microwave diathermy, surgicaldiathermyunit,IRlamps,UVlamps.

UNIT IV SPECIALDIAGNOSTIC TECHNIQUES (9)

PrinciplesofCryogenictechniqueandapplication,Endoscopy,Laproscopy,Thermography.

UNIT V PATIENTSAFETY (9)

Sources ofleakagecurrent, MicroandMacroshock, monitoring circuits, earthingschemes. ElectroMagneticinterference tomedicalelectronic Equipment– SourcesofEMI,EMIeffects,EMItoBiomedicalsensorsandECGequipment.

TOTAL:45

TEXTBOOK

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	KhandpurR.S	HandbookofBiomedicalInstrumentation	, TataMcGraw-Hill,NewDelhi	1997

REFERENCEBOOKS

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	JohnG.Webster	MedicalInstrumentationApplicationandDesign	JohnWileyandsons	1998
2	JosephJ.CarrandJohnM.Brown	IntroductiontoBiomedicalequipmenttechnology	JohnWileyandsons	1997

16	**____OE__**	**OPEN ELECTIVE - 1**	**3003**	**100**

16	**____OE__**	**OPEN ELECTIVE - 2**	**3003**	**100**

16BEBME7E--		**PROFESSIONAL ELECTIVE IV**	**3003**	**100**

16BEBME711A VIRTUAL INSTRUMENTATION DESIGN FOR MEDICAL SYSTEM LAB 0 0 3 2 100

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

LISTOFEXPERIMENTS

1.GettingStartedwithLabVIEW–Basicoperations,controlsandindicators.

2.SimpleprogrammingstructuresandTimingIssues

3.LabVIEW–DebuggingaVI,Sub-VI's

4.LabVIEW–TrafficLight-ProgrammingStructure,Sub-Vis,Clusters

5.GPIB-SerialpollByte

6.Communication viaRS232/SerialPort.

7.Oscilloscope-AttributeNodes,Menus

8.RCCircuitmeasurement-Timingissues

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

16BEBME711B BIOMEDICAL EQUIPMENTS LAB 0 0 3 2 100

COURSE OBJECTIVES:

The goal of this course is for students:

- To discuss the working principle of Biomedical recording systems.
- To infer the basic acquisition techniques of bioelectricsignals.
- To understand about defibrilator
- To learn about biotelemetry
- to understand the diathermy
- To apply Electrical safetymeasures in biomedical engineering

COURSE OUTCOMES:

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

- Develop preamplifiers and amplifiers for various bio signalrecordings.
- Measure various non-electrical parameters using suitablesensors/transducers
- Apply electrical safety measures
- Simulate ECG signal
- Understand about the pacemaker simulation
- Demonstare defibrilator simulation

LISTOFEXPERIMENTS

1. RecordingandanalysisofECGsignalsRecordingandanalysisofEEGsignals.
2. Recording- FatiguetestofEMGsignals.
3. SimulationofECG–detectionofQRScomplexandheartrate
4. Studyof Pacemaker simulator
5. Studyof Defibrillator simulator
6. Studyofshortwaveandultrasonic diathermy.
7. Studyofbiotelemetry
8. Electrical safetymeasurements.

16BEBME791 PROJECT WORK PHASE I 0 0 8 4 100

16BEBME8E__	**PROFESSIONAL ELECTIVE-V**	**3 0 0 3**	**100**
16BEBME8E__	**PROFESSIONAL ELECTIVE-VI**	**3 0 0 3**	**100**
16BEBME891	**PROJECT WORK PHASE II AND VIVA-VOCE**	**0 0 3216**	**300**

FOR SEMESTER V (ELECTIVE-I)

16BEBME5E01 BIOFLUIDS AND DYNAMICS 3 0 0 3 100

COURSE OBJECTIVES:

The aim of the course is to:

- Tounderstandthe concept of fluid mechanics
- Study the flow properties of blood and their relation to blood vessel structure
- TorecognizeMechanicalpropertiesofbloodvessels
- ToidentifyissuesinthePhysicsofcardiovasculardiseases.
- Identify the correct advantages and disadvantaintellectual gesof Prostheticheart valves and replacements
- Apply basic concepts in fluid mechanics to clinical fluid dynamic measurements

COURSE OUTCOMES:

Attheendofthecourse,thestudentshouldbe ableto:

- Demonstrateknowledgeengineeringprinciplesunderlyingfluid mechanics.
- Analyze problems involving circulatory biofluid mechanics and blood rheology T
- Evaluate different methods of Cardiac output measurement
- TorecognizeStudy the operation of heart valves and its relation to blood flow in arteries
- Differentiate between viscid and in-viscid flow
- Apply basic concepts in fluid mechanics to clinical fluid dynamic measurements

UNIT I BIO-FLUIDMECHANICS

Newton'slaws,Stress,Strain,Elasticity,Hooks-law,viscosity, Newtonian fluid,Non-Newtonian fluid,Viscoelasticfluids,vasculartree,Relationshipbetweendiameter,velocityandpressureofbloodflow,Resistanceagainstflow. Viscoelasticity -Viscoelastic models, Maxwell, Voigt and KelvinModels,ResponsetoHarmonicvariation,Useofviscoelasticmodels, Bio-Viscoelasticfluids:Protoplasm,Mucus,Saliva,Synovialfluids.

UNITII FLOW PROPERTIESOFBLOOD

Physical, ChemicalandRheological propertiesof blood.Apparentandrelativeviscosity,Bloodviscosityvariation:Effectofshearrate, hematocrit,temperature,proteincontentsofblood.Casson'sequation,Problemsassociatedwithextracorporealbloodflow. Fahraeus-Lindquisteffectandinverseeffect,distributionofsuspendedparticlesinanarrowrigidtube.Natureofredbloodcellsintightlyfittingtubes,hematocritinverynarrow tube.

UNITIII CARDIACMECHANICS

Cardiovascularsystem.Mechanicalpropertiesofbloodvessels: arteries,arterioles,capillariesandveins.Bloodflow:Laminarand Turbulent,Physicsofcardiovasculardiseases,Prostheticheartvalvesandreplacements.

UNITIV RESPIRATORYMECHANICS

Alveoli mechanics, Interaction of Blood and Lung P-V curveofLung:Breathingmechanism,Airwayresistance,PhysicsofLungdiseases.

UNITIV SOFTTISSUEMECHANICS

Pseudoelasticity, non-linear stress-strainrelationship, Viscoelasticity, Structure,functionandmechanicalpropertiesofskin,ligamentsand tendons.

TEXTBOOKS:

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S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Wei Yin Mary D. Frame	Biofluid Mechanics: An Introduction to Fluid Mechanics, Macrocirculation, and Microcirculation	Academic Press	2011

16BEBME5E02 BIOMETRIC SYSTEMS 3 0 0 3 100

COURSE OBJECTIVES:

The aim of the course is to:

- Tounderstandthetechnologiesoffingerprint,iris,faceandspeechrecognition
- Tounderstandthegeneralprinciplesof designofbiometricsystemsandtheunderlying trade-offs.
- **To**recognizepersonalprivacyandsecurityimplicationsofbiometricsbasedidentification technology.
- Toidentifyissuesintherealisticevaluationofbiometricsbasedsystems.
- Identify the correct advantages and disadvantages of each biometric method
- Demonstateknowledgeengineeringprinciplesunderlyingbiometricsystems.

COURSE OUTCOMES:

Attheendofthecourse,thestudentshouldbe ableto:

- Demonstrateknowledgeengineeringprinciplesunderlyingbiometricsystems.
- Analyzedesignbasicbiometricsystemapplications.
- Tounderstandthegeneralprinciplesof designofbiometricsystemsandtheunderlying trade-offs.
- Torecognizepersonalprivacyandsecurityimplicationsofbiometricsbasedidentification technology.
- identifyissuesintherealisticevaluationofbiometricsbasedsystems.
- Identify the correct advantages and disadvantages of each biometric method

UNITI INTRODUCTIONTOBIOMETRICS

Introductionandbackground–biometrictechnologies–passivebiometrics–activebiometrics-Biometricsystems–Enrollment–templates–algorithm–verification–Biometricapplications–biometriccharacteristics-Authenticationtechnologies–Needforstrongauthentication-Protecting privacyandbiometricsandpolicy–Biometricapplications–biometriccharacteristics

UNITII FINGERPRINTTECHNOLOGY

Historyoffingerprintpatternrecognition-Generaldescriptionoffingerprints-Fingerprintfeatureprocessingtechniques-fingerprintsensorsusingRFimagingtechniques–fingerprintquality assessment–computerenhancementandmodelingoffingerprintimages–fingerprintenhancement –Featureextraction–fingerprintclassification–fingerprintmatching

UNITIII FACERECOGNITIONANDHANDGEOMETRY

Introductiontofacerecognition,Neuralnetworksforfacerecognition–facerecognitionfrom correspondencemaps–Handgeometry–scanning–FeatureExtraction-AdaptiveClassifiers-Visual-BasedFeatureExtractionandPatternClassification-featureextraction–typesof algorithm–Biometricfusion.

UNITIV MULTIMODALBIOMETRICSANDPERFORMANCEEVALUATION

VoiceScan– physiologicalbiometrics–BehavioralBiometrics-Introductiontomultimodalbiometric system–Integrationstrategies–Architecture–leveloffusion–combinationstrategy–trainingand adaptability– examplesofmultimodalbiometricsystems–Performanceevaluation-StatisticalMeasuresofBiometrics–FAR–FRR–FTE– EER–Memoryrequirementandallocation.

UNITV BIOMETRICAUTHENTICATION

Introduction-BiometricAuthenticationMethods-BiometricAuthenticationSystems–Biometric authenticationbyfingerprint-BiometricAuthenticationbyFaceRecognition.-.Expectation-Maximizationtheory-SupportVectorMachines.Biometricauthenticationbyfingerprint–biometric authenticationbyhandgeometry-Securingandtrustingabiometrictransaction–matchinglocation – localhost-authenticationserver–matchoncard(MOC)–MultibiometricsandTwo-FactorAuthentication

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	JamesWayman,AnilJain,DavideMaltoni	BiometricSystems,TechnologyDesignandPerformance Evaluation	Springer	2005
2	S.Y.Kung,S.H.Lin,M.W.Mak	BiometricAuthentication:AMachineLearningApproach	PrenticeHall	2005

REFERENCES:

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

16BEBME5E03 ADVANCED BIOCHEMISTRY 3 0 0 3 100

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 thesebiomolecules.
- To analyse the structural and functional properties of carbohydrates, proteins andlipids
- To discuss about functions of each organelles and Transport of substances across biological membranes
- To infer about the biochemistry of living cells
    - oDemonstrate the concepts of biochemistry of livingcells

COURSE OUTCOMES

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

UNIT-I BIOENERGETICS (8)

Energy relationship between the catabolic and anabolic pathways, Five major reactions in living cells, Bioenergetics and thermodynamics. Phosphoryl group transfers;ATP hydrolysis in two steps, Ping-Pong mechanism of nucleoside diphosphate kinase.

UNIT-II METABOLISM OF CARBOHYDRATES (9)

Majorpathwaysofglucoseutilization:glycolysis,fermentation,gluconeogenesis: carbohydratesynthesisfromsimpleprecursors. Pentose phosphatepathway;TCAcycle:Reactions and regulations,geneticdisordersaffecting carbohydrate metabolism

UNIT III METABOLISM OF NUCLEIC ACIDS (9)

Biosynthesis of nucleotides, denovo and salvage pathways for purines and pyrimidines, regulatory mechanisms: Metabolic disorders associated with nucleic acid metabolism.

UNIT-IV METABOLISM OF AMINOACIDS (10)

BiosynthesisofaminoacidsfromacetylcoA, Biosynthesisofessentialaminoacids(Met,Thr,Lys,Ile,Val, Leu, Phe, Trp, Tyr).Glucose-alaninecycle, Ureacycle.Pathwaysofdegradation of aromatic, glucogenic and ketogenic aminoacids. Human genetic disordersaffectingaminoacid metabolism.

UNIT-V METABOLISMOFLIPIDS (9)

Biosynthesisoffattyacid,Triacylglycerol.Biosynthesisofcholesterol. Digestion,mobilization,andtransportoffats,fattyacidentryintomitochondriaviatheacyl-carnitine/carnitinetransporter.The β-oxidationpathway.Oxidationofamonounsaturated and polyunsaturatedfattyacid.GeneticdefectsinfattyAcyl–CoA dehydrogenases causingseriousdiseases.

TOTAL: 45

TEXTBOOKS

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 100

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
- BenefitsandchallengesinMolecularmanufacturing

COURSE OUTCOMES:

Attheendofthecourse,thestudentshouldbe ableto:

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

UNIT I BIOTECHNOLOGY 9

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 9

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 9

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.

UNIT IV INDUSTRIAL& MICROBIAL BIOTECHNOLOGY 9

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–Microbial Genomics for Industry

UNIT V BIOTECHNOLOGY & INTELLECTUAL PROPERTY RIGHTS ENVIRONMENT 9

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-II & III)

16BEBME6E01 PHYSIOLOGICAL MODELLING 3 0 0 3 100

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 simpleimpedance concept
- Apply feedback systems.
- Analyse applications simulation of biological systems.
- Utilize concepts of physiological modelling..

UNIT I PROPERTIES OF SYSTEMS AND ELECTRICAL ANALOG 9

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 9

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 9

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

UNIT IV FEEDBACK SYSTEMS 9

Characteristics of physiological feedback systems, stability analysis of systems.

UNIT V SIMULATION OF BIOLOGICAL SYSTEMS 9

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

Total : 45

REFERENCES

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

16BEBME6E02 TELEHEALTH TECHNOLOGY 300 3 100

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, benefits and 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.

UNITI TELEMEDICINEANDHEALTH 9

HistoryandEvolutionoftelemedicine,Functionaldiagramoftelemedicinesystem,Telemedicine, Telehealth,Telecare,Organsoftelemedicine,GlobalandIndianscenario,Ethicalandlegalaspects ofTelemedicine-Confidentiality,Socialandlegalissues,Safetyandregulatoryissues,Advancesin Telemedicine.

UNITII TELEMEDICALTECHNOLOGY 9

PrinciplesofMultimedia-Text,Audio,Video,data,Datacommunicationsandnetworks,PSTN,POTS, ANT,ISDN,Internet,Air/wirelesscommunications:GSMsatellite,andMicrowave,Modulation techniques,Typesof Antenna,Integrationandoperationalissues,Communicationinfrastructurefor telemedicine–LANandWANtechnology.Satellitecommunication.Mobilehandhelddevicesand mobilecommunication.Internettechnologyandtelemedicineusingworldwideweb(www).Video andaudioconferencing.Clinicaldata–localandcentralized.

UNITIII TELEMEDICALSTANDARDS 9

DataSecurityandStandards:Encryption,Cryptography,Mechanismsofencryption,phasesofEncrypti on.Protocols:TCP/IP,ISO-OSI,StandardstofollowedDICOM,HL7,H.320series(Video phonebasedISBN)T.120,H.324(VideophonebasedPSTN),VideoConferencing,Real-time Telemedicineintegratingdoctors/Hospitals,Clinicallaboratorydata,Radiologicaldata,andother clinicallysignificantbiomedicaldata,Administrationofcentralizedmedicaldata,securityand confidentiallyofmedicalrecordsandaccesscontrol,Cyberlawsrelatedtotelemedicine.

UNITIV MOBILETELEMEDICINE 9

Teleradiology:Definition,Basicpartsofteleradiologysystem:ImageAcquisitionsystemDisplay system,Telepathology,multimediadatabases,colorimagesofsufficientresolution,Dynamicrange, spatialresolution,compressionmethods,Interactivecontrolofcolor,Medicalinformationstorageand managementfortelemedicine-patientinformationmedicalhistory,testreports,medicalimages diagnosisandtreatment.Hospitalinformationsystem-Doctors,paramedics,facilitiesavailable. Pharmaceuticalinformationsystem.

UNITV TELEMEDICALAPPLICATIONS 9

Telemedicineaccesstohealthcareservices–healtheducationandselfcare.·Introductionto roboticssurgery,Telesurgery,Telecardiology,Teleoncology,Telemedicineinneurosciences, ElectronicDocumentation,e-healthservicessecurityandinteroperability.,Telemedicineaccessto healthcareservices–healtheducationandselfcare,Businessaspects-Projectplanningand costing,Usageoftelemedicine.

Total : 45

TEXTBOOK

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

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Wootton,R.,Craig,J.,Patterson,V	IntroductiontoTelemedicine.RoyalSocietyofMedicine	Taylor&Francis	2006
2	O'Carroll,P.W.,Yasnoff,W.A.,Ward,E.,Ripp	PublicHealthInformaticsandInformationSystems	Springer	2003
3	Ferrer-Roca,O.,Sosa-Iudicissa,M.	HandbookofTelemedicine.Technologyand Informatics	IOSPress(StudiesinHealth)Volume54	2002
4	Simpson,W.	VideooverIP,Apracticalguidetotechnologyandapplications	FocalPressElsevier	2006
5	Bemmel,J.H.van,Musen,M.A.	HandbookofMedicalInformatics	Springer	1997
6	MohanBansal	MedicalInformatics	TataMcGraw-Hill	2004

16BEBME6E03 CANCER BIOLOGY 3003 100

COURSE OBJECTIVES

The goal of this course is for students:

- To infer the key principles for fundamentalsofcancerbiology
- To define principlesofcarcinogenesistechnology.
- To know molecularcellbiologyofcancer.
- To State the principlesofcancermetastasis**.**
- To understand the scope, benefits and limitations of newmoleculesforcancertherapy.
- TodevelopskillsofthestudentsintheareaofCancerBiology.

COURSE OUTCOMES:

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

- Learntaboutpathogenesisofcancer,identificationsofcancerthroughtoolsdevelopedbybiotechnologyresearch&moleculessynthesizedforcancertherapy.Thiswillbeverybeneficialforthestudenttotakeupprojectsin CancerBiology.
- Explain Protocols behind molecularcellbiologyofcancer.
- Utilize principlesofcancermetastasisin healthcare.
- Outline the basic concepts involved in newmoleculesforcancertherapy
- Discuss the fundamentalsofcancerbiology.
- Describe theareaofCancerBiology

UNITI FUNDAMENTALSOFCANCERBIOLOGY 9

Regulationofcellcycle, mutationsthatcausechangesinsignalmolecules, effectsonreceptor,signalswitches,tumoursuppressorgenes,modulationofcellcycleincancer, differentformsof cancers,dietand cancer. Cancerscreeningand early detection, Detectionusingbiochemicalassays,tumormarkers,molecular toolsforearlydiagnosis ofcancer.

UNITII PRINCIPLESOFCARCINOGENESIS 12

Theoryofcarcinogenesis,Chemicalcarcinogenesis, metabolismofcarcinogenesis, principlesofphysicalcarcinogenesis,x-rayradiation-mechanismsofradiation carcinogenesis.

UNITIII PRINCIPLESOFMOLECULARCELLBIOLOGYOFCANCER 9

Signal targetsandcancer,activationofkinases;Oncogenes,identificationofoncogenes, retrovirusesandoncogenes, detection of oncogenes. Oncogenes/proto oncogene activity, Growthfactorsrelatedtotransformation,Telomerases.

UNITIV PRINCIPLESOFCANCERMETASTASIS 9

Clinical significancesofinvasion, heterogeneity of metastaticphenotype, metastatic cascade,basementmembranedisruption,threesteptheoryofinvasion,proteinasesand tumour cell invasion.

UNITV NEWMOLECULESFORCANCERTHERAPY 6

Different forms oftherapy,chemotherapy,radiationtherapy,detectionofcancers, predictionofaggressivenessofcancer,advancesincancerdetection.Useofsignaltargetstowardstherapyofcancer;Genetherapy.

Total : 45

TEXT BOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	MalyB.W.J	VirologyAPracticalApproach	“”,IRLlPress,Oxford	1987
2	DunmockN.J And Primrose S.B	Introduction to Modern Virology	Blackwell ScientificPublications,Oxford	1988

REFERENCE

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	MalyB.W.J	AnIntroductionTopCellular AndMolecularBiologyofCancer	OxfordMedical Publications	1991

16BEBME6E04 BIOSIGNAL CONDITIONING CIRCUITS 3 0 0 3 100

COURSE OBJECTIVE

- 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 9

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 9

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 FILTERS 9

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.

UNIT 4 A/D AND D/A CONVERTERS 9

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.

UNIT 5 AMPLIFIERS 9

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

Total : 45

TEXT / REFERENCE BOOKS

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, 4th 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

16BEBME6E05 RADIOLOGICAL EQUIPMENTS 3 0 0 3 100

COURSE OBJECTIVE:

- To Understandgenerationofx-raysanditsusesinimaging.
- To Learndifferenttypesof radiodiagnostictechniques.
- To Knowtechniquesusedforvisualizingdifferentsectionsofthebody.
- ToLearnradiationtherapymethodologiesandthe radiationsafety.
- To perceive the knowledge of medical devices applied in measurement of parameters relatedmedical imaging and the methods of continuous monitoring and transmittingthem.
- To understand Radiationtherapy 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 andtransmission
- Measure signals generated bymuscles
- Analyze different types of nuclear medicine systems
- Explainthe differentradio diagnosticandtherapeutictechniques.
- Analyze the safety aspects of Radiationtherapy

UNITI MEDICALX-RAYEQUIPMENT 9

Natureof X-rays-X-Ray absorption–Tissuecontrast.X-RayEquipment(Block Diagram)–X-Ray Tube,thecollimator,BuckyGrid,powersupply,DigitalRadiography-discretedigitaldetectors, storagephosphorandfilmscanning,X-rayImageIntensifiertubes–Fluoroscopy–Digital Fluoroscopy.Angiography,cineAngiography.DigitalsubtractionAngiography.Mammography.

UNITII COMPUTEDTOMOGRAPHY 9

Principlesoftomography,CTGenerations,X-Raysources-collimation-X-Raydetectors-Viewing systems-spiralCTscanning–UltrafastCTscanners.Imagereconstructiontechniques-back projectionanditerativemethod.

UNITIII MAGNETICRESONANCEIMAGING 9

FundamentalsofmagneticresonanceInteractionofNucleiwithstaticmagneticfieldandRadio frequencywave-rotationandprecession–Inductionofmagneticresonancesignals–bulk magnetization–RelaxationprocessesT1andT2.BlockDiagramapproachof MRIsystem-system magnet(Permanent,ElectromagnetandSuperconductors),generationsofgradientmagneticfields, RadioFrequencycoils(sendingandreceiving),shimcoils,Electroniccomponents,fMRI.

UNITIV NUCLEARMEDICINESYSTEM 9

RadioIsotopes-alpha,beta,andgammaradiations.RadioPharmaceuticals.Radiationdetectors– gasfilled,ionizationchambers,proportionalcounter,GMcounterandscintillationDetectors,Gamma camera-Principleofoperation,collimator,photomultipliertube,X-Ypositioningcircuit,pulseheight analyzer.Principlesof SPECTandPET.

UNITV RADIATIONTHERAPYANDRADIATIONSAFETY 9

Radiationtherapy–linearaccelerator,TelegammaMachine.SRS –SRT,-RecentTechniquesin radiationtherapy-3DCRT–IMRT–IGRTandCyberknife-radiationmeasuringinstruments-Dosimeter,filmbadges,ThermoLuminescentdosimeters-electronicdosimeter-Radiationprotection inmedicine-radiationprotectionprinciples.

Total : 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	SteveWebb	ThePhysicsofMedicalImaging	AdamHilger,Philadelpia	1988
2	R.HendeeandRussellRitenour	MedicalImagingPhysics	FourthEditionWilliam,Wiley-Liss,	2002

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	GopalB.Saha	PhysicsandRadiobiologyofNuclearMedicine	ThirdeditionSpringer	2006
2	B.H.Brown,PVLawford,RHSmallwood,DRH	MedicalphysicsandbiomedicalEngineering	CRCPress	1999
3	MyerKutz,	StandardhandbookofBiomedicalEngineeringanddesign	McGrawHill	2003

FOR SEMESTER VII (ELECTIVE-IV)

16BEBME7E01 REHABILITATION ENGINEERING 3 0 0 3 100

COURSE OBJECTIVE:

- To perceive the rehabilitation concepts and Rehabilitation team for futuredevelopment andapplications.
- To understand the Primary & secondary Disabilities
- To discuss various Principles of RehabilitationEngineering.
- To infer the various orthotic devices and prosthetic devices to overcomeorthopedic 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 futuredevelopment.
- 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 thesociety.
- Understand the need of virtual reality based rehabilitation
- Simplify about different types of models of Hand and armreplacement.

UNITI MEDICALX-RAYEQUIPMENT 9

NatureofX-rays-X-Rayabsorption–Tissuecontrast.X-RayEquipment(BlockDiagram)–X-Ray Tube,thecollimator,BuckyGrid,powersupply,DigitalRadiography-discretedigitaldetectors, storagephosphorandfilmscanning,X-rayImageIntensifiertubes–Fluoroscopy–Digital Fluoroscopy.Angiography,cineAngiography.DigitalsubtractionAngiography.Mammography.

UNITII COMPUTEDTOMOGRAPHY 9

Principlesoftomography,CTGenerations,X-Raysources-collimation-X-Raydetectors-Viewing systems-spiralCTscanning–UltrafastCTscanners.Imagereconstructiontechniques-back projectionanditerativemethod.

UNITIII MAGNETICRESONANCEIMAGING 9

FundamentalsofmagneticresonanceInteractionofNucleiwithstaticmagneticfieldandRadio frequencywave-rotationandprecession–Inductionofmagneticresonancesignals–bulk magnetization–RelaxationprocessesT1andT2.BlockDiagramapproachof MRIsystem-system magnet(Permanent,ElectromagnetandSuperconductors),generationsofgradientmagneticfields, RadioFrequencycoils(sendingandreceiving),shimcoils,Electroniccomponents,fMRI.

UNITIV NUCLEARMEDICINESYSTEM 9

RadioIsotopes-alpha,beta,andgammaradiations.RadioPharmaceuticals.Radiationdetectors– gasfilled,ionizationchambers,proportionalcounter,GMcounterandscintillationDetectors,Gamma camera-Principleofoperation,collimator,photomultipliertube,X-Ypositioningcircuit,pulseheight analyzer.PrinciplesofSPECTandPET.

UNITV RADIATIONTHERAPYANDRADIATIONSAFETY 9

Radiationtherapy–linearaccelerator,TelegammaMachine.SRS –SRT,-RecentTechniquesinradiationtherapy-3DCRT–IMRT–IGRTandCyberknife-radiationmeasuringinstruments-Dosimeter,filmbadges,ThermoLuminescentdosimeters-electronicdosimeter-Radiationprotection inmedicine-radiationprotectionprinciples.

Total : 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	SteveWebb	ThePhysicsofMedicalImaging	AdamHilger,Philadelpia	1988
2	R.HendeeandRussellRitenour	MedicalImagingPhysics	FourthEditionWilliam,Wiley-Liss	2002

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	GopalB.Saha	PhysicsandRadiobiologyofNuclearMedicine	ThirdeditionSpringer	2006
2	B.H.Brown,PVLawford,RHSmallwood	MedicalphysicsandbiomedicalEngineering	CRCPress	1999
3	MyerKutz	StandardhandbookofBiomedicalEngineeringanddesign	McGrawHill	2003
4	P.Ragunathan	MagneticResonanceImagingandSpectroscopyinMedicine	-	-

16BEBME7E02 LASERS AND FIBER OPTICS IN MEDICINE 3 0 0 3 100

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 photodynamictherapy.

OUTCOMES:

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

- Analyse the optical properties of tissues
- Use the Photonics instrumentation
- Apply lasers in different areas of medicine.
- Perceive the lasersin ophthalmology
- Discuss about opticalhologram
- Explain the special techniques of Lasers.

UNITI OPTICALPROPERTIESOFTHETISSUES 9

Refraction,scattering,absorption,lighttransportinsidethetissue,tissueproperties,Lightinteraction withtissues,optothermalinteraction,fluorescence,speckles.

UNITII INSTRUMENTATIONINPHOTONICS 9

Instrumentationforabsorption,scatteringandemissionmeasurements,excitationlightsources– highpressurearclamp,solidstateLEDs,opticalfilters,polarisers,timeresolvedandphaseresolved detectors.

UNITIII APPLICATIONSOFLASERS 9

Laserintissuewelding,lasersindermatology,lasersinophthalmology,otolaryngology,urology.

UNITIV OPTICALHOLOGRAPHY 9

Wavefronts,interferencepatterns,principleofhologram,opticalhologram,applications.

UNITV SPECIALTECHNIQUES 9

Nearfieldimagingofbiologicalstructures,in-vitroclinicaldiagnostic,fluorescentspectroscopy, photodynamictherapy.

Total : 45

TEXTBOOKS

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	LeonGoldman,M.D., &R.JamesRockwell,Jr	LasersinMedicine	GordonandBreach, SciencePublishersI	1975
2	AbrahamKatzir	LasersandOpticalFibersinMedicine	AcademicPressEdition	1998

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	TuanVoDirh	BiomedicalPhotonics–Handbook	CRCPress,Bocaraton	2003
2	Glasser,O.,	MedicalPhysics--Vol1,2, 3	AdamHilgarBrustolInc	1987
3	G.DavidBaxter	TherapeuticLasers–Theoryandpractice	ChurchillLivingstonePublicationsEdition	2001

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16BEBME7E03 PATIENT AND DEVICES SAFETY 3 0 0 3 100

COURSEOBJECTIVES:

The goal of this course is for students

- To provide basic knowledge on the concept of Healthcare Quality management towards continuous improvementofpatientcare
- To Understandhospitalsafety.
- To be familiar with electrical & fire safety.
- To infer the knowledge of regulatoryrequirementforhealthcare.
- To be exposed to standardization ofqualitymedicalcareinhospitals
- To explain the assessingqualityhealthcare

COURSE OUTCOME:

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

- Makethestudentsawareoftheroleofbiomedicalengineerinhospitals,especiallyinthemanagemento felectricalsupply,maintenanceofelectricalsafety.
- Analyse the hospitalsafety.
- Use the electrical & fire safety.
- Apply regulatoryrequirementforhealthcare in different areas of medicine.
- Perceive thestandardization ofqualitymedicalcareinhospitals.
- Discuss about the assessingqualityhealthcare**.**

UNITI STANDARDIZATION OFQUALITYMEDICALCAREINHOSPITALS 9

DefineQuality-NeedforStandardization&QualityManagement, TQMinHealthcareorganization-Qualityassurancemethods, Q A in(MedicalImaging&Nuclearmedicine) Diagnosticservices–Classificationofequipments

UNITII REGULATORYREQUIREMENTFORHEALTHCARE 9

FDAregulations,Accreditationforhospitals-JCI,NABHandNABL,OtherregulatoryCodes.

UNITIII HOSPITALSAFETY 9

Security &SafetyofHospital-Property, Staff&Patients, Radiation safety, Safetyprecautions, hazardous effectsofradiation, allowedlevelsofradiation,ICRPregulationsforradiationsafety, DisposalofBiologicalwaste.

UNITIV ELECTRICAL&FIRESAFETY 9

Sourcesofshocks, macro&microshocks-Hazards, monitoring andinterruptingtheOperationfromleakagecurrent- Elements offire,causesoffire,ActiontobetakenincaseoffireinaHospital.

UNITV ASSESSINGQUALITYHEALTHCARE 9

PatientSafetyOrganization-Governmental&Independent,MeasuringQualitycare–Evaluationofhospitalservices–sixsigmaway,QualityAssuranceinHospitalsSop's–PatientOrientationfor TotalPatientSatisfaction.5Stechniques.

Total : 45

REFERENCES

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	CesarA.Cacere&AlbertZana	ThePracticeofClinicalEngg.	Academicpress,NewYork	1977
2	WebsterJ.GandAlbertM.Cook	ClinicalEngg,Principles&Practices,PrenticeHallInc.,	EnglewoodCliffs,NewJer	1979
3	B.M.Sakharkar	PrinciplesofHospitaladministrationandPlanning	JAYPEEBrothers, MedicalPublishers	-

FOR SEMESTER VIII (ELECTIVE-V & VI)

16BEBME8E01 BIOLOGICAL SPECTROSCOPY 3 0 0 3 100

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 5

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

UNIT II NUCLEAR MAGNETIC RESONANCE 10

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 10

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

UNIT IV X-RAY DIFFRACTION 10

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 10

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

Total : 45

TEXT BOOKS

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

16BEBME8E02 ROBOTICS AND AUTOMATION 3 0 0 3 100

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, Lagrangianformulation of Robot dynamics.
- To study the trajectory planning for robot.
- To study the control of robots for some specific applications.
- Use Robots in different applications

COURSE OUTCOMES:

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

- Explain the basic concepts of working of robot
- Analyze the function of sensors in the robot
- Write a program to use a robot for a typical application
- Use Robots in different applications
- Know the Euler, Lagrangianformulation of Robot dynamics.

UNIT I BASIC CONCEPTS (9)

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 (9)

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

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS (9)

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 (9)

Solution of inverse kinematics problem–multiple solution jacobianwork envelop–hill Climbing Techniques– robot programming languages

UNIT V CASE STUDIES (9)

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

Total : 45

TEXT BOOKS:

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

		Integration		

REFERENCES:

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	KlafterR.D., Chimielewski T.A., NeginM	Robotic Engineering– An integrated approach	Prentice Hall of India, New Delhi	1994
3	McKerrowP.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

16BEBME8E03 NANOTECHNOLOGY IN MEDICINE 3003 100

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 (9)

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 (9)

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 (9)

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.

Total : 45

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

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

16BEBME8E04 TISSUE ENGINEERING 3 0 0 3 100

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 (9)

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 (9)

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 (9)

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 (9)

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 (9)

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.

Total : 45

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

REFERENCES:

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

16BEBME8E05 SPEECH PROCESSING 3 0 0 3 100

COURSE OBJECTIVES:

- Tointroducespeechproductionandrelatedparametersof speech.
- Toshowthecomputationanduseoftechniquessuchas shorttimeFouriertransform,linear predictivecoefficientsandothercoefficientsintheanalysisofspeech.
- TounderstanddifferentspeechmodelingproceduressuchasMarkovandth eir implementationissues.
- 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:

Uponcompletionofthecourse,studentswillbeableto

- Modelspeechproductionsystemanddescribethefundamentalsof speech.
- Extractandcomparedifferentspeechparameters.
- Chooseanappropriatestatisticalspeechmodelforagivenapplication.
- Designaspeechrecognitionsystem.
- Usedifferentspeechsynthesistechniques.
- .Analyze application of speech processing in speech compression, speech recognition, and speech synthesis

UNITI BASICCONCEPTS 9

SpeechFundamentals:ArticulatoryPhonetics–ProductionandClassificationofSpeechSounds; AcousticPhonetics–Acousticsofspeechproduction;ReviewofDigitalSignalProcessingconcepts; Short-TimeFourierTransform,Filter-BankandLPCMethods.

UNITII SPEECHANALYSIS 9

Features,FeatureExtractionandPatternComparisonTechniques:Speechdistortionmeasures– mathematicalandperceptual–Log–SpectralDistance,CepstralDistances,WeightedCepstral DistancesandFiltering,LikelihoodDistortions,SpectralDistortionusingaWarpedFrequencyScale , LPC,PLPandMFCCCoefficients,TimeAlignmentandNormalization–DynamicTimeWarping, MultipleTime–AlignmentPaths.

UNITIII SPEECHMODELING 9

HiddenMarkovModels:MarkovProcesses,HMMs–Evaluation,OptimalStateSequence–Viterbi Search,Baum-WelchParameterRe-estimation,Implementationissues.

UNITIV SPEECHRECOGNITION 9

LargeVocabularyContinuousSpeechRecognition:Architectureofalargevocabularycontinuous speechrecognitionsystem–acousticsandlanguagemodels–n-grams,contextdependentsub-word units;Applicationsandpresentstatus.

UNITV SPEECHSYNTHESIS 9

Text-to-SpeechSynthesis:Concatenativeandwaveformsynthesismethods,sub-wordunitsfor TTS, intelligibilityandnaturalness–roleofprosody,Applicationsandpresentstatus.

Total : 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	LawrenceRabinerand Biing-HwangJuang	FundamentalsofSpeechRecognition	Pearson Education	2003
2	DanielJurafskyandJamesH Martin	SpeechandLanguageProcessing – AnIntroductiontoNaturalLanguageProcessing,ComputationalLinguistics,andSpeechRecognition	Pearson Education	2002
3	FrederickJelinek	StatisticalMethodsofSpeechRecognition	MITPress	1997

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	StevenW.Smith	TheScientistandEngineer"s GuidetoDigitalSignalProcessing	California TechnicalPublishing	1997
2	ThomasFQuatier	Discrete-TimeSpeechSignalProcessing– PrinciplesandPractice	PearsonEducation	2004
3	ClaudioBecchettiandLucioPrinaRicotti	SpeechRecognition	JohnWileyandSons	1999
4	BenGoldandNelsonMorgan	Speechandaudiosignalprocessing,ProcessingandPerceptionofSpeechandMusic	Wiley-IndiaEdition	2006

16BEBME8E06 RAPID PROTOTYPING 3 0 0 3 100

OBJECTIVE:

- Generatingagoodunderstandingof RPhistory,itsdevelopmentandapplications.
- Toexposethe studentstodifferenttypesof Rapidprototypingprocesses,
- MaterialsusedinRPsystemsandreverse engineering.
- ToprovideknowledgeondifferenttypesofRapidPrototypingsystemsanditsapplicatio nsin variousfields
- Understand SelectiveLaserSintering
- Know Directshellproductioncasting

OUTCOME:

- ToprovideknowledgeondifferenttypesofRapidPrototypingsystemsandits applicationsin variousfields
- Generatingagoodunderstandingof RPhistory,itsdevelopmentandapplications.
- Toexposethe studentstodifferenttypesof Rapidprototypingprocesses,
- MaterialsusedinRPsystemsandreverse engineering.
- Familiarise LaserEngineeredNetShaping(LENS).
- Know medicaldataprocessing

UNITI INTRODUCTION 9

History–DevelopmentofRP systems–ApplicationsinProductDevelopment,ReverseEngineering, RapidTooling,RapidManufacturing-Principle–Fundamental–Fileformat–Othertranslators–medicalapplicationsofRP-Ondemandmanufacturing–Directmaterialdeposition-Shape DepositionManufacturing.

UNITII LIQUIDBASEDANDSOLIDBASEDRAPIDPROTOTYPINGSYSTEMS 9

Classification–Liquidbasedsystem-StereolithographyApparatus(SLA),detailsofSLprocess, products,Advantages,Limitations,ApplicationsandUses.Solidbasedsystem- FusedDeposition Modeling,principle,process,products,advantages,applicationsanduses-LaminatedObject Manufacturing

UNITIII POWDERBASEDRAPIDPROTOTYPINGSYSTEMS 9

SelectiveLaserSintering–principlesofSLSprocess,principleofsinterbondingprocess,Laser sinteringmaterials,products,advantages,limitations,applicationsanduses.ThreeDimensional Printing–process,majorapplications,researchanddevelopment.Directshellproductioncasting–keystrengths,process,applicationsanduses,casestudies,researchanddevelopment.Laser SinteringSystem,e-manufacturingusingLasersintering,customizedplasticparts,customizedmetal parts,e-manufacturing-LaserEngineeredNetShaping(LENS).

UNITIV MATERIALSFORRAPIDPROTOTYPINGSYSTEMS 9

Natureof material–typeofmaterial–polymers,metals,ceramicsand composites-liquidbased materials,photopolymerdevelopment–solidbasedmaterials,powderbasedmaterials-casestudy.

UNITV REVERSEENGINEERINGandNEWTECHNOLOGIES 9

Introduction,measuringdevice-contacttypeandnon-contacttype,CADmodelcreationfrompoint clouds-preprocessing,pointcloudstosurfacemodelcreation,medicaldataprocessing-typesof medicalimaging,softwareformakingmedicalmodels,medicalmaterials,otherapplications–Casestudy.

Total : 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	RafiqI.Noorani	RapidPrototyping–PrinciplesandApplications	Wiley&Sons	2006
2	ChuaC.K,LeongK.FandLimC.S	RapidPrototyping:Principlesand Applications	second edition,WorldScien	2003

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	N.HOPKINSON,R.J.M,HAUGE,PM,DICKENS	RapidManufacturing–AnIndustrialrevolutionforthedigitalage	Wiley	2006
2	IANGIBSON	AdvancedManufacturingTechnologyforMedicalapplications:Rev	Wiley	2006
3	PaulF.Jacobs	RapidPrototypingandManufacturing,“FundamentalsofStereolithography	McGrawHill	1993
4	D.T.PhamandS.S.Dimov	RapidManufacturing	SpringerVerlog	2001

16BEBME8E07 BIO MEMS 3 0 0 3 100

COURSE OBJECTIVES:

Thestudentshouldbemadeto:

- LearnvariousMEMSfabricationtechniques.
- Understanddifferenttypesof sensorsandactuatorsandtheirprinciplesof operationatthemicroscalelevel.
- KnowtheapplicationofMEMSindifferentfieldofmedicine.
- DiscussvariousMEMSfabricationtechniques.
- Explaindifferenttypesofsensorsandactuatorsandtheirprinciplesof operationatthemicroScalelevel.
- ApplyMEMSindifferentfieldofmedicine.

COURSE OUTCOMES:

Attheendofthecourse,thestudentshouldbe ableto:

- DiscussvariousMEMSfabricationtechniques.
- Explaindifferenttypesofsensorsandactuatorsandtheirprinciplesof operationatthemicroScalelevel.
- ApplyMEMSindifferentfieldofmedicine.
- LearnvariousMEMSfabricationtechniques.
- Understanddifferenttypesof sensorsandactuatorsandtheirprinciplesof operationatthemicroscalelevel.
- KnowtheapplicationofMEMSindifferent

UNITI MEMSMATERIALSANDFABRICATION 9

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

UNITII MECHANICALANDTHERMALSENSORSANDACTUATORS 9

MechanicsforMEMsdesign-staticbendingofthinplates,mechanicalvibration,thermomechanics, fractureandthinfilmmechanics.Mechanicalsensorsandactuators–beamandcantilever–microplates,strain,pressureandflowmeasurements,Thermalsensorsandactuators-actuator basedonthermalexpansion,thermalcouples,thermalresistor,Shapememoryalloys-Inertia sensor,flowsensor

UNITIII ELECTROSTATICANDPIEZOELECTRICSENSORSANDACTUATORS 9

Parallelplatecapacitor,pullineffect,Electrostaticsensorsandactuators-Inertiasensor,Pressure sensor,flowsensor,tactilesensor,combdrive.Propertiesofpiezoelectricmaterials,Piezoelectricsensorandactuator–inchwormmotor,inertiasensor,flowsensor.

UNITIV MICROFLUIDICSYSTEMS 9

Fluiddynamics,continuityequation,momentumequation,equationofmotion,laminarflowin circularconduits,fluidflowinmicroconduits,insubmicrometerandnanoscale.Microscalefluid,

expressionforliquidflowinachannel,fluidactuationmethods,dielectrophoresis,microfluiddis

penser,microneedle,micropumps-continuousflowsystem,micromixers

UNITV APPLICATIONSOFBIOMEMS 9

CADforMEMs,Drugdelivery,micrototalanalysissystems(MicroTAS)detectionandmeasurement methods,microsystemapproachestopolymerasechainreaction(PCR),DNAsensor,MEMSbased drugdelivery

Total : 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Tai RanHsu	MEMSandMicrosystemsDesignandManufacture	TataMcGrawHillPublishing Company,NewDelhi	2002
2	WanjunWang,Stephen A.Soper	BioMEMs:TechnologiesandApplications	CRCPress,NewYork	2007

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	MarcJ.Madou	FundamentalsofMicrofabrication:theScienceof Miniaturization	CRCPress	2002
2	NadimMaluf,KirtWilliams	AnintroductiontoMicroelectroMechancialSystemsEngineering	SecondEdition,ArtechHouseInc,MA,	2004
3	ChangLiu,	FoundationsofMEMS	PearsonEducationInternational,NewJersey,USA	2006
4	NitaigourPremchand Mahalik	MEMS	TataMcGrawHillPublishingCompany,NewDelhi	2007

16BEBME8E08 INTELLECTUAL PROPERTY RIGHTS 3003 100

OBJECTIVES:

Thestudentshouldbemadeto:

- Learnhowtovalueintangibleassets,takingintoaccounttheircommercialpotentialandlegal status.
- Explorethelegal&businessissuessurroundingmarketingofnewproductsrelatedto technology.
- Reviewanintellectualpropertyportfolioandcomprehendtheextentof theirprotection.
- Developabusinessplanthatadvancesthevalueoftheirintellectualpropertyportfolio
- Developastrategyofmarketingtheirintellectualpropertyandunderstandsomenegotiation basics.
- Explainsomeofthelimitsof theirintellectualpropertyrightsandcomprehendsomebasic legal pitfalls.

OUTCOMES:

Uponcompletionofthecourse,studentswillbeableto:

- Reviewanintellectualpropertyportfolioandcomprehendtheextentof theirprotection.
- Developabusinessplanthatadvancesthevalueoftheirintellectualpropertyportfolio
- Learnhowtovalueintangibleassets,takingintoaccounttheircommercialpotentialandlegal status.
- Explorethelegal&businessissuessurroundingmarketingofnewproductsrelatedto technology.
- Developastrategyofmarketingtheirintellectualpropertyandunderstandsomenegotiation basics.
- Explainsomeofthelimitsof theirintellectualpropertyrightsandcomprehendsomebasic legal pitfalls.

UNITI INTRODUCTION 9

Introduction–InventionandCreativity–IntellectualProperty(IP)–Importance–ProtectionofIPR – Basictypesofproperty(i)MovableProperty(ii)ImmovablePropertyand(iii)IntellectualProperty.

UNITII PATENTS,COPYRIGHTSANDTRADEMARKS 9

IP –Patents–Copyrightsandrelatedrights–TradeMarksandrightsarisingfromTrademark registration–Definitions–IndustrialDesignsandIntegratedcircuits–ProtectionofGeographical IndicationsatnationalandInternationallevels–ApplicationProcedures.

UNITIII INTERNATIONALSTANDARDISATION 9

InternationalconventionrelatingtoIntellectualProperty–EstablishmentofWIPO–Missionand Activities– History–GeneralAgreementonTradeandTariff(GATT).

UNITIV INDIANSTRATEGIES 9

IndianPositionVsWTOandStrategies–IndianIPRlegislations–commitmentstoWTO-Patent OrdinanceandtheBill–DraftofanationalIntellectualPropertyPolicy–Presentagainstunfair competition.

UNITV CASESTUDIES 9

CaseStudieson –Patents(Basumatirice,turmeric,Neem,etc.) –Copyrightandrelatedrights– TradeMarks–IndustrialdesignandIntegratedcircuits–Geographicindications– Protectionagainstunfaircompetition.

Total : 45

TEXTBOOK:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	SubbaramN.R	HandbookofIndianPatentLawandPractice	S.Viswanathan,PrintersandPublishers Pvt.Ltd	1998

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	EliWhitney	UnitedStatesPatentNumber :72X	CottonGin	March14, 1794
2	DerwentIP Matters	UsingtheInternetfornon-patentpriorartsearches	-	July2000.

OPEN ELECTIVES - OFFERED BY OTHER DEPARTMENTS

SCIENCE AND HUMANITIES

16BTSHOE01 PROBABILITY AND RANDOM PROCESS 3 0 0 3 100

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

Measures of central tendency–Mean, Median, Mode-Standard Deviation Probability-Random Variable-Axioms of Probability-Conditional Probability-Total probability–Bayes' 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 in equality.

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 O FRANDOM PROCESS

Definition and examples-first order, second order, strictly stationary, wide–sense stationary and

Ergodic Processes-Markov Process-Binomial, Poisson and Normal Processes-Sinewave process.

UNIT-V CORRELATION AND SPECTRAL DENSITIES

Autocorrelation-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 – Autocorrelation and cross correlation functions of input and output.

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	Henry Starkand John W. Woods	Probability and Random Processes with Applications to Signal Processing	Pearson Education, Third edition, Delhi	2002
2	Ochi, M. K	Applied Probability and Stochastic Process	John Wiley &Sons, New York	1990
3	Ross, S	A first Course in Probability	Pearson Education, New Delhi(Chap2to8)	2002
4	Gupta, S.C .and Kapur, V. K	Fundamentals of Mathematical Statistics	Sultan Chand and Sons, New Delhi.	2007
5	Veerarajan, T.	Probabilitiy, StatisticsandRandom process	Tata McGraw-Hill Publications, Second Edition, New Delhi	2002

WEBSITES:

1. www.cut-theknot.org/probability.shtml
2. www.mathcentre.ac.uk
3. www.mathworld.Wolfram.com

16BTSHOE02 FUZZY MATHEMATICS 3 0 0 3 100

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 SET (9)

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 (9)

Operations on Fuzzy Sets Operations on [0,1] – Fuzzy negation, triangular norms, tonearms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNIT III FUZZY RELATION (9)

Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations

UNIT IV FUZZY MEASURE (9)

Possibility Theory Fuzzy Measures – Evidence Theory – Necessity and Belief Measures – Probability Measures Vs Possibility Measures

UNIT V FUZZY INFERENCE (9)

Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference – Compositional rule of Inference - Efficiency of Inference - Hierarchical

Total : 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	George J Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic: Theory and Applications	Prentice Hall of India, New Delhi.	2003

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Zimmermann H.J.	Fuzzy Set Theory and its Applications	Kluwer Academic publishers, USA.	2001
2	Michal Baczynski and Balasubramaniam Jayaram	Fuzzy Implications	Springer-Verlag publishers, Heidelberg	2008
3	Kevin M Passino and Stephen Yurkovich	Fuzzy Control	Addison Wesley Longman publishers, USA	1998

WEBSITES:

1. www.mathcentre.ac.uk
2. www.mathworld. Wolfram.com
3. www.calvin.edu/~pribeiro/othrlnks/Fuzzy/fuzzysets.htm

16BTSHOE03 LINEAR ALGEBRA 3 0 0 3 100

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 (9)

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 (9)

Eigen values and Eigen vectors - Diagonalization - Power method - QR decomposition

UNIT III SYSTEM OF LINEAR EQUATIONS (9)

Direct methods, Gauss elimination method, Gauss Jordan method, Croute's method, iterative methods, Gauss-Jacobi method, Gauss–Seidel method, convergence criteria.

UNIT IV LINEAR TRANSFORMATIONS (9)

Linear Transformations - The Null Space and Range - I isomorphism - Matrix Representation of Linear Transformations – Similarity - Eigenvalues and Eigenvectors Eigen values and Eigen vectors - Diagonalization

UNIT V INNER PRODUCT SPACES (9)

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

Total: 45

TEXT BOOKS:

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

REFERENCES:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	Kreyszig,E	Advanced Engineering Mathematics	John Wiley & Sons, New Delhi.	2014
2	Anton and Rorres	Elementary Linear Algebra, Applications version	Wiley India Edition, New Delhi.	2012
3	Jim Defranza, Daniel Gagliardi	Introduction to Linear Algebra with Application	Tata McGraw-Hill, New Delhi.	2008

WEBSITES:

4. www.sosmath.com
5. www.nptel.ac.in
6. www.mathworld.wolfram.com

16BTSHOE04 ENGINEERING ACOUSTICS 3 0 0 3 100

OBJECTIVES:

- 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 (9)

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 (9)

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 (9)

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 (9)

Sound in endo sure – 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 (9)

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker– horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers

Total: 45

TEXT BOOK:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	LawerenceE.Kinsler, Austin R.Frey,	Fundamentals of Acoustics	John Wiley & Sons	2000

REFERENCE:

S.NO	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1	F. AltonEverest & Ken Pohlmann	Master Handbook of Acoustics	McGraw Hill Professional	2014

WEBSITES:

1. www.acousticalsociety.org
2. www.acoustics-engineering.com
3. www.nptel.ac.in
4. www. ocw.mit.edu

16BTSHOE05 SOLID WASTE MANAGEMENT 3 0 0 3 100

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 (9)

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 (9)

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 (9)

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 (9)

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, Remediation, risk assessment.

UNIT V ENERGY GENERATION FROM WASTE (9)

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. Chemical transformation processes.

Total: 45

TEXT BOOK:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dara.S.S,Mishra.D.D	A Text book of Environmental Chemistry and Pollution Control	S.Chand and Company Ltd., New Delhi.	2011

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Naomi B. Klinghoffer and Marco J. Castaldi	Waste to Energy Conversion Technology (Woodhead Publishing Series in Energy)	Woodhead Publishing Ltd., Cambridge, UK	2013
2.	Frank Kreith, George Tchobanoglous	Hand Book of Solid Waste Management- 2nd edition	McGraw Hill Publishing Ltd., Newyork	2002
3.	Shah, L Kanti	Basics of Solid & Hazardous Waste Management Technology	Prentice Hall (P) Ltd., New Delhi.	1999

WEBSITES:

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/

16BTSHOE06 GREEN CHEMISTRY 3 0 0 3 100

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 (9)

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 (9)

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 BIO TECHNOLOGY AND GREEN CHEMISTRY (9)

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 (9)

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 (9)

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.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Sanjay K. Sharma, AckmezMudhoo	Green Chemistry for Environmental Sustainability	CRC Press , London	2010
2.	Ahluwalia V. K. and M.Kidwai	New Trends in Green Chemistry 2^{nd} edition	Anamaya publishers., New Delhi.	2007

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Dr. Sunita Ratan	A Textbook of Engineering Chemistry	S.K. Kataria and Sons., New Delhi.	2012
2.	Mukesh Doble. Ken Rollins, Anil Kumar	Green Chemistry and Engineering, 1^{st} edition	Academic Press, Elesevier., New Delhi.	2007
3.	Desai K. R.	Green Chemistry	Himalaya Publishing House, Mumbai.	2005
4.	Matlack A. S.	Introduction to Green Chemistry	Marcel Dekker: New York	2001

WEBSITES:

1.http://www.organic-chemistry.org/topics/green-chemistry.shtm

2.http://www.essentialchemicalindustry.org/processes/green-chemistry.html

3. http://www.chm.bris.ac.uk/webprojects2004/vickery/green_solvents.htm

4. http://www.epa.gov/research/greenchemistry/

16BTSHOE07 APPLIED ELECTROCHEMISTRY 3 0 0 3 100

OBJECTIVES:

- 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 (9)

Fundamental principles, surface preparation-Electroplating of copper, nickel, chromium, zinc and precious metals (gold & silver)- Electro plating for electronic industry- Alloy plating, brass plating- Electro less plating of nickel- anodizing – Electroforming – Electro winning.

UNIT II CONDUCTING POLYMERS AND ELECTROCHEMICALS (9)

Lector polymerization- 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 (9)

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 (9)

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 (9)

Solar cells- Preparation of CdS/Cu_2S 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.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Cynthia G. Zoski	Hand Book of Electrochemistry	Academic Press, Elesevier., UK	2007
2.	D.Pletcher and F.C.Walsh	Industrial Electrochemistry	Chapman and Hall, London	1990

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M. Barak	Electrochemical Power Sources	I.EEE series, Peter Peregrinius Ltd, Steverage, U.K.	1997
2.	Bruno Scrosati	Applications of Electroactive Polymers	Chapman & Hall, London	1993
3.	K.L. Chopra and I. Kaur	Thin Film Devices and their Application	Plenum Press, New York.	1983
4.	M.M.Baizer	Organic Electrochemistry	Dekker Inc. New York	1983

WEBSITES:

1. http://www.anoplate.com/finishes/
2. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html

16BTSHOE08 INDUSTRIAL CHEMISTRY 3 0 0 3 100

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 (9)

Manufacture of Portland cement – settling of hardening of port land cement – re gauging 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 (9)

Abrasives – hard abrasives – siliceous abrasives – soft abrasives – artificial abrasives – uses. Refractories – definition – classification – acid refractories – basic refractories – neutral refractories – properties – uses.

UNIT IIIINORGANIC CHEMICALS (9)

Common salt and soda ash – manufacture – different grades – products – alkalis – Na_2CO_3, caustic soda and color-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.

UNIT IV EXPLOSIVES (9)

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 (9)

Fertilizers – organic and inorganic – ammoniated superphosphates, sodium nitrate, solid pellets – potassium salts – pesticides – fungicides – herbicides – their preparations and characteristics – environmental impacts.

Total: 45

TEXT BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Hari krishan	Industrial Chemistry	Goel Publishing House, Meerut.	2014
2.	B.K. Sharma	Industrial Chemistry	Goel Publishing House, Meerut.	2000

REFERENCE BOOKS:

S. NO.	AUTHOR(S) NAME	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	B.N.Chakrabarty	Industrial Chemistry	Oxford and IBH Publishing CO. New Delhi.	1998
2.	James A. Kent	Hand Book of Industrial Chemistry, 9^{th} edition	Van Nostrand Reinhold, New York.	1992
3.	R.N. Sherve	Chemical Process Industries	McGraw-Hill, Kugakuisha Ltd., Tokyo.	1984
4.	S.D. Shukla and G.N. Pandy	A Text book of Chemical Technology	Vikas Publishing House (P) Ltd, New Delhi.	1979

WEBSITES:

1.http://en.wikipedia.org/wiki/Cement

2. http://www.hon.ch/HONselect/Selection/D01.html

3. http://fas.org/man/dod-101/navy/docs/fun/part12.htm

LIST OF OPEN ELECTIVES OFFERED BY

COMPUTER SCIENCE ENGINEERINGDEPARTMENT

16BECSOE01 INTERNET PROGRAMMING 3 0 0 3 100

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
- Explain 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
- use various Internet applications

UNIT I INTRODUCTION **9**

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 **9**

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 **9**

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 Applets-Container Class, Components, Applet Life Cycle, Update method, Applications.

UNIT IV Client-Server programming **9**

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 TELEPHON 9

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

TEXT BOOKS:

1. Paul Deitel, Harvey Deitel and Abby Deitel, “Internet and World Wide Web- How to Program”, 5th Edition, 2011.

2. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.

REFERENCES:

1. Rahul Banerjee, Internetworking Technologies, An Engineering Perspective, PHI Learning, Delhi, 2011.

2. Robert W. Sebesta, “Programming the World Wide Web”, Pearson Education, 2016

16BECSOE02 MULTIMEDIA AND ANIMATION

3003 100

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.
- 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 9

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 9

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 9

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 9

Formats – Methods – Usages – Expression – Motion Capture Software's – Script Animation Usage – Different Language of Script Animation Among the Software.

UNIT V Concept Development 9

Story Developing – Audio & Video – Color Model – Device Independent Color Model – Gamma

and Gamma Correction - Production Budgets- 3D Animated Movies.

TOTAL: 45

Text Books:

1. Computer Graphics, Multimedia and Animation-Malay K. Pakhira,PHI Learning PVT Ltd,2010

References:

1. Principles of Multimedia – Ranjan Parekh, 2007, TMH. (Unit I, Unit V)
2. Multimedia Technologies – Ashok Banerji, Ananda Mohan Ghosh – McGraw Hill Publication.
3. Encyclopedia of Multimedia and Animations-Pankaj Dhaka, Anmol Publications-2011

16BECSOE03 PC HARDWARE AND TROUBLE SHOOTING 3 0 0 3 100

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 9

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 9

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.

UNIT III PC Hardware Overview 9

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 9

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 9

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.

Text Books:

1. B. Govindarajalu, “IBM PC Clones Hardware, Troubleshooting and Maintenance”, 2/E, TMH, 2002.

References:

1. Peter Abel, Niyaz Nizamuddin, “IMB PC Assembly Language and Programming”, Pearson Education, 2007
2. Scott Mueller, “Repairing PC's”, PHI, 1992

16BECSOE04 JAVA PROGRAMMING 3 0 0 3 100

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.

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

TEXT BOOKS:

1.Cay S. Horstmann and Gary Cornell Core Java: Volume I–Fundamentals Sun Microsystems

Press 2008

REFERENCE BOOKS:

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, Tata McGraw-Hill Publishing company Ltd., 2008

WEBSITES:

http://elvis.rowan.edu/~kay/cpp/vc6_tutorial/

http://www.winprog.org/tutorial/msvc.html
http://www.tutorialized.com/tutorials/Visual-C/1

http://www.freeprogrammingresources.com/visualcpp.html

LIST OF OPEN ELECTIVES OFFERED BY

ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT

16BEEEOE01 ELECTRIC HYBRID VEHICLES L T P C 3 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 9

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 9

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 9

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 Motor drives, drive system efficiency.

UNIT IV ENERGY STORAGE 9

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, Hybridization of different energy storage devices.

UNIT V ENERGY MANAGEMENT STRATEGIES 9

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

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Iqbal Hussein	Electric and Hybrid Vehicles: Design Fundamentals	CRC Press – 2nd edition	2010

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi	Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design	Standards media – 2nd edition	2009
2	James Larminie, John Lowry	Electric Vehicle Technology Explained	Wiley – 2nd edition	2012

16BEEEOE02 ENERGY MANAGEMENT AND ENERGY AUDITING 3 0 0 3 100

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 9

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 9

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 9

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 9

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 blower's pumps- air conditioning system- energy efficient transformers.

UNIT V POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS 9

Power factor - methods of improvement, location of capacitors, p.f with nonlinear 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

TEXT BOOK

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	Murphy W.R. and G.Mckay Butter worth	Energy Management	Heinemann Publications	2007

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
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

16BEEEOE03 PROGRAMMABLE LOGIC CONTROLLER 3 0 0 3 100

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 9

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 9

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 9

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 9

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 9

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

TOTAL: 45

TEXT BOOKS

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	JR Hackworth and F.D Hackworth – Jr	Programmable Logic Controllers – Programming Method and Applications	Pearson	2006

REFERENCES

S. No.	Author(s) Name	Title of the Book	Publisher	Year of Publication
1	John Webb and Ronald A Reiss	Programmable Logic Controllers – Principle and Applications	Fifth edition, PHI	2004
2	W.Bolton	Programmable Logic controller	Elsevier Newnes Publications, 5th Edition	2009

WEBSITE

http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,- Introduction to programmable Logic controller

16BEEEOE04 RENEWABLE ENERGY RESOURCES L T P C 3 0 0 3

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 9

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 9

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 9

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 9

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 9

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

TOTAL: 45

TEXT BOOKS

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	Renewable Energy: Power sustainable future	Oxford University Press, Third edition	2012
3	John W Twidell and Anthony D Weir	Renewable Energy Resources	Taylor and Francis – 3rd edition	2015

WEBSITES

1. www.energycentral.com
2. www.catelelectricpowerinfo.com

LIST OF OPEN ELECTIVES OFFERED BY

ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT

16BEECOE01 REAL TIME EMBEDDED SYSTEMS L T P C 100
3 0 0 3

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 9

Introduction- Embedded systems description, definition, design considerations &requirements-Overview of Embedded SystemArchitecture (CISC and RISC)-Categories of Embedded Systems-embedded processor selection &tradeoffs- Embedded design life cycle -Product specifications-hardware / software partitioning- iterations and implementation- hardware software integration – product testing techniques–ARM7.

UNIT-II OPERATING SYSTEM OVERVIEW 9

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 9

Introduction-µ C/OS-II Features-Goals ofµ C/OS-II-Hardware and Software Architecture–Kernel Structures: Tasks–Task States–Task Scheduling–Idle Task–Statistics Task–Interrupts Under µC/OS-II –Clock Tick-µ 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 9

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 9

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

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	JeanJ. Labrosse	Micro C/OS–II The Real Time Kernel	CMPBOOKS	2009
2	David Seal	ARM Architecture Reference Manual.	Addison-Wesley	2008
3	Steve Furbe,	ARM System-on-Chip Architecture,	Addison-Wesley Professional, California	2000

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	K.V.K.K.Prasad	Embedded Real-Time Systems: Concepts, Design & Programming	Dream Tech Press	2005
2	Sriram V Iyer, Pankaj Gupta	Embedded Real Time Systems Programming	Tata McGraw Hill	2004

16BEECOE02 CONSUMER ELECTRONICS L T P C 100
3 0 0 3

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 9

Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters – Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

UNITII TELEVISION STANDARDS AND SYSTEMS 9

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 9

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.

UNITIV TELECOMMUNICATION SYSTEMS 9

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 9

Basic principle and block diagram of microwave oven; washing machine hardware and software;

Components of air conditioning and refrigeration systems.

Total Hours: 45

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

16BEECOE03 NEURAL NETWORKS AND ITS APPLICATIONS L T P C 100

3 0 0 3

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 9

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 9

Error– correction learning– memory based learning- hebbian learning-competitive learning-Boltzmann learning-supervised and unsupervised learning-adaptation-statistical learning theory.

UNIT III PERCEPTION 9

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 9

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 9

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.

Total Hours: 45

TEXTBOOKS:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	SimonHaykin	Neural Networks and Learning Machines 3rd Edition	Pearson/Prentice Hall	2009
2	SatishKumar	Neural Networks: A Classroom Approach	TMH	2008

REFERENCES:

S.NO.	Author(s) Name	Title of the book	Publisher	Year of publication
1	Rajasekaran.S, VijayalakshmiPai. G.A	Neural Networks, Fuzzy Logic and Genetic Algorithms,	PHI, New Delhi.	2003
2	LaureneFausett	Fundamentals of Neural Networks: Architectures, Algorithms, and Applications	Pearson/PrenticeHall	1994
3	Wasserman P.D	Neural Computing Theory & Practice	Van Nortrand Reinhold	1989
4	Freeman J.A., S kapura D.M	Neuralnetworks, algorithms, applications, and programming techniques.	AdditionWesley	2005

16BEECOE04 FUZZY LOGIC AND ITS APPLICATIONS L T P C 100
3 0 0 3

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 **9**

Basics of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNIT II **9**

Theory of Approximate Reasoning: Linguistic variables, Fuzzy proportions, Fuzzy if-then statements, inference rules, compositional rule of inference-fuzzy models

UNIT III **9**

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

UNIT IV **9**

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 **9**

Fuzzy based systems: Simple applications of FKBC-washing machines-traffic regulations-lift control-fuzzy in medical Applications-Introduction to ANFIS.

Total Hours: 45

TEXTBOOKS:

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

OPEN ELECTIVES
(COURSES OFFERED BY OTHER DEPARTMENTS)
BIO TECHNOLOGY

16BTBTOE01 BIOREACTOR DESIGN 3003100

COURSE OBJECTIVES:

- To understand the basic design of bioreactors
- To understand the principle of heat transfer inside a bioreactor
- Design of various reactors
- Study various mass transfer equipments
- Learn about cylindrical storage tnks and various applications
- Design of plate and frame filters

COURSE OUTCOMES:

After completion of this course students will be able to

- Design bioreactors for various operations.
- Select the appropriate separation equipment based on the nature of the product.
- Familiarise mass transfer equipments
- Work with cylindrical storage tnaks and know various applications
- Design of plate and frame filters in reactors
- Know varius separation equipments

UNITI ENGINEERINGPROPERTIES AND STORAGE TANK (9)

Introduction to various mechanical properties of material to be used material of construction, design of cylindrical storage tank.

UNITII REACTOR DESIGN (9)

Design of Airlift fermentor, Bubble column reactor and Continuous stirred tank reactor.

UNITIII HEATTRANSFER EQUIPMENTS (9)

Design of Shell and tube Heat exchanger, Double pipe heat exchanger, long tube vertical evaporator and forced circulation evaporator.

UNITIV MASSTRANSFER EQUIPMENTS (9)

Design of Bollman extractor, fractionating column, packed tower and spray tray absorber

UNITV SEPERATIONEQUIPMENTS (9)

Design of plate and frame filter press, leaf filter, rotary drum filter, disc bowl centrifuge, rotartdrum drier and Swenson–walker crystallizer.

TEXTBOOKS:

S.No	Author(s)Name	Title of the book	Publisher	Year o Publications
1	James Edwin Bailey, DavidF.Ollis	Biochemical Engineering Fundamentals	McGraw-Hill	2007
2	DonW.Green,RobertH. Perry	Chemical Engineer Handbook	The McGraw-Hill Companies	2008

REFERENCE BOOKS

S.No	Author(s)Name	Title of the book	Publisher	Year of Publications
1	Pauline.M.Doran	Bioprocess Engineering Principles	Academic Press	2013

16BTBTOE02 FOOD PROCESSING AND PRESERVATION 3003100

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 andequipment 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

UNITI SCOPE AND IMPORTANCE OF FOOD PROCESSING (9)

Properties of food- Physical, thermal, mechanical, sensory. Raw material Preparation -Cleaning, sorting, grading, peeling.

UNITII PROCESSING METHODS (9)

Heating- Blanching and Pasteurization. Freezing - De hydration- canning- additives- fermentation- extrusion cooking -hydrostatic pressure cooking- dielectric heating- micro wave processing and aseptic processing –Infrared radiation processing- Concepts and equipment used.

UNITIII FOOD CONVERSION OPERATIONS (9)

Size reduction- Fibrous foods, dry foods and liquid foods- Theory and equipments- membraneseparation-filtration-equipmentand application.

UNITIV FOOD PRESERVATION BY COOLING (9)

Refrigeration, Freezing-Theory, freezing time calculation, methods of freezing, freezing equipments, freeze drying, freeze concentration, thawing, effect of low temperature on food. Water activity, methods to control water activity.

UNITV PRESERVATION METHODS FOR FRUITS ANDVEGETABLES (9)

Preprocessingoperations - 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.

TEXT BOOKS

S.No	Author(s)Name	Title of the book	Publisher	Year of Publications
1	R.PaulSingh,DennisR. Heldman	Introduction to food Engineering.	Academic Press	2001
2	P.Fellows.	Food Processing Technology, Principles and practice.	Wood head Publishing Ltd	2000
3	MirceaEnachescuDauthy	Fruit and Vegetable Processing	FAO agricultural services	1995

REFERENCEBOOKS

S.No	Author(s)Name	Title of the book	Publisher	Year of Publications
1	M.A. Rao, Syed S.H. Rizvi, AshimK.Datta	Engineering properties Of foods	CRC Press	2005
2	B.Sivasankar	Food processing and preservation	PHI Learning Pvt.Ltd	2002

16BTBTOE03 BASIC BIO INFORMATICS 3003100

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 andclassification.
- 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.

UNITI OVERVIEW OFBIOINFORMATICS (9)

The scope of bio informatics; bio informatics & the internet; useful bio informatics sites. Data acquisition: sequencing DNA, RNA & proteins; determination of protein structure; gene & protein expression data; protein interaction data. Databases–contents, structure & annotation: file formats; annotated sequence databases; miscellaneous databases.

UNITII RETRIEVAL OF BIOLOGICAL DATA (9)

Data retrieval with Entrez &DBGET/ Link DB; data retrieval with SRS (sequence retrieval system).Searching sequence databases by sequence similarity criteria: sequence similarity searches; amino acid substitution matrices ; database searches, FASTA & BLAST; sequence filters; iterative database searches &PSI-BLAST .Multiple-sequence alignment, gene & protein families: multiple-sequence alignment & family relationships; protein families & pattern databases; protein domain families.

UNITIII PHYLO GENETICS (9)

Phylogenetic, cladistics &ontology; building phylogenetic trees; evolution of Macro molecular sequences. Sequence annotation: principles of genome annotation; annotation tools & resources.

UNITIV STRUCTURAL BIOINFORMATICS (9)

Conceptual models of protein structure; the relationship of protein three-dimensional structure to protein function; the evolution of protein structure & function; obtaining, viewing & analyzing structural data; structural alignment; classification of proteins of known three-dimensional structure: CATH &SCOP; introduction to protein structure prediction; structure prediction by comparative modeling; secondary structure prediction; advanced protein structure prediction & prediction strategies.

UNITV MICROARRAYDATAANALYSIS (9)

Microarray data, analysis methods; microarray data, tools & resources; sequence sampling &SAGE. Bioinformatics in pharmaceutical industry: informatics &drug discovery; pharma informatics resources. Basic principles of computing in bio informatics: running computer software; computer operating systems; software downloading &installation; data base management.

TEXTBOOK

S.No.	Author (s) Name	Title of the book	Publisher	Year of Publication
1	Dan E. Krane,Micha L.Rayme	Fundamental Concepts of Bioinformatics	Pearsoneducation	2004
2	Andreas D. Baxevanis,B. F.Francis Ouellette	Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins	Wiley-Inter science	2004
3	David W. Mount	Sequence and GenomeAnalysis	Cold Spring Harbor Laboratory	2004
4	Jonathan Pevsner	Bioinformatics and Functional Genomics	Wiley-Liss	2003

REFERENCEBOOKS

S.No.	Author (s) Name	Title of thebook	Publisher	Year of Publication
1	Michael J. Korenberg	Microarray Data Analysis: Methods and Applications	SpringerScience&BusinessMedia	2007

16BTBTOE04 FUNDAMENTALS OF NANO BIOTECHNOLOGY 3003100

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.
- Define the concepts of biomaterials through molecular selfassembly.
- Outline the clinical applications of nanodevices.
- Describe the socio-economic issues innanobiotechnology.

UNITI INTRODUCTION (9)

Introduction, Scope and Overview, Length scales , Importance of Nano scale and Technology, History of Nanotechnology, Future of Nanotechnology :Nano Technology Revolution, Silicon based Technology, Benefits and challenges in Molecular manufacturing: The Molecular assembler concept, Controversies and confusions, Understanding advanced capabilities, Nanotechnology in Different,Fields:Nanobiotechnology,Materials,Medicine,Dentalcare.

UNITII NANOPARTICLES (9)

Introduction, Types of Nano particles, Techniques to Synthesize Nanoparticles, Characterization of Nanoparticles, Applications, Toxic effects of Nanomaterial's, Significance of Nanoparticles Nanofabrications-MEMS/NEMS,AtomicForceMicroscopy,Selfassembledmonolayers/Dip-pen Nanolithography, Soft Lithography, PDMS Molding, Nanoparticles, Nanowires and Nanotubes.

UNITIII APPLICATIONS (9)

Nanomedicine, Nano biosensor and Nano fluidics. Nano crystals in biological detection, Electrochemical DNA sensors and Integrated Nano liter systems. Nano-Bio devices and Systems. Fabrication of Novel Biomaterials through molecular self-assembly-Small scale systems for in vivo drug delivery-Future Nano machine.

UNITIV NANO BIOTECHNOLOGY (9)

Clinical applications of Nano devices. Artificial neurons. Real-time Nano Sensors-Applicationsincancerbiology.
Nanomedicine.Syntheticretinylchipsbasedonbacteriorhodopsins. Highthroughput DNA sequencing with Nano carbon tubules. Nano surgical devices.

UNITV ETHICAL ISSUES IN NANOTECHNOLOGY (9)

Introduction, Socioeconomic Challenges, Ethical Issues in Nanotechnology: With Especial Reference to Nano medicine, Nano medicine Applied in Nonmedical Contexts, Social Issues Relating to Nano medicine. Social and Ethical Issues, Economic Impacts, Other Issues, Nano technology and Future Socio-economic challenges.

TEXT BOOKS

S.No.	Author(s) Name	Title of the book	Publisher	Year of Publications
1	Niemeyer, C.M. and Mirkin, C.A	Nano biotechnology: Concepts, Applications and Perspectives	Wiley-VCH	2004
2	Good sell, D.S.	Bio nanotechnology	John Wiley and Sons, Inc	2004

REFERENCEBOOKS

S.No.	**Author(s) Name**	**Title of the book**	**Publisher**	**Year of Publications**
1	Shoseyov,O. and Levy,I	Nano biotechnology: Bio inspired Devices and Materials of the Future	Humana Press	2007
2	Bhushan,B.	Springer Handbook of Nanotechnology	Springer-VerlagBeri Heidelberg	2004
3	FreitasJrR.A	Nano medicine	Landes	2004
4	Kohler,M.and Fritzsche,W.	Nanotechnology–An Introduction to Nano structuring Techniques	Wiley-VCH	2004

MECHANICAL ENGINEERING
OPEN ELECTIVES
(COURSES OFFERED TO OTHER DEPARTMENTS)

16BEMEOE01 COMPUTER AIDED DESIGN 3 0 0 3 100

Course Objective

1. To apply basic concepts to develop construction (drawing) techniques.
2. To ability to manipulate drawings through editing and plotting techniques.
3. To understand geometric construction and Produce template drawings.
4. To understand and demonstrate dimensioning concepts and techniques.
5. To understand Section and Auxiliary Views.
6. To become familiar with Solid Modelling concepts and techniques.

Course Outcome

1. Apply basic concepts to develop construction (drawing) techniques.
2. Ability to manipulate drawings through editing and plotting techniques.
3. Understand geometric construction and Produce template drawings.
4. Understand and demonstrate dimensioning concepts and techniques
5. Understand Section and Auxiliary Views
6. Become familiar with Solid Modelling concepts and techniques.

UNIT I OVERVIEW OF CAD SYSTEMS 9

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.

UNIT II INTERACTIVE COMPUTER GRAPHICS AND GRAPHICS TRANSFORMATIONS 9

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 transformations, Visual Realism, Computer animation, customizing graphics software.

UNIT III GEOMETRIC MODELING 9

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 9

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 9

Automated 2D drafting - basics, mechanical assembly - bill of materials generation. Mass property calculations.

TOTAL HOURS 45

TEXT BOOKS

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	Dhanpat Rai & 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	William M Newman and Robert 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	Optimization Techniques	Wiley Eastern, New Delhi	2003

16BEMEOE02 INDUSTRIAL SAFETY AND ENVIRONMENT 3 0 0 3 100

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 9

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 9

The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNIT III EVOLUTION OF SUPPLY CHAIN MODELS 9

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 9

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 9

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

TOTAL 45

TEXT BOOKS

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	Competitive manufacturing management - continuous improvement, Lean production, customer focused quality	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

16BEMEOE03 TRANSPORT PHENOMENA 3 0 0 3 100

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 9

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 9

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 9

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

UNIT V MASS TRANSPORT 9

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

16BEMEOE04 INTRODUCTION TO BIOMECHANICS 3 0 0 3 100

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 9

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 9

Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application of Biomechanics

UNIT III HUMAN ANATOMY AND SOME BASIC TERMINOLOGY 9

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 9

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

UNIT V MECHANICS OF THE MUSCULOSKELETAL SYSTEM 9

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

REFERENCE

S. No.	Author(s) Name	Title of the book	Publisher	Year of Publication
1	Duane Knudson	Fundamentals of Biomechanics	Springer Science+ Business Media, LLC	2007
2	C. Ross Ethier Craig A. Simmons	Introductory Biomechanics	Cambridge University Press	2007

OPENELECTIVES
(COURSES OFFERED TO OTHER DEPARTMENTS)
AUTOMOBILE ENGINEERING

16BEAEOE01 AUTOMOBILE ENGINEERING 3 0 0 3 100

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)

UNIT –II 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

UNIT -III 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.

UNIT-IV 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).

UNIT -V 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.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Young U.P and Griffiths L	Automotive Electrical Equipment	ELBS & New Press	1999
2.	Ganesan.V	Internal Combustion Engines	Tata McGraw-Hill Publishing Co., New Delhi	2003
3.	Dr.Kirpal Singh	Automobile Engineering	Standard Publishes	2011

REFERENCES

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Heldt .P.M	The Automotive Chassis	Literary Licensing,LLC	2012
2.	Crouse.W.H	Automobile Electrical Equipment", 3rd Edition	McGraw-Hill Book Co., Inc., New York.	1986
3.	N.Newton, W. Steeds and T.K.Garrett	The Motor vehicle, 13th edition	SAE Inc	2001

16BEAEOE02 BASICS OF TWO AND THREE WHEELERS 3 0 0 3 100

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.

TEXT BOOKS:

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Irving P.E.	Motor Cycle Engineering.	Temple Press Book, London.	1992.
2.	Srinivasan.S.	Motor cycle, Scooter, Mobeds.	New century book house.	1988.

REFERENCES:

SL. NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	M.M.Griffin.	Motor cycles from inside and outside.	Prentice Hall Inc, New Jersey.	1978.
2.	Bruce A. Johns, David D.Edmundson and Robert Scharff	Motorcycles: Fundamentals, Service, Repair	Goodheart-Willcox	1999

16BEAEOE03 AUTOMOBILE MAINTENANCE 3 0 0 3 100

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 V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY

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.

TEXT BOOKS

SL.NO.	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF

				PUBLICATION
1.	John Doke	Fleet Management	McGraw Hill Co	1984
2.	James D Halderman	Advanced Engine Performance Diagnosis	Prentice Hall Publications	2011
3.	Service Manuals from Different Vehicle Manufacturers			

16BEAEOE04 INTRODUCTION TO MODERN VEHICLE TECHNOLOGY 3 0 0 3 100

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 VTELEMATICS

Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition

TEXT BOOKS

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	LjuboVlacic, Michael Saren and Fumio Harashima	Intelligent Vehicle Technologies	Butterworth-Heinemann publications, Oxford	2001
2.	Ronald K.Jurgen	Navigation and Intelligent Transportation Systems –Progress in Technology	Automotive Electronics Series,SAE, USA.	1998

REFERENCES

SL. NO	AUTHOR(S)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	William B Riddens	"Understanding Automotive Electronics", 5th Edition	Butterworth Heinemann Woburn.	1998
2.	Bechhold,	"Understanding Automotive Electronics"	SAE	1998
3.	Robert Bosch,	"Automotive HandBook", 5th Edition	SAE	2000

OPENELECTIVES
(COURSES OFFERED TO OTHER DEPARTMENTS)
CIVIL ENGINEERING

16BECEOE01 HOUSING, PLAN AND MANAGEMENT 3 0 0 3 100

COURSE OBJECTIVES

- To examine the role and tasks of basic housing policies and building bye laws
- Understand the process of integrated service delivery in the context of economic, social, environmental and institutional factors
- Analyze the Innovative construction methods and Materials
- Analyze city management strategies and strengthen the urban governance through a problem solving approach
- To know the Importance of basic housing policies and building bye laws
- To use Housing Programmes and Schemes

COURSE OUTCOME

- The students will be able to
- Know the Importance of basic housing policies and building bye laws
- Use Housing Programmes and Schemes
- Plan and Design of Housing projects
- Examine Innovative construction methods and Materials
- Know Housing finance and loan approval procedures
- Understand Construction as well as managing techniques

UNIT I INTRODUCTION TO HOUSING 9

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 9

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organizations.

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

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 9

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems).

TOTAL HRS : 45

TEXT BOOKS

1.Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 2002.

2.Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 2001.

REFERENCES

1.Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2002.

2.UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 2000.

16BECEOE02 BUILDING SERVICES 3 0 0 3 100

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 9

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 9

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 – Utilization 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 9

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 HRS : 45

TEXT BOOKS

1. E.R.Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 2002.
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 2005.

REFERENCES

1. Philips Lighting in Architectural 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.

16BECEOE03 MANAGEMENT OF IRRIGATION SYSTEMS 3 0 0 3 100

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 9

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 9

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNIT III. MANAGEMENT 9

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNIT IV. OPERATION 9

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNIT V. INVOLVEMENT OF STAKE HOLDERS 9

Farmer's participation in System operation – Water user's associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

TOTAL HRS : 45

TEXT BOOKS

1. Dilip Kumar Majumdar, "Irrigation Water Management – Principles and 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

REFERENCES

1. Hand Book on Irrigation System Operation Practices, Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi, 2000
2. Maloney, C. and Raju, K.V., "Managing Irrigation Together", Practice and Policy in India, Stage Publication, New Delhi, India, 2000

16BECEOE04 ADVANCED CONSTRUCTION TECHNOLOGY 3 0 0 3 100

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 9

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 equipment's

TOTAL HRS : 45

TEXT BOOKS

1.Peurifoyu , R. L., , Ledbette, W.B., Construction Planning , Equipment and Methods, Mc Graw Hill Co., 2000.

2. Antill J.M., PWD, Civil Engineering Construction, Mc Graw Hill Book Co., 2005

REFERENCE

1.Varma, M Construction Equipment and its Planning & Applications, Metropolitan Book Co., 2000

2.Nunnaly, S.W., Construction Methods and Management , Prentice – Hall, 2000

3.Ataev, S.S., Construction Technology, MIR , Pub. 2000ss