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OBJECTIVE: To make them master the techniques of professional communication so that they become employable after completing the course.

COURSE OUTCOMES:

CO01 - Parts of speech - Active and passive voices - Subject verb agreement.
CO02 - Etiquettes of E mail communication. Interpreting graphic representation - Flow chart and Bar chart.
CO03 - Degrees of comparison – Positive, Comparative, Superlative.
CO04 – Writing a review- Preparing minutes of the meeting, Agenda, official circulars
CO05 – Hints development - Imperatives - Marking the stress Connectives, prepositional relatives.

S – Strong, M – Medium, W – Weak

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COURSE CONTENT

UNIT I 9 + 3
Parts of speech - Active and passive voices - Subject verb agreement. - Writing about School life, Hobbies, Family and friends – Word formation with prefixes and suffixes - Tenses - Concord - Summarizing - Note-making

UNIT II 9+3
Cause and effect relations – Punctuations – Differences between verbal and nonverbal communication - E mail communication – Homophones - Etiquettes of E mail communication. Interpreting graphic representation - Flow chart and Bar chart.
UNIT III 9+3
Degrees of comparison – Positive, Comparative, Superlative - wh questions - SI units - Lab reports - Physics, chemistry, workshop and Survey report for introducing new product in the market.

UNIT IV 9+3
Writing project proposals - Presentation skills - Prefixes and suffixes - If conditions - Writing a review - Preparing minutes of the meeting, Agenda, official circulars.

UNIT V 9+3
Accident reports (due to flood and fire) - Hints development - Imperatives - Marking the stress Connectives, prepositional relatives.

Total: 60 Periods

Text Book

Reference:
1. S.P.Danavel, English and Communication for Students of Science and engineering, Orient Blackswan, Chennai,
OBJECTIVES:

- To impart Eigen values and eigen vectors of the real matrix
- To make them understand Orthogonal transformation of a symmetric matrix to diagonal form
- The lectures are to be given in such a way as to make the students to be well versed with Equation of a Sphere- Plane section of a sphere.

COURSE OUTCOMES:

- **CO01** – Having a knowledge of Quadratic form- Reduction of quadratic form to canonical form by orthogonal transformation.
- **CO02** – To learn Equation of a cylinder- Right circular cylinder.
- **CO03** – Having a deep knowledge with Curvature in Cartesian coordinates and Centre and radius of curvature
- **CO04** – To learn Partial derivatives and Euler’s theorem for homogeneous functions.
- **CO05** – Having a well-versed knowledge Triple integration in Cartesian coordinates- Area as double integral- Volume as triple integral.

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**CO/PO Mapping**

S – Strong, M – Medium, W – Weak

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COURSE CONTENT

UNIT-1 MATRICES

9+3
Characteristic equations- Eigen values and eigen vectors of the real matrix- Properties- Cayley-Hamilton theorem(Excluding proof)- Orthogonal transformation of a symmetric matrix to diagonal form- Quadratic form- Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT-II THREE DIMENSIONAL ANALYTICAL GEOMETRY  

UNIT-III DIFFERENTIAL CALCULUS  
Curvature in Cartesian coordinates- Centre and radius of curvature- Circle of curvature- Evolutes- Envelopes- Evolute as envelope of normals.

UNIT-IV FUNCTIONS OF SEVERAL VARIABLES  

UNIT-V MULTIPLE INTEGRALS  
Double integration- Cartesian and Polar coordinates- Change of order of integration- Change of variables between Cartesian and Polar coordinates- Triple integration in Cartesian coordinates- Area as double integral- Volume as triple integral.

Total : 60 Periods

TEXT BOOK:

REFERENCES:

BPH101 Engineering Physics – I  
(New Syllabus 2015 – 2016 batch onwards)

SUBJECT CODE – BPH101  
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OBJECTIVES:
- To make a bridge between the physics in school and engineering courses.
- To impart a sound knowledge on the basic concepts of modern sciences like engineering applications of ultrasonics, lasers, fundamentals of crystal physics.

COURSE OUTCOMES:
C001 - To Know about Ultrasonics and its application in NDT.
C002 - To Know the principle of Laser and its application in Engineering and medicine.
C003 - Acquire Knowledge on Quantum Physics.
C004 – Properties of Electro Magnetic Theory.
C005 – To Understand the impact of Crystal Physics.
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### COURSE CONTENT

**UNIT I - ULTRASONICS**


**UNIT II - LASER**


**UNIT III - QUANTUM PHYSICS**

Drawbacks with classical physics- Blackbody radiation: Max Planck theory and concept of energy quantization, deduction of Wien’s displacement law, Raleigh-Jeans law – Matter waves- de Broglie wave length-photoelectric effect – Schrödinger equation (time-independent, and time-dependent equations)- wave functions and energy spectrum- application to particle in box-problem.

**UNIT IV - ELECTROMAGNETIC THEORY**

Electric charges-coulombs law of inverse squares- Electric field and its calculations-field lines-Gauss’s law-applications of Gauss law. Magnetism - Magnetic field- Magnetic field lines- Magnetic flux- Motion of charged
particles in magnetic field- Magnetic field of a moving charge. Electromagnetic wave- speed of and electromagnetic wave and its quantitative deduction-group velocity- energy in electromagnetic wave-electromagnetic waves in matter-problem.

UNIT V - CRYSTAL PHYSICS
Lattice- Unit Cell- Bravais Lattice- Lattice Plane- Miller Indices- D-Spacing In Cubic Lattice- Calculation of Number of Atoms Per Unit Cell- Atomic Radius- Coordination Number- Packing Factor- SC,BCC, FCC, HCP Structures- Polymorphism And Allotropy- Crystal Defects- Point, Line And Surface Defects- Burgers Vector-problem.

Text Books

Reference Books

BCH101 REVISED SYLLABUS FOR ENGINEERING CHEMISTRY – I
[ FROM – 2015 -16 ] 3 0 0 100

OBJECTIVES :
- To impart knowledge to the Students about the principles, water characterization and treatment of portable and industrial purposes.
- To make them understand the Principles of polymer chemistry and engineering applications of polymers
- To impart a sound knowledge about the Principles of electrochemistry, electrochemical cells, emf and applications of emf measurements

COURSE OUTCOMES :

CO01 – Having a knowledge of Water characterization and treatment of portable and Industrial purposes.
CO02 – Having the thinking of Principles of polymer chemistry and engineering applications of polymers
CO03 – Having a deep knowledge about the Principles of electrochemistry
CO04 – With a true wisdom about Corrosion
CO05 - Having a sound knowledge in the Field of the Conventional and non-conventional energy.

CO/PO Mapping
**Programme Outcomes (POs)**

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**COURSE CONTENT**

**UNIT I  WATER TECHNOLOGY**

**INTRODUCTION**
Characteristics :
- Hardness of water – types - temporary and permanent hardness - estimation by EDTA method
- Alkalinity – types of alkalinity - Phenolphthalein and Methyl orange alkalinity - determination – Domestic water treatment – disinfection methods (Chlorination, ozonation , UV treatment)

**UNIT II  POLYMERS**

**INTRODUCTION**
Polymers:
- Definition – polymerization – degree of polymerization - types of polymerisation – Addition polymerization and Condensation polymerization – Mechanism of Polymerization - free radical polymerization mechanism only
- Plastics:
  - Classification – thermoplastics and thermosetting plastics – difference between thermoplastics and thermosetting plastics - preparation, properties and uses of PVC, Teflon, nylon-6,6, PET
- Rubber:
  - Types – drawbacks of natural rubber -vulcanization of rubber - properties and uses of vulcanized rubber
  - Synthetic rubbers – butyl rubber and SBR
UNIT III  ELECTROCHEMISTRY
INTRODUCTION
CELLS:
Types of Cells:
Electrochemical cells, Electrolytic cells – Reversible and Irreversible cells EMF – measurement of emf –
Single electrode potential – Nernst equation
Reference electrodes:
Standard Hydrogen electrode - Calomel electrode
Ion selective electrode:
Glass electrode and measurement of pH using Glass electrode
Electrochemical series – significance
Tittrations:
Potentiometer titrations (redox - Fe²⁺ vs dichromate titrations)
Conductometric titrations (acid-base – HCl vs. NaOH titrations)

UNIT IV  CORROSION AND CORROSION CONTROL
INTRODUCTION
Chemical corrosion
Definition - Chemical Corrosion - Electrochemical corrosion – different types (Galvanic corrosion –
differential aeration corrosion) – mechanism of Chemical and Electrochemical corrosion factors influencing
corrosion
Corrosion control – sacrificial anode and impressed cathodic current methods
Protective coatings:
Paints – constituents of the paint and their functions
Metallic coatings – electroplating of Gold and electroless plating of Nickel.

V. NON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES
INTRODUCTION:
Nuclear fission and nuclear fusion reactions – differences between nuclear fission and nuclear fusion reactions
– nuclear chain
Reactions – nuclear energy critical mass - super critical mass - sub critical mass Light water nuclear reactor
for power generation (block diagram only) – breeder reactor
Solar energy conversion – solar cells – wind energy
Fuel cells – hydrogen – oxygen fuel cell
Batteries:
Primary and secondary Batteries – differences between Primary and secondary Batteries
Secondary batteries:
Lead–acid storage battery – working – uses
Nickel–cadmium battery - working – uses
Solid – state battery : Lithium battery

TEXT BOOKS:
   (2007).

TOTAL: 45 PERIODS
REFERENCES:

OBJECTIVES:

The Students will be able to
- To understand the fundamentals of the structure of cells
- To study the types and functions of cell organelles
- To comprehend the methods involved in the cellular transport
- To know the cause, and methods of cell signaling
- Finally to give a basic knowledge of cell culture and its applications

COURSE OUTCOMES:

CO01 – Having a knowledge of, Eukaryotic cell and prokaryotic cell – differences and key organelles
CO02 – Having the thinking of Nucleus, Cytoplasm, Endoplasmic reticulum, Golgi complex, lysosomes, cell membranes, chloroplast, mitochondria.
CO03 – Having a deep knowledge about the Transport across cell membranes, importance and its classification Active and passive, passive transport and movement of water.
CO04 – With a true wisdom about, Qualification and characterization of receptors, different modes of signal transduction and amplification with examples.
CO05 - Having a sound knowledge about, Media preparation, Propagation of eukaryotic and prokaryotic cell.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

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UNIT I Cell Structure  
Cells-definition, Eukaryotic cell and prokaryotic cell – differences and key organelles, Relationship and evolution of Eukaryotic cell and prokaryotic cell, plant cells and animal cells–differences and general structure- Cellular environment, tissues, various types of cell, Extra cellular matrix, cytoskeletal proteins, Cell cycle-Mitosis and meiosis

UNITII Cell Organelles  
Cell Organelles and function – Nucleus, Cytoplasm, Endoplasmic reticulum, Golgi complex, lysosomes, cell membranes, chloroplast, mitochondria – structure, importance and function

UNIT III Cellular Transport  

UNITIV Cell Signaling And Signal Transduction  
Cell signaling – process importance, various kinds of Receptors and ligands – Examples, Different modes of action of ligands, Qualification and characterization of receptors, different modes of signal transduction and amplification with examples, signaling through G-Proteins (Monomeric and trimeric), signaling for growth factors, second messengers, protein kinases, Ca ions and cAMP molecule in signaling.

UNIT V Cell Culture  
Definition, Media preparation, Propagation of eukaryotic and prokaryotic cell, cell lines, primary cultures, stock cell cultures, maintenance of cell lines in cell culture, explants cultures, differentiation and contamination

TOTAL: 30 PERIODS

TEXT BOOKS:
2. Molecular Biology of the Cell, Bruce Albert et al., Taylor and Francis, 2002

REFERENCE BOOKS
2. The Cell, T. Coopper, John Wiley and Sons, 2005
OBJECTIVES:
1. To enable the student to learn the major components of a computer system.
2. To know the correct and efficient way of solving problem.

COURSE OUTCOMES:
- **CO01** - Classification of Computers-Basic Computer Organization-Number system.
- **CO02** - Pseudo code Introduction to Office Packages: MS Word , Spread Sheet, Power Point, MS Access, Outlook.
- **CO03** - Managing Input and Output statements-Decision making-Branching and Looping statements
- **CO04** – Managing Input and Output operators-Decision making-Branching and Looping.
- **CO05** – Overview of C++ - Applications of C++-Classes and objects-OOPS concepts Constructor and Destructor

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COURSE CONTENT

UNIT I: Introduction to Computer

UNIT II: Problem Solving and Office Automation
UNIT III: Introduction to C
Overview of C-Constants-Variables-Keywords-Data types-Operators and Expressions -Managing Input and Output statements-Decision making-Branching and Looping statements.

UNIT IV: Arrays and Structures
Overview of C-Constants, Variables and Data types-Operators and Expressions -Managing Input and Output operators-Decision making-Branching and Looping.

UNIT V: Introduction to C++
Overview of C++ - Applications of C++-Classes and objects-OOPS concepts -Constructor and Destructor- A simple C++ program –Friend classes and Friend Function.

Text books: Total: 45 Periods

References:
BBA101/BBA102 Personality Development

OBJECTIVE:
The students should be able to act with confidence, be clear about their own personality, character and future goals.

COURSE OUTCOME:
• To make students understand the concept and components of personality and thereby to apply the acquired knowledge to themselves and mould their personality.
• To impart training for positive thinking, this will keep the students in a good stead to face the challenges.
• To bring out creativity and other latent talents with proper goal setting so that self-esteem gets enhanced.
• To develop an individual style and sharpen the skills in the area of leadership, decision making, time management and conflict management.
• To sharpen the employability skills of the professional undergraduate students and aid them in landing in the desired job.

UNIT I Introduction to Personality Development
9

UNIT II Attitude & Motivation
9
Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude - Advantages –Negative attitude
- Disadvantages - Ways to develop positive attitude - Difference between personalities having positive and negative attitude. Concept of motivation - Significance - Internal and external motives - Importance of self-motivation- Factors leading to de-motivation

UNIT III Self-esteem
9

UNIT IV Other Aspects of Personality Development
9

UNIT V Employability Quotient
9
Resume building- The art of participating in Group Discussion – Acing the Personal (HR & Technical)
Interview - Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions.

**Total: 45 Periods**

**Text Books:**


**Reference Books:**

Course Objectives: At the end of this course, students shall be able to

1. To expose students with the basics of Civil Engineering
2. To understand the components of a building
3. To Learn Engineering aspects related to dams, water supply, and sewage disposal

Course Outcomes

CO01 - To learn the Basic Civil Engineering Materials
CO02 - To learn principles of survey Measurement of distances
CO03 - To have a clear understanding Foundation for Building
CO04 – To study stone and brick masonry and Plastering
CO05 - To learn principles standards of drinking- distribution system – Sewage Treatment

CO/PO Mapping

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UNIT- I  Civil Engineering Materials
Introduction – Civil Engineering – Materials – Stones – Bricks – Sand – Cement – Plain Concrete – Reinforced Cement Concrete – Steel Sections – Timber – Plywood – Paints – Varnishes (simple examples only)

UNIT- II  Surveying

UNIT- III  Foundation for Building
Bearing Capacity of Soil – Foundation – Functions – Requirement of good foundations – Types
UNIT- IV  Superstructure  7
Stone Masonry – Brick Masonry – Columns – Lintels – Beams – Roofing – Flooring – Plastering – White Washing (Simple examples only)

UNIT- V  Miscellaneous Topics  5
Types of Bridges – Dam- purpose – selection of site - Types of Dams – Water Treatment & Supply sources – standards of drinking- distribution system. – Sewage Treatment (simple examples only)

TOTAL : 30 PERIODS

Text

Books:

Reference Books:
Course Objectives:

1) To provide basic knowledge regarding various power plants.
2) To provide basic knowledge of I.C engines, Refrigeration and Air-Conditioning.
3) To provide basic Knowledge of basic manufacturing process.
4) To provide basic knowledge of mechanical design required for engineering.

Course Outcomes

CO01 - To learn the Renewable and Non-renewable resources
CO02 - To Working principles of petrol and diesel engines
CO03 - To have a clear study Layout of typical domestic refrigerator
CO04 – To study Mould making and casting process
CO05 - To learn

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UNIT-I  Energy Resources and Power Generation
Renewable and Non-renewable resources- solar, wind, geothermal, steam, nuclear and hydel power plants- Layout, major components and working. Importance of Energy storage, Environmental constraints of power generation using fossil fuels and nuclear energy.

UNIT-II  IC Engines
Classification, Working principles of petrol and diesel engines- two stroke and four stroke cycles, functions of main components of I.C engine. Alternate fuels and emission control.

UNIT-III  Refrigeration and Air-Conditioning System


UNIT-IV  Manufacturing Processes  6
Brief description of Mould making and casting process, Metal forming, Classification types of forging, forging operations, Brief description of extrusion, rolling, sheet forging, and drawing. Brief description of welding, brazing and soldering. Principal metal cutting processes and cutting tools, Brief description of Centre lathe and radial drilling machine.

UNIT-V  Mechanical Design  6
Mechanical properties of material - Yield strength, ultimate strength, endurance limit etc., Stress-Strain curves of materials. Stresses induced in simple elements. Factor of safety - Design of Shafts and belts. Types of bearings and its applications Introduction to CAD/CAM/CIM & Mechatronics.

Total: 30 Periods

TEXT
BOOKS:


REFERENCES :

BEE 101/201 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

OBJECTIVES
- To impart knowledge to the Students about the principles Ohm’s law, Kirchoff’s Laws, V – I Relationship of Resistor (R) Inductor (L) and capacitor (C).
- To make them understand the Principles of Introduction to Measurement Systems, Construction and Operating principles of PMMC,
- To impart a sound knowledge about the Basic Concepts of semiconductor devices – PN Junction Diode Characteristics

COURSE OUTCOMES:
CO01 – Having a knowledge of Current and voltage source transformation – mesh current & node voltage method – superposition theorem – Thevenin’s and Norton’s Theorem - Problems.

CO02 – Having the thinking of Principles of Construction, principle of operation, Basic Equations and applications and D.C. Generators and D.C. Motors.

CO03 – Having a deep knowledge about the Introduction to Measurement Systems, Construction and Operating principles of PMMC, and moving Iron.

CO04 – With a true wisdom about HWR, FWR, Zener Diode, BJT (CB, CE, CC) configuration & its characteristics.

CO05 – Having a knowledge in Number system – Logic Gates – Boolean Algebra – De-Morgan’s Theorem.

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UNIT – I D.C. AND A.C CIRCUITS
UNIT – II ELECTRICAL MACHINES  6

UNIT – III BASIC MEASUREMENT SYSTEMS  6

UNIT IV – SEMICONDUCTOR DEVICES  6

UNIT V – DIGITAL ELECTRONICS  6

Total No. of Periods: 30

TEXT BOOKS:

REFERENCE BOOKS:
LIST OF EXERCISES

A) Word Processing
Document creation, Text manipulation with Scientific Notations.
Table creation, Table formatting and Conversion.
.Mail merge and Letter Preparation.
Drawing - Flow Chart

B) Spread Sheet
Chart – Line, XY, Bar and Pie.
Formula – Formula Editor.
Spread Sheet-Inclusion of Object, Picture and Graphics, Protecting the document and sheet.
Sorting and Import / Export features.

C) Simple C Programming *
Data types, Expression Evaluation, Condition Statements.
Arrays
Structures and Unions
Functions

D) Simple C++ Programming
13. Classes and Objects
14. Constructor and Destructor

*For Programming exercises Flow chart and Pseudo code are essential.

Total: 45 Periods
OBJECTIVE:
To provide exposure to the students with hands on experience on various basic Civil & Mechanical Engineering practices.

COURSE OUTCOME:

1. To provide hands on exercises in common plumbing and carpentry works associated with residential and industrial buildings.
2. To expose the students regarding pipe connection for pumps & turbines and to study the joint used in roofs, doors, windows and furnitures.
3. To provide hands on exercise on basic welding, machining and sheet metal works.
4. To provide exposure regarding smithy, foundry operations and in latest welding operations such as TIG, MIG, CO2, spot welding etc.,
5. To expose the students regarding the construction and working of centrifugal pump, air-conditioner and lathe.

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I. CIVIL ENGINEERING

PRACTICE Buildings:
Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:
a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
b) Study of pipe connections requirements for pumps and turbines.
c) Preparation of plumbing line sketches for water supply and sewage works.
e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Hand tools and Power tools:
a) Study of the joints in roofs, doors, windows and furniture.
b) Hands-on-exercise: Wood work, joints by sawing, planning and cutting. c) Preparation of half joints, Mortise and Tenon joints.
II MECHANICAL ENGINEERING PRACTICE

Welding: Preparation of butt joints, lap joints and tee joints by arc welding.

Basic Machining:
  a) Simple Turning and Taper turning
  b) Drilling Practice

Sheet Metal Work:
  a) Forming & Bending:
  b) Model making – Trays, funnels, etc.
  c) Different type of joints.
  d) Preparation of air-conditioning ducts.
Machine assembly practice:
   a) Assembling, dismantling and Study of centrifugal pump
   b) Assembling, dismantling and Study of air conditioner
   c) Assembling, dismantling and Study of lathe.

Moulding: Moulding operations like mould preparation for gear and step cone pulley etc.,

Fitting:
   Fitting Exercises – Preparation of square fitting and vee – fitting models.

Demonstration:
   a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise –
      Production of hexagonal headed bolt. b) Gas welding.

TOTAL: 45 PERIODS

REFERENCES:
I - List of Experiments for Electrical Engineering Lab

1. Fluorescent lamp wiring
2. Stair case wiring
3. Measurement of electrical quantities-voltage current, power & power factor in RLC circuit
4. Residential house wiring using fuse, switch, indicator, lamp and energy meter
5. Measurement of energy using single phase energy meter
6. Measurement of resistance to earth of electrical equipment

I - List of Experiments for Electronics Engineering Lab

1. Study of electronic components and equipments.
   A. Resistor colour coding using digital multi-meter.
   B. Assembling electronic components on bread board.
3. Soldering and desoldering practice.
4. Verification of logic gates (OR, AND, OR, NOT, NAND, EX-OR).
5. Implementation of half adder circuit using logic gates.
I - LIST OF EXPERIMENTS – PHYSICS

1. Determination of particle size using laser
2. Determination of wavelength of laser light
3. Determination of numerical aperture and acceptance angle of an optical fiber
4. Study of photo electric effect
5. Determination of velocity of sound and compressibility of liquid-ultrasonic interferometer
6. Determination of wave lengths of mercury spectrum - spectrometer grating

II - LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of hardness of Water by EDTA
2. Estimation of Copper in brass by EDTA
3. Determination of DO in water (Winkler’s method)
4. Estimation of Chloride in Water sample (Argento metry)
5. Estimation of alkalinity of Water sample
OBJECTIVE: To make them master the techniques of professional communication so that they become employable after completing the course. To make the students learn the basics of communication in order to talk fluently, confidently and vividly.

**COURSE OUTCOMES:**
- **CO01**: Numerical adjectives - Meanings in context Same words used as different parts of speech.
- **CO02**: C.Ds, News bulletin, Special Lectures, Discourse - Note taking Sentence patterns SV, SVO, SVC, SVOCA.
- **CO03**: Recommendations and suggestions - Sequencing jumbled sentences to make a paragraph advertisement and notices, designing or drafting posters.
- **CO04**: Abbreviations and acronyms - Business or official letters (for making enquiries, registering complaints, asking for and giving information, placing orders and sending replies).
- **CO05**: Editing Prepositions - Articles - Permission letter for undergoing practical training - Essay writing - Application for a job.

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**COURSE CONTENT**

**UNIT I  Orientation**

Numerical adjectives - Meanings in context - Same words used as different parts of speech - Paragraph writing - Non-verbal communication - Regular and Irregular verbs.

**UNIT II  Oral Skill**
Listening to audio cassettes - C.Ds, News bulletin - Special Lectures, Discourse - Note taking - Sentence patterns - SV, SVO, SVC, SVOC, SVOCA - Giving Instructions - Reading Comprehension and answering questions. Inferring meaning.

UNIT III        Thinking Skill                          9 + 3
Self-introduction - Describing things - Group Discussion – Debate - Role play – Telephone etiquette – Recommendations and suggestions – Sequencing jumbled sentences to make a paragraph - advertisement and notices, designing or drafting posters, writing formal and informal invitations and replies.

UNIT IV        Writing Skill                            9 + 3
Definitions - Compound nouns - Abbreviations and acronyms - business or official letters(for making enquiries, registering complaints, asking for and giving information, placing orders and sending replies): (b) letters to the editor(giving suggestions on an issue).

UNIT V        Formal Information                        9 + 3
Editing – Prepositions - Articles - Permission letter for undergoing practical training , Essay writing - Application for a job , letter to the principal authorities regarding admissions, other issues, requirement or suitability of course etc.

Total: 60 Periods

TEXT BOOK:

REFERENCE BOOKS:
Sumanth , English for engineers, Vijay Nicole , Imprints pvt ltd.2013.
Sangeetha Sharma, Binodmishra , Communication skills for engineers and scientists , PHI Learning Pvt Ltd, New Delhi, 2010
OBJECTIVE:
To impart adequate knowledge of Mathematics to the students so as to formulate problems in engineering environment and solve them using mathematical tools.

COURSE OUTCOME:
At the end of this course, students shall be able to
i) Solve differential equations, simultaneous linear equations, and some special types of linear equations related to engineering.
ii) Deal with applications in a variety of fields namely fluid flow, heat flow, solid mechanics, electrostatics, etc.
iii) Find intensity of degree of relationship between two variables and also bring out regression equations.

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COURSE CONTENT

UNIT I ORDINARY DIFFERENTIAL EQUATION
9+3
Higher order linear differential equations with constant coefficients - Method of variation of parameters – Cauchy’s and Legendre’s linear equations - simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS
9+3 Gradient, divergence and curl –Directional derivatives – Irrational and solenoidal vector fields – vector integration – Green’s theorem in a plane , Gauss divergence theorem and Stoke’s theorem (without proofs) – simple applications involving cubes and rectangular parallelepipseds.
UNIT III  ANALYTIC FUNCTIONS  
9+3
Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy-Riemann equation and sufficient conditions (without proofs) – Harmonic and orthogonal properties of analytic functions – Harmonic conjugate – construction of analytic functions – conformal mapping: \( W = Z + C, CZ, 1/Z \) and bilinear transformation.

UNIT IV  COMPLEX INTEGRATION  
9+3

UNIT V  STATISTICS  
9+3
Mean, Median, Mode – Moments – Skewness and Kurtosis – correlation – Rank Correlation – Regression – Chi square test – 2 x 2, m x n.

TOTAL : 60 PERIODS

TEXT BOOK :

REFERENCES :
OBJECTIVES:

- To make a bridge between the physics in school and engineering courses.
- To expose the students to multiple areas of Science of Engineering materials which have direct relevance to different Engineering applications.

COURSE OUTCOMES

- **CO01** - To Know about properties and advancements of conducting materials.
- **CO02** - To Know the principle and properties semiconducting materials.
- **CO03** - Acquire Knowledge on magnetic and dielectric materials
- **CO04** – To Know about the creation of new materials with novel properties
- **CO05** – To Understand the impact of light in technical uses

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**COURSE CONTENT**

**UNIT I - CONDUCTING MATERIALS**

**UNIT II - SEMICONDUCTING MATERIALS**
Elemental and Compound Semiconductors and their Properties- Carrier Concentrations (Electrons and Holes) in Intrinsic Semiconductors - Carrier Concentrations in N-Type and P-Type Semiconductors – Variation of Fermi Level with Carrier Concentration and Temperature - Variation of Conductivity with Temperature – Band Gap Determination – Hall Effect – Experimental Arrangement - Application.

**UNIT III - MAGNETIC AND DIELECTRIC MATERIALS**

UNIT IV - NEW ENGINEERING MATERIAL

UNIT V - OPTICAL MATERIALS &OPTIC FIBERS

TEXT BOOKS

REFERENCE BOOKS
1. Rajendran V and Marikani a, ‘material science’ tata mcgraw hill publications Ltd. 3rd edition

BCH 201 ENGINEERING CHEMISTRY – II

OBJECTIVES:
- To make the students to have a sound knowledge with industrial applications of surface chemistry
- To impart knowledge about the Industrial importance of Phase rule and alloys
- To make the students to be conversant with Analytical techniques and their importance
- To have an idea and knowledge about the Chemistry of Fuels and
- To make them study to have a deep knowledge in Chemistry of engineering materials

COURSE OUTCOMES:
- CO01 - To Know about properties and advancements of conducting materials.
- CO02 - To Know the principle and properties chemical engg.
- CO03 - Acquire Knowledge on magnetic and Chemical materials
- CO04 – To Know about the creation of new materials with novel properties
- CO05 – To Understand the impact of light in technical uses

S – Strong, M – Medium, W – Weak

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B.Tech – Biomedical Engineering Bharath Institute of Higher Education and Research
COURSE CONTENT

UNIT I - Surface Chemistry
Introduction: Adsorption, absorption, desorption, adsorbent, adsorbate and sorption – (definition only)
Differences between adsorption and absorption Adsorption of gases on solids – factors affecting adsorption of
gases on solids – Adsorption isotherms – Freundlich adsorption isotherm and Langmuir adsorption isotherm
Role of adsorbents in catalysis, Ion-exchange adsorption and pollution abatement.

UNIT II - Phase Rule and Alloys
Introduction : Statement of Phase Rule and explanation of terms involved – one component system – water
system – Construction of phase diagram by thermal analysis - Condensed phase rule [ Definition only ] Two
Component System : Simple eutectic systems (lead-silver system only) – eutectic temperature – eutectic
composition – Pattinsons Process of desilverisation of Lead Alloys : Importance, ferrous alloys – nichrome
normalizing – carburizing – nitriding. Non- ferrous alloys: Brass and Bronze

UNIT III - Analytical Techniques
Introduction: Type of Spectroscopy - Atomic spectroscopy – molecular spectroscopy - Explanation IR
spectroscopy – principles – instrumentation (block diagram only) – applications - finger print region UV-visible
spectroscopy — principle – instrumentation (block diagram only) – Beer-Lambert’s law – estimation
of iron by colorimetry – Atomic absorption spectroscopy- principle - instrumentation (block diagram only) -
estimation of Nickel by Atomic absorption spectroscopy Flame photometry— principles – instrumentation
(block diagram only) - estimation of sodium ion by Flame photometry

UNIT IV - Fuels
Introduction : Calorific value – types of Calorific value - gross calorific value – net calorific value Analysis of
Coal — Proximate and ultimate analysis – hydrogenation of coal - Metallurgical coke – manufacture by Otto-
Hoffmann method Petroleum processing and fractions – cracking – catalytic cracking – types – fixed bed
catalytic cracking method- Octane number and Cetane number ( definition only ) Synthetic petrol – Bergius
processes – Gaseous fuels- water gas, producer gas, CNG and LPG ( definition and composition only ) Flue
gas analysis – importance - Orsat apparatus

UNIT V - Engineering Materials
Introduction : Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness,
refractoriness under load, dimensional stability, porosity, thermal spalling) Manufacture of Refractories :
alumina bricks and Magnesite bricks, Abrasives – natural and synthetic abrasives Natural type: Siliceous
quartz ; Non-siliceous – diamond Synthetic Abrasives : silicon carbide and boron carbide. Lubricants :
Liquid lubricants - Properties – viscosity index, flash and fire points, cloud and pour points, oilyness) Solid
lubricants – graphite and molybdenum sulphide

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVES
- To impart knowledge to the Students about the principles Internet principles-IP addressing-Internet Service Provider (ISP)-URL.
- To make them understand the Principles of Introduction to HTML – Structure of HTML Document

COURSE OUTCOMES:
- CO01 – Having knowledge of Internet principles-IP addressing-Internet Service Provider (ISP)-URL.
- CO03 – Having a deep knowledge about the Introduction to Dynamic HTML-Object model and collections-Event model-Filter and transition-Data binding-Data control-ActiveX control.
- CO04 – With a true wisdom about VB Script & Java Script:Introduction-Operators –Data type-Control structures
- CO05 – Having a knowledge in Online database-functions of online database-Merits and Demerits-Internet Information Systems

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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COURSE CONTENT

Unit – I Basic Internet Concepts
Internet principles-IP addressing-Internet Service Provider (ISP)-URL-Basic web concepts-World Wide Web (WWW)-Intranet and Extranet-Internet Protocols:
HTTP,TCP,UDP,FTP,Telnet-Domain Name System(DNS)-E mail-Next generation internet.
Unit-II Web Design Basics 6

Unit-III Dynamic HTML 6
Introduction to Dynamic HTML-Object model and collections-Event model-Filters and transition-Data binding-Data control-Activex control.

Unit-IV Client and Server Side Programming 6

Unit-V Internet Applications 6
Online database-functions of online database-Merits and Demerits-Internet Information Systems (IIS)-EDI applications in business and its types-Internet commerce-Types and Applications.

TOTAL: 30 Periods

TEXT BOOKS:

References:
OBJECTIVE:
The Students will be able to
• To understand the fundamentals of genetics and the Mendelian laws
• To differentiate between the structure and organization of chromosomes in prokaryotes and eukaryotes

COURSE OUTCOMES:

CO01- Mendelian Laws Mendel’s experiment-monohybrid cross-phenotype, genotype, Dihybrid inheritance,

CO02-Chromosome structure and organization in prokaryotes and eukaryotes unusual chromosomes

CO03-Classical concepts of Pleomorphism, Multiple alleles, ABO blood groups, Rh factor, sex linkage in Drosophila

CO04-Coupling and Repulsion-Hypothesis, Test cross in maize and crossing over, theory of crossing over, molecular mechanism

CO05 - Transformation, Tansduction, Conjugation, Plasmids and Episomes

S – Strong, M – Medium, W – Weak

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COURSE CONTENT

UNIT I BASICS OF GENETICS
Classical genetics, Mendelian Laws- Mendel’s experiment-monohybrid cross-phenotype, genotype, Dihybrid inheritance, Interaction of genes, Fine structure of Genes
UNIT II CHROMOSOMES
Chromosome structure and organization in prokaryotes and eukaryotes, unusual chromosomes- chromosome banding, chromosome abnormalities- genetic disorders

UNIT III ALLELES
Classical concepts of Pleomorphism, Multiple alleles, ABO blood groups, Rh factor, sex linkage in Drosophila, linkage in human beings, mechanism of sex determination, XX-XY mechanisms of sex determination, sex determination in Drosophila, environmental factors and sex determination, sex differentiation.

UNIT IV CROSSING OVER
Coupling and Repulsion-Hypothesis, Test cross in maize and crossing over, theory of crossing over, molecular mechanism of crossing over, sex chromosomes and sex linked inherited disorders, colour blindness, hemophilia, Muscular dystrophy

UNIT V GENE TRANSFER
Transformation, Tansduction, Conjugation, Plasmids and Episomes

TOTAL: 30 PERIODS

TEXT BOOKS
1. Principles of Genetics, Gardner, Simmons and Snustad, John Wiley and Sons (Asia), 2002

REFERENCE BOOKS
LIST OF EXERCISES

1. **HTML (Hypertext Mark-up Language):**
   
   Basics of HTML.
   How to create HTML Document
   Steps for creating a simple HTML Program.

   a) Favorite Personality
   b) Resume Preparation

2. **Advanced HTML:**
   
   Advanced Topics of HTML
   a) Time Table
   b) Table Creation

3. **JavaScript:**
   
   Script Basics.
   Incorporating JavaScript into Web page.

   a) Star Triangle
   b) Temperature Converters

4. **VBScript:**
   
   VBScript Basics.
   Incorporating VBScript into HTML.

   a) Changing Background Color
   b) Simple Calculator

5. **Web Design:**
   
   Inserting External Media in the Web Page.
   a) Forms and Links
   b) Frames with Links and Lists

To export a Dream weaver Document as XML File, checking entries, working in frames, windows control, the java script URL.
I - LIST OF EXPERIMENTS – PHYSICS

1. Determination of resistivity of high resistance alloys and temperature coefficient
2. Study of Hall effect – Hall coefficient determination
3. Determination of electrical conductivity of good conductors
4. Study of magnetic hysteresis and energy product
5. Determination of Band gap of a semiconductor
6. Determination of Dispersive power of a prism – Spectrometer

II - LIST OF EXPERIMENTS – CHEMISTRY

1. Conductometric titration (Simple acid base)
2. Conductometric titration (Mixture of weak and strong acids)
3. Conductometric titration using BaCl₂ vs Na₂SO₄
4. Potentiometric Titration (Fe²⁺ / KMnO₄ or K₂Cr₂O₇)
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper Sulphate)
7. Estimation of Ferric iron by spectrophotometer.
Importance of the Course:
1. Learning a language is almost akin to a journey of discovery. It not only opens up a whole new dimension but also contributes significantly to the development of an individual’s intelligence.
2. Language gives us access and insights into another culture. It is a fundamental truth that cultures define themselves through languages.
3. Since language is a symbol of culture, the curriculum for all the languages reflects this spirit.

Course Objective
The Basic Course in French is designed to:
1. Introduce the basics of the language to beginners
2. To develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.

Synchronies I consists of 13 lessons with each lesson presenting a dialogue and giving the know-how, grammatical and lexical notions as well as activities required for communication. In addition, Synchronies I includes documents which initiate the learners to another world, another culture and which acclimatize them to the authentic use of the French language through the exploitation of written and iconographic documents. The Indian context has been used.

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UNIT – I:
At the airport: Savoir-faire: exchanging greetings, self introduction, introducing another, welcoming someone, identifying someone - Grammar: verbs ‘to be’, ‘to call oneself’, subject pronouns, interrogation

UNIT – II
At the University: Savoir-faire: enquiring after one’s welfare, taking leave, expressing appreciation - Grammar: definite & indefinite articles, gender of nouns, adjectives, present tense of regular ‘er’ verbs, ‘to have’, ‘to learn’, negation, irregular verbs

UNIT – III
At the café: Savoir –faire: speaking about one’s likes, giving information, expressing admiration, asking information about someone - Grammar: Interrogative adjectives, irregular verbs, possessive and interrogative adjectives

UNIT – IV
At the beach: Savoir faire: proposing an outing, accepting/ refusing the proposal - Grammar: singular & plural, indefinite pronoun, demonstrative adjectives, negation, irregular verbs

UNIT – V
A concert: Savoir –faire: inviting, accepting, expressing one’s inability to accept an invitation, complimenting, speaking on the phone
UNIT – VI
Grammar: Present tense of more irregular verbs, contracted articles, future tense, interrogative adverbs, At Nalli’s Savoir- faire: asking the price of an article, protesting against the price, Grammar: possessive adjectives, exclamative adjectives, imperative tense

Total: 45 hours

REFERENCES:
Course Material: Synchronie I – Méthode de Français
**Course Aim:** To equip students with some basic knowledge of German to get oriented to the new problems in global environment and address them.

**Course Objectives:** At the end of this course, students shall be able to obtain good knowledge of the language, to read, write and speak German, whereby the emphasis is laid on speech. At the end of the first course, the students are in the position to communicate in a basic manner. An example of their skills would be:

- Ordering food in a restaurant
- Expressing their likes and dislikes
- Going for shopping
- Booking a room in a hotel
- Or even making complaints where ever necessary.

**Course structure:**
A. German Language (speaking, reading, writing, grammar and test)
B. Life in Germany (shopping, restaurant, doctor, government, bank, post)
C. The German Way (introduction, doing business, conversation, meetings, dining)
D. Germany (Culture, Climate)

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**UNIT I**
Welcome: Introduction to the Language, Spelling and Pronunciation (The alphabets and numbers)
Greetings, ordering, requesting, saying thank you - Grammar – the article “the”, conjugation of verbs

**UNIT II**
Shopping - Grammar – adjectives, endings before nouns, practice. Self introduction

**UNIT III**
Addresses, Occupations, Studies - Grammar – ‘to be’, the definite/indefinite articles, individual training

**UNIT IV**
Leisure Time, Sports, Hobbies - Grammar – position of a verb in a main clause, oral practice

**UNIT V**
At a Restaurant, Food and Drink - Grammar – the personal pronoun in the Nominative and Accusative, Narrating an event
Resources:
Sprachkurs Deutsch 1 (Verlag Diesterweg), New Delhi
Learning Centre

TOTAL 45 hours
Course Objective:

The student will be able

1. To have a basic knowledge of Japanese language, Japanese culture and heritage
2. To impart knowledge Japanese lifestyle.
3. To give sufficient exposure to develop basic conversational skills.

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UNIT I                                                                                     9
Introduction-history and origin of Japanese language-Japan and its cultural heritage-Self introduction-counting numbers (1-100)-time-conversation with the use of audio devices, grammar– usage of particles wa, no, mo and ka

UNIT II                                                                                     9
Greetings, seasons, days of the week and months of the year-numbers (up to 99,999)-grammar– usage of kore, sore, are, kono, sono, ano, koko and kochira, arimasu and imasu-i-ending and na-ending adjectives-use of audio and drills for practice

UNIT III                                                                                    9
Asking the price–associated vocabulary-usage of particles ni, ga and ne- use of audio and drills for practice-Introduction to basic Kanji characters- use of audio and drills for practice

UNIT IV                                                                                    9
Family relationships- colours-Kanji (numbers) and festivals of Japan-religion-Japanese art and culture-ikebana, origami-introduction to hiragana- use of audio and drills for practice

UNIT V                                                                                    9
Vocabulary associated with directions-asking way-particles – e, de, mo, koko, soko, asoko, doko, nani, mae, ushiro, ue, shita- use of audio and drills for practice-introduction to katakana

Total: 45 Periods

Text books

Reference Books
2. Living language Japanese Complete edition beginneers through advanced course, Living language, 2012
Course Objective: Learning a language is almost akin to a journey of discovery. It not only opens up a whole new dimension but also contributes significantly to the development of an individual’s intelligence. Language gives us access and insights into another culture.

It is a fundamental truth that cultures define themselves through languages. Since language is a symbol of culture, the curriculum for all the languages reflects this spirit. To give students some proficiency in the foreign languages like Korean

Course Outcome: Upon completion of the course, students should be able to manage conversation, reading and writing on the topics related to:

- Holiday and travel
- Shopping
- Feelings, advice and introductions
- Hobbies and job requirements
- Plans and preparations
- Appointments and requests
- Ordering for food, rooms and houses

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UNIT I
Asking/giving reasons for studying Korean, making plans for the holiday, writing letters, describing past travel experiences and future travel plans, shopping in a grocery store, shopping in electronics store, storytelling. Grammar: would like to (do), want to (do), construct future tense.

UNIT II
Asking about feelings, asking about problems and giving advice, brief introductions - Grammar: Noun modifier, please try doing (something), irregular adjective/verb

UNIT III
Asking about hobbies, asking about abilities (sports), job requirements, Ordering things for delivery, ordering a meal at a restaurant - Grammar: Sentence ending for the honorific form, please do something for me, have tried (something).

UNIT IV

Asking about evening plans, making plans with others, making preparations - Asking about rooms, describing your room to your classmates, describing your house. Grammar: to know/not know how to do something, must (do), have to (do), should,

**UNIT V**
Describing your plans and giving reasons, cancelling appointments. Grammar: Shall we~? / Should we~?, with, and, irregular verbs/adjective, so, because, cannot, intend to, plan to, or hope to, (more) than, the most, tag question/is n’t it? ,will (do)

**Course Material:**
Korean for Non-Native Speakers (Student Book 1B)
Korean Language Education Center, Sogang University
BCN 101/201 CHINESE

Aim: To make the learners get acquainted with the language for professional life

Objective: To enhance the students use this language in day today conversations with ease and confidence.

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UNIT-1
history, Origins, Old and middle Chinese, Rise of northern dialects

UNIT-II

UNIT-III
Chinese characters, Homophones, Phonology

UNIT-IV
Tones, Phonetic transcriptions, Romanization, Other phonetic transcriptions

UNIT-V
Grammar and morphology, Vocabulary, Loanwords, Modern borrowings and loanwords

Total: 45 Periods

REFERENCES:


**BMA301 MATHEMATICS – III**

**OBJECTIVE:**
1. To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
2. To acquaint the student with Fourier transform techniques used in wide variety of situations.
3. To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes
4. To develop Z transform techniques for discrete time systems.

**Course Outcomes**

**CO01** - To learn the problem solving methods in linear differential equations
**CO02** - To learn Dirichlet’s condition and operations using Fourier series
**CO03** - To have a clear understanding about 2nd order equations and wave equations
**CO04** – Properties of Laplace transform and problem solving using it
**CO05** - Properties of Fourier transform and problem solving using it

**CO/PO Mapping**

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Course Content

UNIT – I
PARTIAL DIFFERENTIAL EQUATIONS  
Formation – Solution of Standard types of first order equations – Lagrange’s equation – Linear partial differential equations of second and higher order with constant coefficients

UNIT – II
FOURIER SERIES  
Dirichlet’s conditions – General Fourier series- Half range sine and cosine series – Parse Val’s identity – Harmonic analysis

UNIT – III
BOUNDARY VALUE PROBLEMS  
Classification of second order linear partial differential equations – solution of one – dimensional wave equations, one dimensional heat equations.

UNIT IV
LAPLACE TRANSFORMS  
Transforms of simple functions – basic operational properties – transforms of derivatives and integrals – initial and final value theorems – inverse transforms – convolution theorem – periodic functions – applications of Laplace transforms for solving linear ordinary differential equation up to second order with constant coefficients and simultaneous equations of first order with constant coefficients.

UNIT – V
FOURIER TRANSFORMS  

L = 45 TOTAL: 45 PERIODS

TEXT BOOKS:
OBJECTIVE:
To provide the students the exposure to the fundamentals in human anatomy and physiology.

Course Outcomes
At the end of the course, the students would
CO01 – Learn the basic terminologies, structural and functional elements of human body
CO02 - Understand the physiological aspects of respiratory and cardiac system
CO03 – Learn the structure and function of nervous tissue, visual and auditory pathways
CO04 – Analyze the process of temperature regulation; understand the process of GI reflex
CO05 – Attain a good knowledge on the role of hormones and functions of Endocrine gland

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course Content

UNIT I INTRODUCTION: HUMAN BODY AND CELL PHYSIOLOGY
Define Anatomy, Terms of Location, Position and Planes, Cell structure, Cell membrane Transport, Resting membrane potential and ionic basis of potentials, Action potential in nerve, Muscle and Heart.

UNIT II RESPIRATORY AND CARDIAC SYSTEM
UNIT III  NERVOUS SYSTEM AND SPECIAL SENSES

UNIT IV  DIGESTIVE AND EXCRETORY SYSTEM

UNIT V  ENDOCRINE AND REPRODUCTIVE SYSTEM
Mention of Endocrine glands general hormonal action (Pituitary, Thyroid, Parathyroid, Adrenal, Pancrease), Second messengers, testis, ovaries, Fallopian tube, Uterus.

L = 45 TOTAL: 45 PERIODS

REFERENCES

BEI301 – ELECTRICAL MEASUREMENTS AND INSTRUMENTS

OBJECTIVES:
The student will be made to understand:
• Magnetic circuits, principle and application of transformers
• Principle of operation of DC motors and AC Machines
• Principle of fractional-kW motors and their applications.

OUTCOME:
At the end of the course, the student should be able to:
CO01 – Describe principles and applications of different ammeters and voltmeters
CO02 – Explain the types and working of watt meters and energy meters
CO03 – Learn the types, construction, and working of different types of potentiometers
CO04 – Describe in detail the different methods of resistance measurements
CO05 – Describe in detail the different methods of impedance measurements

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course Content

UNIT – I
DIFFERENT TYPES OF AMMETERS AND VOLTMETERS
Galvanometers – Principle of operation, Construction and sources of errors and compensation in PMMC and Moving iron Instruments – Dynamometer and Rectifier type Ammeter and Voltmeters

UNIT – II
WATTMETERS AND ENERGY METERS

UNIT – III
POTENTIOMETERS AND INSTRUMENT TRANSFORMERS

UNIT IV
RESISTANCE MEASUREMENT

UNIT – V
IMPEDANCE MEASUREMENT

L:45

TEXT BOOKS:

L = 45 TOTAL: 45 PERIODS
OBJECTIVES:
To learn C++ programming language, be exposed to the different data structures and be familiar with applications using different data structures.

OUTCOME:
At the end of the course, the student should be able to:
CO01 - Design and implement C++ programs for manipulating stacks, queues, linked lists, trees, and graphs.
CO02 - Apply good programming design methods for program development.
CO03 - Apply the different data structures for implementing solutions to practical problems.
CO04 – Learn the interface of different types of I/O devices
CO05 – Know in detail about parallel architecture

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course Content

UNIT - 1 REVIEW OF FUNDAMENTALS
CPU. Memory, I/O design, performance evaluation

UNIT – 2 CPU ARCHITECTURE
Instruction Sets of Different Machines – CISC Vs RISC – Pipelining Issues – Super Scalar Architecture

UNIT – 3 MEMORY DESIGN
Virtual Memory – Cache design for different architectures & multiprocessor environments – Evaluating Memory Performance
UNIT – 4  I/O DESIGN  
Speed Limits – Interfacing to Different types of I/O Devices – Performance Measures

UNIT – 5  PARALLEL ARCHITECTURE  
Data Flow – Vector Processor – EPIC – Case Studies

TOTAL : 45

TEXT BOOKS:


REFERENCE BOOKS:


BBM302  BIOSENSORS AND TRANSDUCERS  
L  T  P  C
3  0  0  3

OBJECTIVES :

The student should be made to:

• Understand the purpose of measurement, the methods of measurements, errors associated with measurements.
• Know the principle of transduction, classifications and the characteristics of different transducers and study its Biomedical applications.
• Know the different display and recording devices.

OUTCOME:

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

CO01- Describe the purpose and methods of measurements
CO02 - Explain different display and recording devices for various applications.
CO03 - Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications
CO04- Remember and understand the concepts, types, working and practical applications of important biosensors.
CO05 – Know some of the commonly used biomedical transducers
**CO/PO Mapping**

S – Strong, M – Medium, W – Weak

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**Course Content**

**UNIT - I**

**SCIENCE OF MEASUREMENT**

Units and Standards - calibration methods - statics calibration - classification of errors, error analysis - statistical methods - odds and uncertainty.

**UNIT - II**

**CHARACTERISTICS OF TRANSDUCERS**

Static characteristics - accuracy, precision, sensitivity, linearity etc - mathematical model of transducers - zero first - order and second - order transducers - response to impulse step, ramp and sinusoidal inputs.

**UNIT - III**

**VARIABLE RESISTANCE TRANSDUCERS**

Principle of operation, construction details, characteristics and applications of resistance potentiometers, strain gauges, resistance thermometers, thermistors, hot-wire anemometer, piezoresistive sensors and humidity sensors.

**UNIT - IV**

**BIOSENSORS - PHYSIOLOGICAL RECEPTORS - J RECEPTORS**
Chemo receptors, Baroreceptors, Touch receptors, Biosensors - Working Principle and Types, Applications.

UNIT - V
OTHER TRANSDUCERS

Piezoelectric transducers, magnetostrictive transducer, IC sensor digital transducers - smart sensor - fibre optic transducers.

L = 45 TOTAL: 45 PERIODS

Text Books:

BEC 306 INTRODUCTION TO ELECTRONIC DEVICES AND CIRCUITS

L T P C
3 1 0 4

OBJECTIVE:-
- To introduce electric circuits and its analysis.
- To impart knowledge on solving circuits using network theorems.
- To introduce the phenomenon of resonance in coupled circuits.
- To educate on obtaining the transient response of circuits.
- To Phasor diagrams and analysis of three phase circuits.

OUTCOME:
At the end of the course, the student should be able to:
- Understand and design electric circuits and do various tests on it
- Gain knowledge on solving circuits using network theorems.
- Attain in-depth knowledge on the phenomenon of resonance in coupled circuits.
- Work on obtaining the transient response of circuits.
- Plot the phasor diagrams and analysis of three phase circuits.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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<td>Analysis of PN junction diode equation, transition and diffusion capacitance, breakdown characteristics. Charge control model and switching characteristics, tunnel diode, light emitting diode, bipolar junction transistor, Ebers moll’s equation, JFET – theory of operation and current equation.</td>
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**UNIT II SPECIAL SEMICONDUCTOR DEVICES AND DEVICES TECHNOLOGY**
Charge transfer device, UJT, SCR, Diac, Triac, GTO and introduction to gallium arsenide devices, N MOS, C MOS integrated circuits.

**UNIT III AMPLIFIERS**
Biasing circuits for transistors-FET and their analysis –CE, CC and CB amplifiers –PET amplifiers
Differential amplifiers- common mode and difference mode analysis- Drift compensation FET inputs stages- introduction to tuned amplifiers.

**UNIT IV RECTIFIERS**
Half and full wave, ripple factor calculations for C, L, L-C.

**UNIT V POWER SUPPLIES**
SMPS, linear electronic voltage regulators, power control using SCR.

\[ L = 45 \text{ TOTAL: 45 PERIODS} \]

**TEXT BOOK:**
OBJECTIVES:
To study about the characteristics, working and applications of various devices in the field of bio sensors and transducers.

Lab Outcomes:
CO01: To understand voltage characteristics of a potentiometric transducer.
CO02: To learn the Strain Gauge characteristics.
CO03: To learn load cell characteristics.
CO04: To learn the characteristics of Photoelectric tachometer.
CO05: To learn the characteristics of Hall Effect transducer.
CO06: To learn the characteristics of LVDT.
CO07: To learn the characteristics of LDR, thermistor and thermocouple.
CO08: To learn the Ramp response characteristic of filled in system thermometer.
CO09: To learn the Step response characteristics of RTD and thermocouple.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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2 Record Book | 2 Faculty Survey
3 Model Examination | 3 Industry
4 Viva Voce | 4 Alumni
5 End Semester Examinations | 5

List of Experiments
1. Displacement versus output voltage characteristics of a potentiometric transducer.
2. Strain Gauge characteristics.
3. Load cell characteristics.
4. Photoelectric tachometer.
5. Hall Effect transducer.
6. Characteristics of LVDT.
7. Characteristics of LDR, thermistor and thermocouple.
8. Ramp response characteristic of filled in system thermometer.
9. Step response characteristics of RTD and thermocouple.

**BEI3L2 ELECTRICAL AND ELECTRONIC MEASUREMENT LAB**

**OBJECTIVES:**
To study about the characteristics, working and applications of various devices in the field of measurement.

**Lab Outcomes:**
CO01: To understand the Use of Wheat Stone bridge as resistance to voltage converter
CO02. To learn the characteristics and working of Kelvin double bridge.
CO03. To learn and Determine the critical damping resistance of a D’Arsonval Galvanometer.
CO04. To learn the characteristics and working of phase energy meter.
CO05. To learn the characteristics and working of Calibration of wattmeter.
CO06. To learn the characteristics and working of current transformers.
CO07. Calibration of ammeter, voltmeter and wattmeter using student type potentiometer.
CO08. To learn the Design/construction and calibration of series and shunt type ohmmeters.
CO09. To learn the characteristics and working of Operational amplifier applications.
CO10. To learn the characteristics and working of Regulated power supply using fixed voltage IC regulators and LM 723.
CO11. To learn the Frequency response characteristics of CE and CB amplifiers.
CO12. To learn the characteristics and working of feedback in amplifiers.
CO13. To learn the characteristics and working of RC phase shift and Wien Bridge Oscillator.

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**Indirect**

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List of Experiments
1. Use of Wheat Stone bridge as resistance to voltage converter and to determine its sensitivity for various ratios.
2. Kelvin double bridge.
4. Tests on a single - phase energy meter.
5. Calibration of wattmeter at different power factors.
7. Calibration of ammeter, voltmeter and wattmeter using student type potentiometer.
8. Design construction and calibration of series and shunt type ohmmeters.
9. Operational amplifier applications.
10. Regulated power supply using fixed voltage IC regulators and LM 723.
11. Frequency response characteristics of CE and CB amplifiers.
12. Study of feedback in amplifiers.
13. RC phase shift and Wien Bridge Oscillator.

BBM3L2 ANATOMY AND PHYSIOLOGY LAB

OBJECTIVE:
To provide the students the exposure to the fundamentals in human anatomy and physiology.

Course Outcomes
At the end of the course, the students would
CO01 – Learn the basic terminologies, structural and functional elements of human body
CO02 - Understand the physiological aspects of respiratory and cardiac system
CO03 – Learn the structure and function of nervous tissue, visual and auditory pathways
CO04 – Analyze the process of temperature regulation; understand the process of GI reflex
CO05 – Attain a good knowledge on the role of hormones and functions of Endocrine gland

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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1. Study on Upper Extremity bone.
2. Study in Lower Extremity bone.
   - Identification of Bone
   - Side identification
   - Identification of Important feature
3. Study of ECG.
6. ESR estimation.
8. Auscultation for Heart Sounds

BMA402

NUMERICAL METHODS

L T P C
3 1 0 4

OBJECTIVES:
This course aims at providing the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.

OUTCOMES:
At the end of the course, the students would

CO01- Have a fundamental knowledge of the basic solutions of equations and eigen value problems.
CO02- Have a well-founded knowledge of standard numerical differentiation and integration which can describe real life phenomena.
CO03- Acquire skills in handling situations involving first and second order differential equations
CO04- Understand boundary value problems on ordinary and partial differential equations
CO05- Be able to analyze the interpolation techniques.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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### Course Content

**UNIT-I**

SOLUTIONS OF EQUATIONS AND EIGEN VALUE PROBLEMS


**UNIT-II**

INTERPOLATION (FINITE DIFFERENCES)

Newton’s Divided Difference Formula – Lagrange’s Interpolation Newton forward and backward difference formulae – Stirling’s Bessel’s central difference formulae.

**UNIT-III**

NUMERICAL DIFFERENTIATION AND INTEGRATION

Numerical Differentiation with interpolation polynomials, Numerical integration by Trapezoidal Simpson’s (Both 1/3” and 3/8”) rules. Double Integrals using Trapezoidal and Simpson’s rules.

**UNIT-IV**

INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS


**UNIT-V**

BOUNDARY VALUE PROBLEMS FOR ODE AND PDE

Finite difference for the second order ordinary differential equations. Finite difference solutions for one dimensional heat Equations. Finite difference solutions for one dimensional heat Equations(both implicit and Explicit) one dimensional wave equation and two dimensional Laplace and Poisson Equation.

L = 45 TOTAL: 45 PERIODS

### References:

OBJECTIVES:
The student will get:
• Introduced to the basics of biochemistry, i.e, synthesis and carbohydrates, lipids etc
• Familiarized with the Classification, structure and properties of carbohydrates, Lipids, Protein and Enzyme

COURSE OUTCOMES:
At the end of the course, the student will learn:
CO01- Classification, properties, metabolism and synthesis of carbohydrates, glucose.
CO02- Classification of amino acids, proteins, metabolism of urea etc
CO03- Types and properties of lipids, metabolic disorders etc
CO04- Chemical nature and properties of Enzymes, hormones and nucleic acids and related disorders
CO05- Basic functional tests, measurement of electrolytes etc.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course Content

UNIT-I

CARBOHYDRATE
Carbohydrate classification, structure and Properties of Mono-di and Polysaccharides with its clinical importance and its uses Biological importance of carbohydrates metabolism – glycolysis, TCA cycle, Glyes, resogenesis, Pentose phosphate pathway, Uronic acid pathway, metabolism of fructose, Sorbitol pathway, metabolism of gelatos and its dysfunction

UNIT-II

PROTEIN

UNIT-III
LIPIDS

UNIT-IV
ENZYMES, HARMONES AND NUCLEIC ACID

UNIT-V
BIOCHEMISTRY OF BLOOD AND BODY FLUIDS

\[ L = 45 \text{ TOTAL: 45 PERIODS} \]

Text Books:

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

OUTCOMES:
At the end of the course, the student will:
CO01- Understand the purpose of measurement, the methods of measurements, errors associated with measurements.
CO02- Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications.
CO03- Know the different display and recording devices for various biosignals
CO04- Know the measurement techniques for blood flow measurement and cell counting
CO05- Learn the uses of pH, spectrometers and auto-analyzer

CO/PO Mapping
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Course Content

UNIT-I INTRODUCTION TO MEDICAL INSTRUMENTS
Design of medical instruments – components of biomedical instrument system, Electrodes & Transducers.

UNIT-II BIOSIGNAL ACQUISITION

UNIT-III BIOPOTENTIAL RECORDS
ECG, EMO, EEG, ERO, EOG, Echo cardiography – characteristics of the recording systems – lead systems and recording methods – waveforms.

UNIT-IV 9
BLOOD FLOWMETERS AND BLOOD CELL COUNTING

UNIT-V 9
BIOCHEMICAL MEASUREMENTS
ph, pco2, po2, - calorimeter, spectrophotometer, flame photometer. Autoanalyser.

L = 45 TOTAL: 45 PERIODS

Text Books:

Reference:

BBM403 LINEAR AND DIGITAL INTEGRATED CIRCUITS L T P C
3 0 0 3

OBJECTIVES:
To study the application of analog ICs in the designing circuit.
To study the applications of these Digital ICs.
To understand the basic of the Digital systems.
To study the design of the various functional circuits using these ICs.

OUTCOMES:
CO01- Basics of number systems, conversion and filters
CO02- Basics of Logic gates and Boolean algebra
CO03- Full adder and Half adder and its implementation using ICs
CO04- Different types of ICs and sequential circuits
CO05- Details about RAM, ROM, EPROM and types of memories

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course Contents

Unit 1: Number Systems, Codes and Operational Amplifiers

Number systems-Decimal, binary, Octal, Hexadecimal, conversion from one to another, complement arithmetic. Codes – Gray code, Excess-3 code, alphanumeric code. Error detection and correction. Characteristics of ideal op amp, Virtual Short, differential amplifier, offset currents and voltages, Slew rate, 741 IC Specifications, inverting and non-inverting amplifiers, differential dc amplifier, bridge amplifier, integrator, differentiator, active low pass, high pass and band pass active filters, precision diode and clamp, half wave rectifier, average detector, peak detector, log – antilog amplifiers, monostable and triangular wave generators.

UNIT II: Boolean Algebra and Logic Gates


UNIT III: Combinational Circuits

Basic adder – half adder, full adder, comparator, decoder, encoder, multiplexer, demultiplexer, Parity generator or checker. Boolean Expression Implementation using these IC’s.

UNIT IV: Sequential Circuits


UNIT V: Memory and Storage
Basics of semiconductor memory, RAM-static and dynamic, ROM-EPROM, special types of memories.

**TEXT BOOKS**

**REFERENCE BOOKS**

**BEC404 BASIC PRINCIPLES OF COMMUNICATION AND CIRCUITS**

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**OBJECTIVES:**
The student should be made to:
1. Understand analog and digital communication techniques
2. Learn data and pulse communication techniques
3. Be familiarized with source and Error control coding
4. Gain knowledge on multi-user radio communication

**OUTCOMES:**
At the end of the course, the student should be able to:
CO01- Apply analog and digital communication techniques
CO02- Use data and pulse communication techniques
CO03-Analyze Source and Error control coding
CO04-Utilize multi-user radio communication
CO05- Modulate and demodulate a signal

**CO/PO Mapping**
S – Strong, M – Medium, W – Weak

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**Course Assessment Methods:**
**Course contents**

**UNIT I**

**BASIC OF CIRCUIT ANALYSIS**

Kirchoffs law, DC and AC excitation, series and parallel circuit, sinusoidal steady state analysis. Mesh current and nodes voltage method of analysis, matrix method of analysis, Thevenins and Norton theorems, super position theorem, compensation theorem, Reciprocity theorem, maximum power transfer theorem and parallel resonance, quality factor and bandwidth.

**UNIT II**

**STATICS ELECTRIC FIELD**


**UNIT III**

**STEADY MAGNETIC FIELD**


**UNIT IV**

**ANALOG MODULATION SYSTEM**

Basic principle of AM, FM and PM spectra power consideration. Receivers characteristic and deduction of AM, FM and system performance Threshold effect reduction.

**UNIT V**

**BASE BAND DATA COMMUNICATION AND DIGITAL MODULATION**

Sampling and quantization PCM, ADPCM, DM, ADM, Base and pulse shaping binary data formats. Base band transmission ISI Correlative coding, Optimum SNR matched filter detection, Digital modulation, coherent binary modulation techniques, non coherent binary modulation.
B.Tech – Biomedical Engineering
Bharath Institute of Higher Education and Research

L = 45 TOTAL: 45 PERIODS

Textbook:

Reference:

BEC405 MICROPROCESSOR AND ITS APPLICATIONS

L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
1. Study the Architecture of 8086 microprocessor.
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. Study about communication and bus interfacing.
4. Study the Architecture of 8051 microcontroller.

OUTCOMES:
At the end of the course, the student should be able to:
1. Design and implement programs on 8086 microprocessor.
2. Design I/O circuits.
3. Design Memory Interfacing circuits.
4. Design and implement 8051 microcontroller based systems.
5. Learn the instruction sets and interfacing

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course content

UNIT-I
ARCHITECTURE
General 8 bit microprocessor and its architecture – 8085 functional block diagram architecture – functions of different sections architecture of 8086 CPU.

UNIT-II
INSTRUCTION SETS

UNIT-III
ASSEMBLY LANGUAGE PROGRAMMING
assembly format of 8085 – assembly directions multiple precision arithmetic operations – binary to BCD and BCD to binary code conversion – ALU Programming using look up table – stack and subroutines.

UNIT-IV
DATA TRANSFER AND INTERFACING

UNIT-V
MICRO CONTROLLERS

L = 45 TOTAL: 45 PERIODS

Text Books:

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

OUTCOMES:
Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
1. Public awareness of environment at infant stage.
2. Ignorance and incomplete knowledge has lead to misconceptions.
3. Development and improvement in standard of living has lead to serious environmental disasters.
4. Understand the effects of different environmental pollution
5. Need for value based education and human health

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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UNIT-I
THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES
Definition, scope and importance. Need for public awareness.

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

UNIT-II
ECOSYSTEM
Concepts of an ecosystem-structure and function of and ecosystem-producers, consumers and decomposers-energy flow in ecosystem-ecological-Succession-Food chains, food webs and ecological pyramids-introduction, types, characteristics features, structure and function of the following ecosystem – Forest ecosystem Grass land ecosystem, Desert ecosystem, Aquatics ecosystem(Ponds, stream,lakes,rivers,oceans,estuaries)

UNIT-III
BIODIVERSITY AND ITS CONSERVATION
Introduction – Definition: genetic, species and ecosystem diversity- Biogeographical classification of India- Value of Biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national, local levels –India as a mega diversity nation –Hotspots of wildlife conflicts- Endangered and endemic species of India- Conservation od biodiversity In-Situ and Ex-Situ conservation of biodiversity.

ENVIRONMENTAL POLLUTION
Definition, causes, effects and control measures of – Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, and Nuclear hazards. Solids waste Management: causes effects and control measures of urban and industrial wastes –Role of an individual in earth quake, cyclone and landslides.

UNIT-IV
SOCIAL ISSUES AND THE ENVIRONMENT

UNIT-V
HUMAN POPULATION AND THE ENVIRONMENT

\[ L = 45 \ \text{TOTAL: 45 PERIODS} \]

**TEXT BOOKS**

**REFERENCE BOOKS**
OBJECTIVES:
The student should be made to:
1. Study the Architecture of 8086 microprocessor.
2. Learn the design aspects of I/O and Memory Interfacing circuits.
3. Study about communication and bus interfacing.
4. Study the Architecture of 8051 microcontroller.

OUTCOMES:
At the end of the course, the student should be able to:
1. Design and implement programs on 8086 microprocessor.
2. Design I/O circuits.
3. Design Memory Interfacing circuits.
4. Design and implement 8051 microcontroller based systems.
5. Learn the instruction sets and interfacing

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Direct

1. Observation Book
2. Record Book
3. Model Examinations
4. Viva Voce
5. End Semester Examinations

Indirect

1. Course and Survey
2. Faculty Survey
3. Industry
4. Alumni

1. Familiarization of 8085 microprocessor kit.
2. Familiarization of 8051 microcontroller kit
3. 8085 and 8051 assembly language programming exercises
4. Interfacing of switches and display devices
5. Interfacing of D/A and A/D converters
6. Interface of key board and display using programming controllers
7. Interface of programmable timer
8. Stepper motor control using microprocessor
9. Interface of printer using UART
OBJECTIVES: To quantitatively analyze the important sugars and carbohydrates.

OUTCOMES:
At the end of the course, the student should be able to:
1. To analyze important carbohydrates
2. To estimate glucose by various methods
3. To estimate protein, amino acids by various methods
4. To estimate creatinine by various methods
5. Analyze urine for protein, ketones, glucose etc

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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1. Qualitative analysis of Glucose.
2. Qualitative analysis of Fructose.
3. Qualitative analysis of Maltose.
4. Qualitative analysis of Sucrose.
5. Qualitative analysis of Lactose.
8. Estimation of Protein by Biuret’s Method.
10. Estimation of Glucose present in Urine Sample.
11. Isolation of Starch from Potato.
14. Abnormal Urine analysis (Glucose, Protein, Acetone, etc.).
OBJECTIVES:
• To provide practice on recording and analysis of different Bio potentials
• Study the function of different Therapeutic equipments.

OUTCOMES:
At the end, the student should know:
CO01- IC circuits, Op-amps, rectifiers and its applications
CO02- Safety concerns in hospitals
CO03- Use of filters in biomedical applications
CO04- Different types of read-out devices used
CO05- Use of timers and counters

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course content:

UNIT-I
LINER INTEGRATED CIRCUITS
Introduction to liner integrated circuits, operational amplifiers, characteristics, application, Op amp circuits, Bio medical applications. Rectifiers op amp circuits using diodes, SMPS basic ECG amp, was form generation using Op amps.

UNIT-II
SAFETY INSTRUMENTATION
UNIT-III
FILTERS
Carrier current and line noise HP,BP, BR – radio frequency interference, RF power, measurement – base line shift.

UNIT-IV
READ OUT DEVICES

UNIT-V
TIMERS AND COUNTERS
Delay timer, interval timer, design of ADC and DAC circuits, frequency counters, multivibrator, flip flop.

L = 45 TOTAL: 45 PERIODS

Text Books:

References:
3. Terra behilla “Bio medical and clinical Engineering” Brent ice hall inc., 2001

BEI501           DIGITAL SIGNAL PROCESSING           L T P C
3 0 0 3

OBJECTIVES:
1. To learn discrete Fourier transform and its properties
2. To know the characteristics of IIR and FIR filters learn the design of infinite and finite impulse
3. response filters for filtering undesired signals
4. To understand Finite word length effects
5. To study the concept of Multi-rate and adaptive filters

OUTCOMES:
Upon completion of the course, students will be able to
CO01- Apply DFT for the analysis of Digital Signals & Systems
CO02- Design IIR and FIR Filters
CO03- Characterize finite word length effect on filters
CO04- Design the Multi-Rate Filters
CO05- Apply Adaptive Filters to equalization

**CO/PO Mapping**

**S – Strong, M – Medium, W – Weak**

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**Course content:**

**UNIT-1**

**DISCRETE TIME SIGNALS AND SYSTEMS**

Periodic and Pulse signals-eg.’s for sequences-Pulse,Step,Impulse,Ramp,Sine and exponential-Differential equations-Linear time invariant-Stability,casuality-DT systems-Time domain analysis.

**UNIT-2**

**Discrete Time Systems - Z TRANSFORM**


**UNIT-3**

**Frequency Analysis of Signals - FAST FOURIER TRANSFORMS**

Introduction to Radix to FFT’s-decimation in the FFT Algorithm-Decimation in frequency FFT Algorithm-Computing inverse DFT using FFT-mixed radix FFT algorithm, Periodogram Techniques.

**UNIT-4**

**IIR FILTER DESIGN**

Classification-Reliability constraints-IIR design-Butterworth and Chebyshev Filters, Bilinear Transform Method-Impulse Invariant Method-Step Invariance Method.
UNIT-5

FIR FILTER DESIGN

L = 45 TOTAL: 45 PERIODS

Textbook:

References :

BBM502 BIOFLUIDS AND BIOMECHANICS L T P C
3 0 0 3

OBJECTIVES:
To provide the students:
1. An understanding on the physiology and anatomy of studied systems,
2. A capability to analyze cardiac, respiratory, soft tissue and orthopedic mechanics

OUTCOMES:
At the end of the course, the student should be able to:
1. The fundamental concepts and definitions related to Biomechanics
2. Discuss on Cardiovascular and pulmonary system in human body
3. Explain blood properties, especially the anatomy and physiology of blood vessels.
4. Explain the laws concerning bio-fluid mechanics
5. Various mechanical properties of tissues, bone, ligaments and cartilage

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Course Content

UNIT-I Biomechanics
Newton’s law, Stress, Strain, Hookes-law, Elasticity, Shear, Tension, Compression, Bone – Cancellous and cortical bone, structure, Mechanical Properties and mechanical testing of bone, UTM, creep and Fatigue.

UNIT II BIOFLUID MECHANICS

UNIT-III Respiratory and cardiac Mechanics

UNIT IV SOFT TISSUE MECHANICS
Tissue Mechanics-Mechanical Properties of Tissues, Biological materials, Pseudo elasticity, nonlinear stress-strain relationship, viscoelasticity, structure, function and mechanical properties of skin, ligaments and tendons, Mechanical testing of Soft tissue.

UNIT V ORTHOPAEDIC MECHANICS

REFERENCES:

TOTAL : 45
4. Basic Biomechanics by Susan J Hall
5. Jay D Humphrey and Sherry L. Delange, “An Introduction to Biomechanics” Springer

BBM503 BIOMEDICAL INSTRUMENTATION II L T P C
3 0 0 3

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

OUTCOMES:
At the end of the course, the student should be able to:
CO01- Explain about measurements of parameters related to respiratory system
CO02- Describe the measurement techniques of sensory responses
CO03- Analyze different types and uses of diathermy units
CO04- Discuss ultrasound imaging techniques and its usefulness in diagnosis
CO05- Outline the importance of patient safety against electrical hazard

CO/PO Mapping
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Course Content
UNIT-I
HEART LUNG MACHINE
Condition to be satisfied by the H/L system, different type of Oxygenators, pumps- Blood handling system.

UNIT-II 9
CARDIAC ASSIST DEVICES
Synchronous counter pulsation, right ventricular bypass pump, left ventricular bypass pump, Intra aortic balloon pumping and veno arterial pumping.

UNIT-III 9
ARTIFICIAL KIDNEY
Indication and Principle of Haemodialysis, different types of dialysis, monitoring systems, artificial kidney.

UNIT-IV 9
PROSTHETIC AND ORTHODIC DEVICES
Hand and arm replacement- different types of models, externally powered Prosthesis feedback in orthodic system, materials for prosthetic and orthodic devices

UNIT-V 9
RESPIRATORY AND HEARING AIDS
Intermittent positive pressure breathing apparatus, operating sequence, audiograms, types of deafness hearing aids, impedance matching -BERA Test.

L = 45 TOTAL: 45 PERIODS

Textbook:

References:
OBJECTIVES:
• To Study effects of sound and light in human body
• To study effects of radiation in matter and how isotopes are produced

OUTCOMES:
At the end of the course, the student should be able to:
CO01- Analyze mechanics involved with various physiological systems.
CO02- Perform derivation of mathematical models related to blood vessels
CO03- Understand the principle of radioactivity and uses of some radio-isotopes
CO04- Physics relating the interaction of radiation with matter
CO05- Radiation effects in human tissues and organs

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Radionuclide – fission and electron Capture reaction, Radionuclide Generator – Milking Process - Linear accelerator , Radionuclide used in Medicine and technology.

UNIT III - INTERACTION OF RADIATION WITH MATTER
Interaction of charged particles with matter – Specific ionization , linear energy Transfer Range, Bremsstrahlung , Annihilation Interaction of Gamma radiations with matter – Photoelectric effect, Compton Scattering , pair Production, Attenuation of Gamma Radiation, Interaction of neuron with matter

UNIT IV - PHYSICS OF CARDIOPULMONARY SYSTEM

UNIT V - RADIATION EFFECTS
Acute Radiation Effects - The concept of LD 50 – Radiation syndromes- Central nervous system syndrome - Gastro-intestinal syndrome –Bone Marrow syndrome
Delayed Effects of Radiation - Stochastic and Deterministic effects – Late Deterministic effect in different organs and tissues.

PERIODS
TEXT BOOKS

REFERENCES:

BBM505 BIOMATERIALS AND IMPLANTABLE DEVICE

OBJECTIVES:
The student should be made to:
1. Learn characteristics and classification of Biomaterials
2. Understand different metals and ceramics used as biomaterials
3. Learn polymeric materials and combinations that could be used as a tissue replacement implants
4. Know the various artificial organs developed using these materials

OUTCOMES:
At the end of the course, the student should be able to:
CO01- Analyze different types of Biomaterials and its classification.
CO02- Perform combinations of materials that could be used as a tissue replacement implant.
CO03- Know about the various polymeric materials used for medical applications
CO04- About bio-ceramics and its applications in medicine
CO05- Applications and properties of materials in orthopedics

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course Assessment Methods:

- **Direct**
  1. Internal Tests
  2. Assignments
  3. Seminar
  4. Quiz
  5. Online test
  6. End Semester Examinations

- **Indirect**
  1. Course and Survey
  2. Faculty Survey
  3. Industry
  4. Alumni

Course Content

**Unit 1**

**Unit 2**
Bioelectric effect, Wolff’s law. Interface problems with artificial joints and various fixation methods. Failure of implantation materials- metallic corrosion, wear, metallic implant fractures and their impact on biological systems. Hard tissue replacements- total hip and knee joint replacements

**Unit 3**

**Unit 4**
Unit 5

L = 45 TOTAL: 45 PERIODS

References:

BBM506 PHYSIOLOGICAL CONTROL SYSTEMS L T P C
3 0 0 3

OBJECTIVES:
1. To study the concept and different mathematical techniques applied in analyzing any given system
2. To learn the analysis of given system in time domain and frequency domain
3. To study the stability analysis of the given system
4. To study the concept of physiological control system

OUTCOMES:
The learner will be able to:
CO01- Analyze the time and frequency domains of the given system using different mathematical techniques
CO02- Learn the basics of control systems
CO03- Time and frequency response analysis
CO04- Bio-control system definition and modeling
CO05- Study the model of eye, respiratory system, etc

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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B.Tech – Biomedical Engineering  Bharath Institute of Higher Education and Research
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1. CONTROL SYSTEM MODELLING 9
System concept, Differential Equations, Transfer functions, Modelling of electrical systems, Translational and rotational mechanical systems, Electro-mechanical systems, physiological systems, block diagram modelling, signal flow graphs.

2. TIME RESPONSE ANALYSIS 9

3. FREQUENCY RESPONSE ANALYSIS 9
Frequency response, Bode plot-Nyquist plots, Nyquist stability criterion, Relative stability, Gain margin, phase margin, bandwidth magnitude plots, constant circles, Nichol's chart

4. PHYSIOLOGICAL CONTROL SYSTEMS 9
Introduction to physiological control systems, modelling of human movements, parameter estimation, linearizing

5. STUDY OF BIOLOGICAL SYSTEMS 9
Human Thermal system, Neuro muscular system, Respiratory system, ocularomotor system.

L = 45 TOTAL: 45 PERIODS

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

OUTCOMES:
At the end of the course, the student will:
CO01- Understand the purpose of measurement, the methods of measurements, errors associated with measurements.
CO02- Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications.
CO03- Know the different display and recording devices for various biosignals
CO04- Know the measurement techniques for blood flow measurement and cell counting
CO05- Learn the uses of pH, spectrometers and auto-analyzer

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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2 Record Book 2 Faculty Survey
3 Model Examination 3 Industry
4 Viva Voce 4 Alumni
5 End Semester Examinations

LIST OF EXPERIMENTS:
1. ECG recording and Analysis.
2. EEG recording and analysis.
3. Respiratory Analysis.
5. Nerve Conduction Study.
6. Digital Heart Monitor.
7. EOG system
8. Study of ESU – cutting and coagulation modes
10. Spectrophotometer.
11. Flame photometer.
12. ELIZA.
13. Plotting of human auditory response using audiometer
14. Analysis of bio signals using FFT Spectrum Analyser
15. Ultra Sound Dopplers.
16. Defibrillators and Pacemakers (Demo)
17. Ventilators and Humidifiers
18. Nebuliser
19. Pacemaker(Demo)
20. Physiotherapy equipment - Digi laser, Indsonic, Indotherm – 500W
22. Mini project.

BBM5L2 LINEAR AND DIGITAL INTEGRATED CIRCUITS

OBJECTIVES:
To study the application of analog ICs in the designing circuit.
To study the applications of these Digital ICs.
To understand the basic of the Digital systems.
To study the design of the various functional circuits using these ICs.

OUTCOMES:
CO01- Basics of number systems, conversion and filters
CO02- Basics of Logic gates and Boolean algebra
CO03- Full adder and Half adder and its implementation using ICs
CO04- Different types of ICs and sequential circuits
CO05- Details about RAM, ROM, EPROM and types of memories

CO/PO Mapping
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2. Record Book | 2. Faculty Survey
3. Model Examination | 3. Industry
4. Viva Voce | 4. Alumni
5. End Semester Examinations |  

1. Inverting, non-inverting amplifier and comparator
2. Active filter – first order LPF and HPF
3. Schmitt trigger using IC741
4. Instrumentation amplifier using IC741
5. Wein bridge oscillator
6. Multivibrator using IC555 Timer
7. Study of logic gates, Half adder and Full adder
8. Encoder and BCD to 7 segment decoder
9. Multiplexer and demultiplexer using digital ICs
10. Universal shift register using flipflops
11. Design of mod-N counter
12. Study of operational amplifier IC 741.
14. Inverting and non inverting mode of operation.
15. Operational amplifier as summer and subtractor.
16. Operational amplifier as integrator and differentiator.
17. Active high pass filter(second order)
18. Active low pass filter(second order)
20. RC phase shift oscillator.
22. Squaring circuit.
23. Halfwave rectifier.
24. Current to voltage converter.
25. Voltage to current converter

BBM601 C++ and Java Programming L T P C
3 1 0 4

OBJECTIVES:
To learn C++ programming language, be exposed to the different data structures and be familiar with applications using different data structures.

OUTCOMES:
At the end of the course, the students would
CO01- Have a fundamental knowledge of the basic concepts of C++
CO02- Have a well-founded knowledge of programming in C++
CO03- Acquire skills in handling the file with different operation
CO04- Have a fundamental knowledge of the basic concepts of Java
CO05- Able to understand the concepts of Java.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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6 End Semester Examinations
UNIT I - INTRODUCTION
Object-oriented paradigm, elements of object oriented programming – Merits and demerits of OO methodology – C++ fundamentals – data types, operators and expressions, control flow, arrays, strings, pointers and functions.

UNIT II - PROGRAMMING IN C++
Classes and objects – constructors and destructors, operator overloading – inheritance, virtual functions and polymorphism

UNIT III - FILE HANDLING
C++ streams – console streams – console stream classes-formatted and unformatted console I/O operations, manipulators - File streams - classes file modes file pointers and manipulations file I/O – Exception handling

UNIT IV - JAVA INTRODUCTION
An overview of Java, data types, variables and arrays, operators, control statements, classes, objects, methods – Inheritance.

UNIT V - JAVA PROGRAMMING
Packages and Interfaces, Exception handling, Multithreaded programming, Strings, Input /Output.

L = 45 TOTAL: 45 PERIODS

TEXT BOOKS
1. K.R.Venugopal, Rajkumar Buyya, T.Ravishankar, "Mastering C++", TMH, 2003 (Unit I, Unit II, Unit III)
2. Herbert Schildt, "the Java 2 : Complete Reference", Fourth edition, TMH, 2002 (Unit IV, Unit-V)(Chapters 1-11,13,17)

REFERENCES
OBJECTIVE:
1. To introduce microcontroller, the role of microcontrollers. Types and selection, its application and examples.
2. To study the microcontroller resources and Family members, bus widths program and data memory parallel ports. D/A and A/D convertors, reset circuitry, watchdog timers, power down considerations.
3. To study Interrupt structures programmable timers, real time clock, latency, interrupt, density and interval constraints.
4. To study CPU register- structure- addressing modes- instruction sets- assembly languages-assemblers.
5. To study Queues, tables and strings, program organisation, microcontroller expansion methods, I/O hardware alternatives, development tools, RTOS.

COURSE OUTCOMES
CO01 - To learn introduce microcontroller the role of microcontrollers. The Types and selection.
CO02 - To learn D/A and A/D convertors, reset circuitry, watchdog timers, power down considerations.
CO03 - To have a clear view Interrupt structures programmable timers, real time clock.
CO04 – To learn CPU register its structure and its addressing modes and instruction sets.
CO05 - To learn I/O hardware alternatives, development tools, RTOS, motorola MC68HC11.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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UNIT-I
**Introduction to Digital Signal Processing Devices**
9
Architecture of TMS 320C54XX Digital Signal Processor-18. Addressing Modes and Instruction sets of TMS 320C54XX DSP-19. TMS 320VC5416 Assembly Language Programming-. Interfacing and Real Time C Programming with TMS 320C54XX- TMS 320C6713 Floating Point Processor Architecture and Real Time C Programming

**UNIT-II**

Programmable embedded system-on-chip (PSoC) Processor
9
Architecture- Designer- Developing tools- biomedical applications

**UNIT-III**

Introduction to real-time imaging
9
Basic Hardware Architecture.-Linear Image Processing Algorithms-Compression by Matrix Transforms-Nonlinear Image Processing Algorithms-Parallel Architectures-Programming Languages-Optimization Techniques

**UNIT IV**

MEMS AND MICROSYSTEMS
9
Working principle of Microsystems, materials for MEMS and Microsystems, micromachining, System modeling and properties of materials

**UNIT V**

BIOMEMS
9
Drug delivery, micro total analysis systems (MicroTAS) detection and measurement methods, microsystem approaches to polymerase chain reaction (PCR), DNA hybridization, Electronic nose, Bio chip.

L = 45 TOTAL: 45 PERIODS

**REFERENCES**

2. Technical Reference Manuals,Cyprus Semiconductors,USA 2008

**BBM603 PATHOLOGY AND MICROBIOLOGY**
L T P C
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**OBJECTIVES:**
- To learn about the cell structure and its disorders
- To gain knowledge about the fundamental structure of virus, bacteria and its causes

**OUTCOMES:**
At the end of the course, the students would
CO01- Have a Fundamental Knowledge about the cell and concepts of tumor.
CO02- Have to learn about the fluid present in the body and hemodynamic derangement
CO03- Have a fundamental knowledge of real time imaging with basic hardware architecture, algorithms and transform techniques

CO04- Have knowledge about basic concepts of infection and immunity of the human body

CO05- Acquire the fundamental knowledge of structure of Bacteria, virus and its causes.

CO/PO Mapping

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UNIT-I
NORMAL CELL STRUCTURE

UNIT-II
FLUID AND HAEMODYNAMIC DELANGEMENT
Edema, Shock, Hemorrhage- Thrombus- Embolism- Disseminated intravascular coagulation- Hematological disorders- Bleeding disorders- Leukemia lymphoma

UNIT-III
INFECTION AND IMMUNITY
Normal Flora of the body- Host and Parasite relationship- Types of immunity-Innate and adaptive immunity- Important Bacterial, Viral, Protozoan and Helminthic Diseases.

UNIT-IV
Structure of Bacteria and Virus – Methods of Isolation of Bacteria viz Streak Plate, Pour plate and Spread plate methods, viral cell- Growth and cultivation of bacteria. Microscopy- Light microscopy- Dark field microscopy- Phase contrast microscopy- Electron microscopy.

UNIT-V
Identification of disease producing organism simple, gram, AFB stain, fluorescent techniques, Ag-Ab techniques like Double diffusion, electro immune diffusion and agglutination techniques.

L = 45 TOTAL: 45 PERIODS
Text Book:

BBM604 DIGITAL AND MEDICAL IMAGE PROCESSING

OBJECTIVES:
The aim of the courses to show how to extract, model, and analyze information from medical data and application in order to help diagnosis, treatment and monitoring of diseases through computer sciences.

OUTCOMES:
At the end of the course, the students would
CO01- Have a Fundamental Knowledge of digital image processing with Fourier transforms.
CO02- Acquire knowledge about the image sampling, Modeling and quantization
CO03- Have a fundamental knowledge of image enhancement, its process and types of filters used in image processing
CO04- Have knowledge about image analysis, classification and reconstruction of act and MRI images
CO05- Acquire the skills in the transmission of biological images.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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UNIT-I
DIGITAL IMAGE FUNDAMENTAL

UNIT-II Image Fundamentals

Image sampling and quantization, Matrix and Singular Value representation of discrete images. Image pre-processing, point operation, Histogram modelling, spatial operations, transform operations.

UNIT-III Image Enhancement


UNIT-IV

IMAGE ANALYSIS, CLASSIFICATION AND RECONSTRUCTION OF ACT AND MRI IMAGES

Image analysis, Spatial feature extraction, edge detection, Image segmentation. Image reconstruction from projections, Random transform, filter back projection algorithm, reconstruction of CT images, Imaging methods in MF images, fourier reconstruction of MRI.

UNIT-V

TRANSMISSION OF MEDICAL IMAGES

Medical Image, data compression of transmission, transform coding, pixel Coding, predictive coding, Interference coding.

L = 45 TOTAL: 45 PERIODS

Text Book:


OBJECTIVES:

The aim of the courses to show the introduction to biomedical signal, data acquiring system, Filtering and event detection in the biomedical signals.

OUTCOMES:

At the end of the course, the students would
CO01- Have a fundamental knowledge of biomedical signal.
CO02- Acquire knowledge about the filtering the biomedical signal.
**CO03-** Have fundamental knowledge event detection, ECG, EEG, EMG and the detection of waveform

**CO04-** Have knowledge about Biosignal processing using Fourier transformation.

**CO05-** Acquire the skills Pattern classification and diagnostic Decision.

**CO/PO Mapping**

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**Course content**

**Unit – 1**

**Introduction to Biomedical signals**

The nature of biomedical signals, Examples of Biomedical signals-The action potential, The Electroneurogram( ENG), The Electromyogram (EMG), The Electro Cardiogram (ECG), Event related potentials (ERPs), The Electroencephalogram (EGG), The Phonocardiogram (PCG), The speech signal.

**Unit-2**

**Filtering For Removal of Artifacts**

Time –domain Filters-synchronized averaging, Moving Average Filters, Derivative-based operators to remove low frequency artifacts. Frequency- domain filters-Removal of High Frequency noise; Butterworth, Low pass filters. Removal of low frequency noise; Butterworth, high pass filters. Removal of periodic artifacts: Notch and comb Filters.

**Unit-3**

**Event Detection**


**Unit 4**

**Analysis of Non stationary signals**

Unit-5
Pattern classification and diagnostic Decision

L = 45 TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

BBM6L1 BIOSIGNAL AND IMAGE PROCESSING LAB

OBJECTIVES:
To study about the characteristics, working and applications of various devices in the field of bio sensors and transducers.

Lab Outcomes:
CO01: To understand the computation of convolution.
CO02: To learn the Response of a difference equation to initial conditions.
CO03: To learn the DFT computation.
CO04: To perform Computational experiments with digital filtering.
CO05. To learn Sampling and waveform generation.
CO06. To learn FIR and IIR filters implementation.
CO07. To learn the characteristics of ECG signals, EEG signals and EMG signals.
CO08. To learn the Image arithmetic operations.
CO09. To learn the Gray level transformation.
CO10. To learn the characteristics of Spatial Filters and Gaussian Filter.
CO11. To learn about FFT Discrete Fourier transform.
CO12. To learn the Properties of Fourier transform- FFT SHIFT, IFFT SHIFT.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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B.Tech – Biomedical Engineering
Bharath Institute of Higher Education and Research
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. Simulation of Biosignals and Analysis of ECG signals, EEG signals and EMG signals.
8. Image arithmetic operations – Addition, Subtraction, Multiplication and Division of 2 images.
10. Spatial Filters-Salt and pepper noise, speckle noise, Average Filter and Gaussian Filter
12. Properties of Fourier transform- FFT SHIFT, IFFT SHIFT
OBJECTIVES:
To learn C++ programming language, be exposed to the different data structures and be familiar with applications using different data structures.

OUTCOMES:
At the end of the course, the students would
- CO01 - Have a fundamental knowledge of the basic concepts of C++
- CO02 - Have a well-founded knowledge of programming in C++
- CO03 - Acquire skills in handling the file with different operation
- CO04 - Have a fundamental knowledge of the basic concepts of Java
- CO05 - Able to understand the concepts of Java.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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3. Model Examination | 3. Industry
4. Viva Voce | 4. Alumni
5. End Semester Examinations | 6. End Semester Examinations

C++ PROGRAMMING
1. Simple C++ Program.
2. Function overloading.
3. Operator overloading.
4. Inheritance.
5. Virtual functions and Dynamic binding.
6. Templates.
7. File Handling.
8. Exception handling.

Java Programming
1. Simple Java programs.
2. Inheritance.
3. Event handling programs.
OBJECTIVES:
To learn about the historical information of hospitality and recent trends in the Hospital information system.

OUTCOMES:
At the end of the course, the students would
CO01 - Have Knowledge about the historical information of hospital.
CO02 - Have a well-founded knowledge of overview of computer hardware used in the Hospital Information system
CO03 - Have a fundamental knowledge of Hospital Information system
CO04 - Have a skills about the visual programming and multimedia information.
CO05 - Acquire the skills integrated medical information system.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course content
UNIT-1
BIOMEDICAL INFORMATION SYSTEM
Historical Highlights of health care information system-Biomedical information system-problems and pitfalls-History and evolution of Electronic resources, Multimedia components.

UNIT-2
OVERVIEW OF COMPUTER HARDWARE
Motherboard and its logic-Memory and I/O interfacing/memory and input output mapping-I/O peripherals and Add-on cards.

UNIT-3
HOSPITAL INFORMATION SYSTEM
Concept of HIS its position in hospital-introduction of a computerized HIS Automation of medical record-cost and Benefits of HIS-Modems and Networking in Hospitals.
UNIT-4
VISUAL PROGRAMMING AND MULTIMEDIA INFORMATION
Visual Basic Principles and Programming-Design, Production and Testing of Multimedia based HIS.

UNIT-5
INTEGRATED MEDICAL INFORMATION SYSTEM
Integration of inter and intra hospital information system. Role of expert systems-web based Multimedia information system-Video-conferencing-PowerPoint Presentation.

L = 45 TOTAL: 45 PERIODS

Text book:

References:

BBM702 NEURAL NETWORKS AND PATTERN RECOGNITION

OBJECTIVES:
• To learn about the Neurophysiology and biological network
• To extract the model of network and its process

OUTCOMES:
At the end of the course, the students would
CO01- Have to know about the process of neurophysiology.
CO02- Have to gain knowledge about the neural networking process such as back propagation
CO03- Have a fundamental knowledge of pattern recognition
CO04- Have a skills about the manipulating, transforms using classifiers theorems.
CO05- Acquire the skills cluster analysis and feature extraction

CO/PO Mapping

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Course content

UNIT I
ADAPTIVE LINEAR COMBINER
Elementary neurophysiology and biological neural network-Artificial neural network, Adeline and Madeline.

UNIT II
BACK PROPOGATION AND ASSOCIATE MEMORY
Back propogation network, generalized delta rule, Bidirectional associate memory, Hopefield memory architecture.

UNIT III
PRINCIPLES OF PATTERN RECOGNITION
Patterns and features, training and learning in pattern recognition, pattern recognition approach, different types of pattern recognition.

UNIT IV
DECISION MAKING
Bayer’s theorem, multiple features, decision boundaries, estimation of error rates, histogram, kernels, window estimaters, nearest neighbor classification, maximum distance pattern classifier, adaptive decision boundaries.

UNIT V
CLUSTER ANALYSIS AND FEATURE EXTRACTION
Unsupervised learning, hierarchical clustering, Graph theories approach to pattern clustering, fuzzy pattern classifier, application of pattern recognition in medicine.

L = 45 TOTAL: 45 PERIODS

TEXT BOOK:
OBJECTIVES:
To learn about the health, hospital and equipment management.

OUTCOMES:
At the end of the course, the students would
CO01- Have Knowledge about the health organization of the country.
CO02- Have a well-founded knowledge hospital organization and management
CO03- Have a fundamental knowledge of regulatory requirement and health care codes
CO04- Have a skills about the equipment maintenance management
CO05- Acquire the skills Function, role of Clinical Engineer.

CO/PO Mapping

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| 2 Assignments    | 2 Faculty Survey    |
| 3 Seminar        | 3 Industry          |
| 4 Quiz           | 4 Alumni            |
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| 6 End Semester Examinations |        |

Course content

UNIT-I
HEALTH SYSTEM
Health organisation of the country, the state, the cities and the region, Health Financing System, Organisation of Technical Section.

UNIT-II
HOSPITAL ORGANISATION AND MANAGEMENT
Management of Hospital Organisation. Nursing section Medical Sector, Central Services, Technical Department, Definition and Practice of Management by Objective, Transactional Analysis Human relation in Hospital. Importance to Team Work, Legal aspect in Hospital Management

UNIT-III
REGULATORY REQUIREMENT AND HEALTH CARE CODES
FDA Regulation, joint commission of Accreditation for Hospitals, National Fire Protection Association Standard, IRPC.
UNIT-IV
EQUIPMENT MAINTENANCE MANAGEMENT

UNIT-V
TRAINED TECHNICAL PERSONNEL
Function of Clinical Engineer, Role to be performed in Hospital, Man power Market, Professional Registration, Structure in Hospital.

L = 45 TOTAL: 45 PERIODS

References:
4. Hans Pfeiff Vera Dammann (Ed.) Hospital Engineering In Developing Countries, Z report Eschborn, 1986.

BBM704 MODELLING OF PHYSIOLOGICAL SYSTEMS

OBJECTIVES:
To design the physiological systems

OUTCOMES:
At the end of the course, the students would
CO01- Have Knowledge about the physiological process in the biological system.
CO02- Have a skills to modeling of human thermal regulatory system
CO03- Have a fundamental basis for respiratory system
CO04- Have a skills to design the Ultra Filtration system
CO05- To design the Model of body dynamics

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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B.Tech – Biomedical Engineering
Bharath Institute of Higher Education and Research
### Course Assessment Methods:

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### Course content

**UNIT I**

Physiological processes and principles of their control flow, gas exchange, Ultra filtration, biochemical reactions, pneumatic transport, digestion, Energy utilization and waste disposal, linear and nonlinear control systems, principles of open loop and feedback systems techniques for system Response characterization.

**UNIT II**

Modeling of human thermal regulatory system parameters involved, control system model etc. biochemistry of digestion, types of heat loss from body, models of heat transfer between subsystems of human body like skin core, etc. and systems like within body, body environment etc.

**UNIT III**

Respiratory system: Modeling oxygen uptake by RBC and pulmonary capillaries, mass balancing by lungs, gas transport mechanism of lungs, oxygen and carbon dioxide transport in blood and tissues.

**UNIT IV**

Ultra Filtration system Transport through cells and tubules, diffusion, factated diffusion and active transports, methods, of waste removal, counter current model of urine formation in nephron, moellir Henle's loop.

**UNIT V**

Modeling body dynamics: Principles of mechanical modeling of bone, tissues etc. modeling stress were propagation in bones, hills, model of muscle mechanisms Current trends: Pharmacokinetic modeling with illustrated example like drug diffusion, computer aided modeling etc.

**L = 45 TOTAL: 45 PERIODS**

### TEXT BOOKS:

1. Advanced Methods of Physiological System Modeling by V.Z. Marmarelis
2. Applied mathematical model in Human Physiology, by Johnny T. Ottesen, Mette S. Olufsen, Jesper K.Larsen
REFERENCE BOOKS:
1. Physiological basis of Ventilatory Support, By John. J. Marini, Arthur S. Slutsky

BBM7L1 PATHOLOGY AND MICROBIOLOGY LAB  L  T  P  C  0  0  3  2

OBJECTIVES:
- To learn about the cell structure and its disorders
- To gain knowledge about the fundamental structure of virus, bacteria and its causes

OUTCOMES:
At the end of the course, the students would
CO01- Have a Fundamental Knowledge about the cell and concepts of tumor.
CO02- Have to learn about the fluid present in the body and hemodynamic derangement
CO03- Have a fundamental knowledge of real time imaging with basic hardware architecture, algorithms and transform techniques
CO04- Have knowledge about basic concepts of infection and immunity of the human body
CO05- Acquire the fundamental knowledge of structure of Bacteria, virus and its causes.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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2 Record Book | 2 Faculty Survey
3 Model Examination | 3 Industry
4 Viva Voce | 4 Alumni
5 End Semester Examinations |

LIST OF EXPERIMENTS:
2. Peripheral smear study (i) Morphology.
   (ii) Different count,
   (iii) Total count.
4. Cytopathic effect.
5. Study on inclusion bodies.
6. Antigen-Antibody reaction Immuno electrophoresis.
7. Simple staining.
8. Gram staining.
9. Acid-fast staining.
10. IMVIC test.
11. Oxidase-Citrate.
13. Cutting section and staining.

BBM801  REHABILITATION ENGINEERING  L  T  P  C
3  0  0  3

OBJECTIVES:
To learn about the rehabilitation engineering and its process.

OUTCOMES:-
At the end of the course, the students would
CO01- Have basic Knowledge about the principles of rehabilitation engineering.
CO02- Have a well-founded knowledge of mechanics of wheel chair and its type
CO03- Have a fundamental knowledge about the applications of Orthopedic Prosthetics
CO04- Have a skills about the Sensory Rehabilitation Systems.
CO05- Acquire the skills applications of rehabilitation.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course content
Unit 1
Introduction to Rehabilitation:
Principles involved in the study of Rehabilitation Engineering, HAAT – Human Activity Assistive Technology.

Unit 2
Rehabilitation Engineering Science & Technology:
Rehabilitation engineering concepts in motor rehabilitation engineering concepts in communication disorders.Wheel chairs: Categories of Wheelchairs, Wheelchair structure and Component design, Ergonomics of Wheelchair Propulsion, Power Wheelchair Electrical

Unit 3
Orthopedic Prosthetics & Orthotics in Rehabilitation Technology: 9

Unit 4
Sensory Rehabilitation Systems: 9

Unit 5
Réhabilitation Engineering Technologies: Principles of Application: 9
Conceptual frameworks, Education and Quality Assurance, Specific Impairments and Related technologies, Future Developments – Rehabilitation Robotics, and Brain computer interface systems.

Text Book:

Reference:
3. Leon Goldman m.d.r James Rockwell. J.r Lasers in medicine.

OBJECTIVES:
To learn about the basic mechanics of Tissue Engineering, model of artificial organs and it process.

OUTCOMES:
At the end of the course, the students would
CO01- Have Fundamental Knowledge about the tissue Engineering.
CO02- Have a well-founded knowledge of cell mechanics and its effect
CO03- Have a basic concepts of tissue barriers to molecular and cellular transport
CO04- Have a skills about the tissue replacement implant.
CO05- Have a fundamental knowledge about the artificial organs.
### CO/PO Mapping

**S** – Strong, **M** – Medium, **W** – Weak

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REFERENCES:


BBM052 BIOLOGICAL EFFECTS OF RADIATION

OBJECTIVES:
To learn about effects of radiation in the biological system.

OUTCOMES:-
At the end of the course, the students would

CO01- Have Knowledge about the theory related to radiation in the living cell.
CO02- Have a well-founded knowledge somatic application of radiation.
CO03- Have a fundamental knowledge of genetic effects of radiation
CO04- Have a skills about effect of microwave and RF with matters.
CO05- Acquire the skills radiation effects.

CO/PO Mapping

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UNIT – I
ACTION OF RADIATION IN LIVING CELLS

Various theories related to radiation at cellular level. DNA and chromosomal damages.

UNIT – II
SOMATIC APPLICATION OF RADIATION
Radio sensitivity protocols of different tissues of human. LD50/30 effective radiation on skin. Bone marrow, eye, endocrine glands, and basis of radio therapy.

UNIT – III
GENETIC EFFECTS OF RADIATION

Threshold and linear dose, gene control hereditary diseases effect of dose.

UNIT – IV
EFFECT OF MICROWAVE AND RF WITH MATTERS

Effects of various human organs and systems, Wavelength in tissue, non thermal interaction. Standards of protection, national, and international standards and precautions.

UNIT – V
UV RADIATION

Classification of sources, measurement, photo medicine, UV radiation, safety visible and infrared Radiation.

$L = 45$ TOTAL: 45 PERIODS

Reference:

BBM053 DATA MINING

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OBJECTIVE:
1. To introduce data mining. Its concepts and class description.
2. To study the Data Mining Primitives-Languages & system Architecture-Data mining query language-Designing graphical user interfaces. Data Warehousing-Introduction-Data marts
3. Introduction to mining association rules in target databases.
4. Basics of classification & prediction-Cluster analysis. Types of data in cluster analysis. Developing a Data Warehouse-Design considerations

COURSE OUTCOMES
CO01 - To learn the concepts of data mining and a clear description about the class.
CO02 - To learn data mining query language, architecture of data mining systems.
CO03 - To have a clear Basics of classification & prediction, Cluster analysis. Types of data in cluster analysis.
CO04 - To learn Data Warehousing, Introduction, Data marts Online analytical processing OTLP-OLAP tools.
CO05 - To learn Data Warehouse, design considerations, Data content-Meta data, Distribution of data.
CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course content:

UNIT-I
What is data mining? Data mining, on what kind of data? Relational databases-Transactionaldatabases-concepts/class description-Characterization-Association analysis-cluster analysis-Outlier analysis-Evolution analysis-Data preparation-Data cleaning-Data Integration&transformation-Data reduction-Discretization&concept hierarchy generation.

UNIT-II
Data Mining Primitives-Languages&system Architecture-Data mining query language-Designing graphical user interfaces based on data mining query language-Architecture of data mining systems-Introduction to mining association rules in large databases.

UNIT-III
Basics of classification&prediction-Cluster analysis-Types of data in cluster analysis-Partitioning methods-Neural networks&decision trees-Nearest neighbour induction rule.

UNIT-IV
Data Warehousing-Introduction-Data marts/loading, meta data, data model, maintenance, nature&software components)-Online analytical processing0OTLP-OLAP tools.

UNIT-V
Developing a Data Warehouse-Design considerations-Data content-Meta data-Distribution of data-Performance considerations-Applications - National data warehouses;
REFERENCE:
3."Data Warehouse Project Management,"Sid Ado/man & larissa T.Moss, Addison Wesley

BBM054 BIOINFORMATICS L T P C
3 1 0 4

OBJECTIVE:
2. To study Strings-Edit distance two strings-string similarity local alignment gaps-parametric sequence alignments.
3. To study Introduction to databases-database search-Algorithms issues in database search-sequence database search FASTA-BLAST.
4. Introduction to Ultrasonic trees-parsimony-Ultrametric problem-perfect phylogeny.
5. DNA Mapping and sequencing-Map alignment-Large scale sequencing and alignment.

COURSE OUTCOMES
CO01 - To learn bioinformatics and the protocols.
CO02- To learn Strings-Edit distance two strings-string similarity local alignment gaps-parametric sequence alignments.
CO03 - To have a clear view on Amino acid substitution matrices PAM and BLOSSUM.
CO04 –To learn Ultrasonic trees-parsimony-Ultrametric problem-perfect phylogeny-phyllogenetic alignment.
CO05- To DNA Mapping and sequencing-Map alignment-Large scale sequencing.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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**Course content:**

**UNIT – 1: WHAT IS BIOINFORMATICS**

Scope of Bioinformatics-Elementary commands and protocols, ftp, telnet, http. Primer on information theory.

**UNIT – 2: SEQUENCING ALIGNMENT AND DYNAMIC PROGRAMMING**

Introduction-Strings-Edit distance two strings-string similarity local alignment gaps-parametric sequence alignments-suboptimal alignments-multiple alignment-common multiple alignment methods.

**UNIT – 3: SEQUENCE DATABASE AND THEIR USE**

Introduction to databases-database search-Algorithms issues in database search-sequence database searchFASTA-BLAST-Amino acid substitution matrices PAM and BLOSSUM.

**UNIT – 4: EVOLUTIONARY TREES AND PHYLOGENY**

Ultrasonic trees-parsimony-Ultrametric problem-perfect phylogeny-phylogenetic alignment-connection between multiple alignment and tree construction.

**UNIT – 5: SPECIAL TOPICS IN BIOINFORMATICS**

DNA Mapping and sequencing-Map alignment-Large scale sequencing and alignment-Shotgun-DNA sequencing-Sequence assembly-Gene predictions-Molecular predictions with DNA strings

\[ L = 45 \text{ TOTAL: 45 PERIODS} \]

**Text book:**

**References:**
BBM055  TELEMEDICINE

OBJECTIVE:
1. To introduce telemedicine advancements in telemedicine. Benefits of telemedicine, Functional Block of a telemedicine system, Tele healthcare and E-medicine.
2. To study Communication infrastructure for telemedicine LAN and WAN technology Satellite communication, Mobile hand held devices and mobile communication Internet technology and telemedicine using World Wide Web Video and audio conferencing.
3. Introduction to Network Configuration, circuit and packet switching.
4. Introduction to Archives Electronic Documentation Business aspects Common Access to Biological Resources and Information (CABRI) Database indexing and search terms Nucleic and genome databases Molecular data base and servers.
5. To learn Ethical and legal issues of Telemedicine - Confidentiality and the law - Patient rights and consent - Access to medical Records.

COURSE OUTCOMES
CO01 - To learn introduce telemedicine advancements in telemedicine. Benefits of telemedicine, Functional Block of a telemedicine system, Tele healthcare.
CO02 - To learn Mobile hand held devices and mobile communication - Internet technology and telemedicine using World Wide Web - Video and audio conferencing.
CO03 - To have a clear view on, medical images diagnosis and treatment - Hospital information - Doctors, paramedics, facilities available.
CO04 – To learn Protein Identification Resource (PIR) - Telemedicine in Neuroscience - Telecardiology – Teledermatology - Teleneurology
CO05 - To learn Telemedicine technology and Health care delivery for rural population - Use of telemedicine technology for clinical diagnostic study.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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### Course content:

#### UNIT I  **FUNDAMENTALS OF TELEMEDICINE**


#### UNIT II  **COMMUNICATION SYSTEMS AND NETWORKS IN TELEMEDICINE**


#### UNIT III  **DATA EXCHANGE, MANAGEMENT, SECURITY AND STANDARDS IN TELEMEDICINE**


#### UNIT IV  **APPLICATIONS OF TELEMEDICINE**


#### UNIT V  **ETHICAL ASPECTS AND CASE STUDIES IN TELEMEDICINE**

- Ethical and legal issues of Telemedicine - Confidentiality and the law - Patient rights and consent - Access to medical Records - Consent treatment - Jurisdictional Issues - Intellectual property rights - Telemedicine technology and Health care delivery for rural population - Use of telemedicine technology for clinical diagnostic study - Conceptual frame work on home telemedicine.
TOTAL NO. OF HOURS: 45

TEXT BOOKS


REFERENCES


OBJECTIVE:
1. To introduce microcontroller, the role of microcontrollers. Types and selection, its application and examples.
2. To study the microcontroller resources and Family members, bus widths program and data memory parallel ports. D/A and A/D convertors, reset circuitry, watchdog timers, power down considerations.
3. To study Interrupt structures programmable timers, real time clock, latency, interrupt, density and interval constraints.
4. To study CPU register- structure- addressing modes- instruction sets- assembly languages- assemblers.
5. To study Queues, tables and strings, program organisation, microcontroller expansion methods, I/O hardware alternatives, development tools, RTOS.

COURSE OUTCOMES
CO01 - To learn introduce microcontroller the role of microcontrollers. The Types and selection.
CO02 - To learn D/A and A/D convertors, reset circuitry, watchdog timers, power down considerations.
CO03 - To have a clear view Interrupt structures programmable timers, real time clock.
CO04 – To learn CPU register its structure and its addressing modes and instruction sets.
CO05 - To learn I/O hardware alternatives, development tools, RTOS, motorola MC68HC11.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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UNIT-1: THE ROLE OF MICROCONTROLLERS

Types and selection- application example

UNIT-2: MICROCONTROLLER RESOURCES

Family members, bus widths program and data memory parallel ports. D/A and A/D convertors, reset circuitry, watchdog timers, power down considerations.

UNIT-3: REAL TIME CONTROL

Interrupt structures programmable timers, real time clock, latency, interrupt, density and interval constraints.

UNIT-4: PROGRAMMING FRAMEWORK FOR 8051 AND PC16F877

CPU register- structure- addressing modes- instruction sets- assembly languages- assemblers.

UNIT-5: SOFTWARE BUILDING BLOCKS

Queues, tables and strings, program organisation, microcontroller expansion methods, I/O hardware alternatives, development tools, RTOS, motorola MC68HC11 and intel 8051.

L = 45 TOTAL: 45 PERIODS

Textbooks:


BEI062 VLSI DESIGN

L T P C
3 0 0 3

OBJECTIVE:

1. To introduce NMOS, PMOS, CMOS devices and their characteristics.
2. To study CMOS inverter design principles, design layout rules, construction of multiplexers
3. To study Combinational logic and sequential logic circuits.
4. To study Design concepts- design tools, simulators, introduction to VHDL- sequential and concurrent descriptions- signal port and variable statements.

COURSE OUTCOMES

CO01 - To learn NMOS, PMOS, CMOS devices characteristics, linear saturating modes, bulk effect capacitances, device models for simulation CMOS device fabrication principles.
CO02 - To learn CMOS inverter design principles, design layout rules, construction of multiplexers, transmission gates, latches, flip flops, timing and fan out considerations.
CO03 - To have a clear view on Combinational logic and sequential logic circuits. Data path circuits. Adder multiplier architecture and accumulators.
CO04 – To learn simulation of VHDL code, VHDL, functions, procedures, packages and libraries, introduction to verilog and brief comparison with VHDL.
**CO05**- To learn FPGA design flow for logic gates, ALU, multiplexer, flip flop, counter.

### CO/PO Mapping

**S – Strong, M – Medium, W – Weak**

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### COURSE ASSESSMENT METHODS:

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### Course content:

**UNIT-1: BASIC DEVICE CHARACTERISTICS**

NMOS, PMOS, CMOS devices characteristics, linear saturating modes, bulk effect capacitances, device models for simulation CMOS device fabrication principles.

**UNIT-2: BASIC CIRCUITS FOR DIGITAL SYSTEMS**

CMOS inverter design principles, design layout rules, construction of multiplexers, transmission gates, latches, flip flops, timing and fan out considerations.

**UNIT-3 : BUILDING BLOCKS OF DIGITAL SYSTEMS**

Combinational logic and sequential logic circuits. Data path circuits. Adder multiplier architecture and accumulators.

**UNIT-4: DIGITAL DESIGN USING VHDL**

Design concepts- design tools, simulators, introduction to VHDL- sequential and concurrent descriptions- signal port and variable statements- case and other sequential statements-compilation and simulation of VHDL code- VHDI, functions- procedures - packages and libraries- introduction to verilog and brief comparison with VHDL

**UNIT-5 : FPGA DESIGN**
VHDL model for combinational networks- routing procedures in FPGA and CPLD programming, methods for FPGA and CPLD- simulation and synthesis issues- FPGA architecture - FPGA design flow for logic gates, ALU, multiplexer, flip flop, counter.

L = 45 TOTAL: 45 PERIODS

References:


BEI063  DIGITAL SYSTEM DESIGN:  

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OBJECTIVE:

1. To introduce Circuit diagram of Til, CMOS, NMOS, ECL, GaAs building blocks, operating conditions, interfacing between different families.
2. To study CAN bus characteristics. Bus interface for R8422 and RS485.
3. To study Principles of PAL’s PLD’s GAL’s CPLD and their design considerations.
4. To study Principles and design considerations of specific PROM, EPROM, SRAM, SDRAM. Dual ported memories, FIFO’s flash memories
5. To study Multiphase clock generators, LCD display controller.

COURSE OUTCOMES

**CO01** - To learn interpreting data sheet of 74 series, CD 4000 series, ECL 10000 series-power supply considerations for digital IC.

**CO02** - To learn RS-232, RS-485, R8422, ISA, PCL, HC, SPI, CAN bus characteristics. Bus interface for R8422 and RS485

**CO03** - To have a clear view on Principles of PAL’s PLD’s GAL’s CPLD and their design considerations.

**CO04** - To learn Principles and design considerations of specific PROM, EPROM, SRAM, SDRAM. Dual ported memories, FIFO’s flash memories.

**CO05** - To learn Multiphase clock generators, LCD display controller, PRBS generator, watch dog timer, interfacing with SPI bus, interfacing with flash memory.

**CO/PO Mapping**

| S – Strong, M – Medium, W – Weak |

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B.Tech – Biomedical Engineering  
Bharath Institute of Higher Education and Research
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UNIT-1: DIGITAL LOGIC FAMILIES

Circuit diagram of TTL, CMOS, NMOS, ECL, GaAs building blocks, operating conditions, interfacing between different families- interpreting data sheet of 74 series, CD 4000 series, ECL 10000 series- power supply considerations for digital IC.

UNIT-2: DIGITAL SYSTEM BUS CHARACTERISTICS

RS-232, RS-485, R8422, ISA, PCL, HC, SPI, CAN bus characteristics. Bus interface for R8422 and RS485

UNIT-3: PROGRAMMABLE LOGIC DEVICES

Principles of PAL’s PLD’s GAL’s CPLD and their design considerations

UNIT-4: DIGITAL MEMORIES

Principles and design considerations of specific PROM, EPROM, SRAM, SDRAM. Dual ported memories, FIFO’s flash memories.

UNIT-5: DIGITAL SYSTEM DESIGN CASE STUDIES

Multiphase clock generators, LCD display controller, PRBS generator, watch dog timer, interfacing with SPI bus, interfacing with flash memory.

L = 45 TOTAL: 45 PERIODS

Textbooks:

OBJECTIVE:
1. To introduce Historical perspectives, advantages, block diagram and architecture of a virtual instrument, data flow techniques.
2. To study CAN bus characteristics. Bus interface for R8422 and RS485.
3. To study Principles of PAL’s PLD’s GAL’s CPLD and their design considerations.
4. To study Principles and design considerations of specific PROM, EPROM, SRAM, SDRAM.
   - Dual ported memories, FIFO’s flash memories
5. To study Multiphase clock generators, LCD display controller.

COURSE OUTCOMES

CO01 - To learn interpreting data sheet of 74 series, CD 4000 series, ECL 10000 series power supply considerations for digital IC.

CO02 - To learn RS-232, RS-485, R8422, ISA, PCL, HC, SPI, CAN bus characteristics. Bus interface for R8422 and RS485

CO03 - To have a clear view on Principles of PAL’s PLD’s GAL’s CPLD and their design considerations.

CO04 –To learn Principles and design considerations of specific PROM, EPROM, SRAM, SDRAM. Dual ported memories, FIFO’s flash memories.

CO05 - To learn Multiphase clock generators, LCD display controller, PRBS generator, watch dog timer, interfacing with SPI bus, interfacing with flash memory.

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UNIT-1: REVIEW OF VIRTUAL INSTRUMENTATION
Historical perspectives, advantages, block diagram and architecture of a virtual instrument, data flow techniques. Graphical programming in data flow, comparison with conventional programming.

UNIT-2: VIRTUAL INSTRUMENTATION PROGRAMMING TECHNIQUES 9

VIS and subVIS loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O.

UNIT-3: DATA ACQUISITION BASICS 9

ADC, DAC, DIO, counters and timers. PC hardware structure, timing, interrupts, DMA, software and hardware installation.

UNIT-4: COMMON INSTRUMENT INTERFACES 9

Current loop, RS232C/RS485, GPIB, system buses, interface buses: USB, PCMCIA, VXI, SCXI, PXI etc., networking basics for office and industrial applications, visa and IVI, image acquisition and processing, motion control.

UNIT-5: USE OF ANALYSIS TOOLS 9

Fourier transforms, power spectrum correlation methods, windowing uttering, VI application in various fields.

L = 45 TOTAL: 45 PERIODS

Textbooks:


BBM056     BIOPROCESS TECHNOLOGY     L   T     P    C

3 1 0 4

OBJECTIVE: To learn introduction and technology of bioprocess, screening, preservation. To clear view of Bioreactor design. Batch, fed batch and continuous cultivation. Growth rate parameters: Specific growth rate, doubling time. Kinetics and thermodynamics of enzyme-catalyzed reactions, techniques of enzyme immobilisation

COURSE OUTCOMES

CO01 – To learn introduction and technology of bioprocess, screening, preservation
CO02 – To clear view of Bioreactor design. Batch, fed batch and continuous cultivation.
CO03 – To learn about Growth rate parameters: Specific growth rate, doubling time
CO04 – To learn Kinetics and thermodynamics of enzyme-catalyzed reactions, techniques of enzyme immobilisation,
CO05 – To clear view methods of on-line and off-line biomass estimation; Flow injection analysis for measurement of substrates.

### CO/PO Mapping

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**S – Strong, M – Medium, W – Weak**

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1. **INTRODUCTION OF BIOPROCESS TECHNOLOGY**  
Introduction to bioprocess technology, Screening, preservation and improvement of industrially important microorganisms, Raw material and media formulation for fermentation process, Influence of environmental factors on growth and product formation.

2. **BIOREACTORS**  
Bioreactor design. Batch, fed batch and continuous cultivation. Solid state cultivation. Sterilization of media reactor and air. Agitation and aeration and mass transfer of oxygen. Inoculum development, addition and sampling.

3. **GROWTH RATE ANALYSIS**  
Growth rate parameters: Specific growth rate, doubling time, validity of exponential growth law, growth yield, metabolic quotient, Effect of substrate concentration, Monod Kinetics, Determination of Ks, Definition of lag period.

4. **ENZYME TECHNOLOGY**
Kinetics and thermodynamics of enzyme-catalyzed reactions, techniques of enzyme immobilisation, basic design and configuration of immobilised enzyme reactors, applications of immobilised enzyme technology.

5. BIOPROCESS ESTIMATIONS

Methods of on-line and off-line biomass estimation; Flow injection analysis for measurement of substrates. Product and other metabolites; State and parameter estimation techniques for biochemical processes; Computer-based data acquisition, monitoring and control-LABVIEW Software.

L = 45 TOTAL: 45 PERIODS

Reference Books:
1. Principles of Fermentation Technology : Whitekar & Stanbury
2. Industrial Microbiology – Casida

BBM057 ROBOTICS AND NANOTECHNOLOGY

OBJECTIVE: To learn about origin of robotics, different types of robotics, various generations of robots, Hydraulic, pneumatic and electric drives determination of HP of motor and gearing ratio variable speed arrangements, Construction of manipulators manipulator dynamics and force control

COURSE OUTCOMES

CO01 – To learn about origin of robotics, different types of robotics, various generations of robots
CO02 – To clear view of Hydraulic, pneumatic and electric drives determination of HP of motor and gearing ratio variable speed arrangements
CO03 – To learn about Construction of manipulators manipulator dynamics and force control
CO04 – To clear view of Basic concepts of Nano science and technology, Quantum wire, Quantum well, Quantum dot
CO05 – To learn about Material processing by Sol, Gel method, Chemical Vapor deposition and Physical Vapor deposition

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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L. Tech – Biomedical Engineering
Bharath Institute of Higher Education and Research
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UNIT – I

BASIC CONCEPTS
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.

UNIT – II

POWER SOURCES AND SENSORS

UNIT – III

MANIPULATORS, ACTUATORS AND GRIPPERS

UNIT IV

NANO MATERIALS AND NANOTECHNOLOGY
Basic concepts of Nano science and technology – Quantum wire – Quantum well – Quantum dot – Properties and technological advantages of Nanomaterials – Carbon Nanotubes and applications

UNIT V

MATERIALS PROCESSING AND CHARACTERISATION:
Material processing by Sol – Gel method, Chemical Vapor deposition and Physical Vapor deposition – Microwave Synthesis of materials – Principles of SEM, TEM and AFM - Fluorescence Microscopy and Imaging.

L = 45 TOTAL: 45 PERIODS

TEXT BOOK

BBA702  PROFESSIONAL ETHICS  L  T  P  C
3  1  0  4

OBJECTIVE: To learn about nature of management, management science or art, origin of robotics, different types of robotics and historical evolution of management

COURSE OUTCOMES:
CO01 – To learn about nature of management, management science or art
CO02 – Have clear view of origin of robotics, different types of robotics
CO03 – To learn about historical evolution of management
CO04 – Have a clear idea on planning, important steps, types and objects. mbo- swot- concept
CO05 - to learn about social responsibility of managers- benefits of professional ethics

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course Contents
UNIT I
CONCEPTUAL HUMAN ISSUES AND HUMAN VALUES
Nature of Management- Management science or art- Management as profession-
Universality of Management- Technical, human and conceptual- Manager Vs Entrepreneurs-
Managers Vs Leaders- Guidelines for managerial success.

UNIT II
HISTORICAL EVOLUTION OF MANAGEMENT
UNIT III
PLANNING AND ORGANIZING
Planning- important steps- types and objects. MBO- SWOT- Concept and features of strategy- policy and strategy- Forecasting and decision making – creativity and decision making- Organizing- Organizing structure- Organization Chart- Span of management- Authority and responsibility- Measure for effective delegation- Centralization and decentralization- Line and staff relationships.

UNIT IV
DIRECTING AND CONTROLLING
Direction- concept of direction- effective supervision- concept of leadership- Control- concept of control- quantitative and qualitative measures of control- TQM- Quality circle- ISO 9000 quality systems- PCMM level

UNIT V
CONTEMPORARY MANAGEMENT ISSUES AND HUMAN VALUES
Social responsibility of managers- benefits of professional ethics- Values, value system of Indian managers- Ethics- Business, nature, importance in organization- Managing ethical dilemmas- shaping and maintaining the ethical culture- protection of stake holders- Whistle blowing.

L = 45 TOTAL: 45 PERIODS

Reference:
OBJECTIVE: To learn about Hospital Organization and the Role of Clinical Engineering, Clinical Engineering Programs To clear view of The Health Care Delivery System, Strategic Technology Planning, Technology Assessment, To learn about Quality Improvement, Standard Database, Measurement Indicators

COURSE OUTCOMES:
CO01 – To learn about hospital organization and the role of clinical engineering, clinical engineering programs
CO02 – To get a clear view of the health care delivery system, strategic technology planning, technology assessment
CO03 – To learn about quality improvement, standard database, measurement indicators.
CO04 – To clear view Deming’s 14 Points, Zero Defects, TQM (Total Quality Management) and tools
CO05 – To learn about quality improvement, standard database, measurement indicators.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course Contents

UNIT – 1 CLINICAL ENGINEER
Definition, Evolution of Clinical Engineering – interactions of a clinical engineer, Hospital Organization and the Role of Clinical Engineering, Clinical Engineering Programs

UNIT -2 MANAGEMENT AND ASSESSMENT OF MEDICAL TECHNOLOGY AND RISK FACTORS

UNIT -3 QUALITY OF IMPROVEMENT AND TEAM BUILDING  9
Deming’s 14 Points, Zero Defects, TQM (Total Quality Management) and Tools Used for Quality Improvement, Standard Database, Measurement Indicators.

UNIT -4  9
Standards Regulatory and Assessment Agencies, Standards for clinical Engineers, Regulatory Agencies, Technology Assessment Agencies

UNIT -5 APPLICATIONS OF VIRTUAL INSTRUMENTS IN HEALTH CARE  9
Application with Examples, Trending, Relationships, and Interactive Alarms, Data Modeling, Medical Equipment Risk Criteria, Peer Performance Reviews

L = 45 TOTAL: 45 PERIODS

REFERENCES

BBM059 COMPUTER NETWORKS L T P C
3 1 0 4

OBJECTIVE: To learn about Transmission media, Data encoding, Interface and Modems, Multiplexing clear view ISO – OSI layered architecture, learn about Frames relay operation – layers and traffic control; ATM networks, LAN topology, Ethernet, Token bus, Token ring, FDDI, Wireless LAN

COURSE OUTCOMES:

CO01- To learn about transmission media, data encoding, interface and modems, Multiplexing
CO02 – To get a clear view of ISO – OSI layered architecture
CO03 – To learn about Frames relay operation – layers and traffic control; ATM networks
CO04 – To clear view LAN topology, Ethernet, Token bus, Token ring, FDDI, Wireless LAN
CO05 – To learn about Transport layer issues, session layer, Synchronization, Presentation layer

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course Contents

1. DATA COMMUNICATION CONCEPTS

2. WIDE AREA NETWORKS

3. FRAME RELAY AND ATM NETWORKS
Frames relay operation – layers and traffic control; ATM networks – Architecture switching, layers service classes.

4. LOCAL AREA NETWORK

5. OSI LAYERS
Transport layer issues – Session layer – Synchronization – Presentation layer – Encryption, decryption, Application layer – Message handling system, file transfer, virtual terminal – E-mail.

L = 45 TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES

BBM060 MEDICAL IMAGING TECHNIQUES

OBJECTIVE
To learn about Quality assurance and image improvement in diagnostic radiology with X-Rays. view Radio isotopic imaging equipments, radiation detectors. Learn about Development of NMR, relaxation processes and their measurements, MRI-Image

COURSE OUTCOMES
CO01 - To learn about Quality assurance and image improvement in diagnostic radiology with X-Rays
CO02 – To clear view Radio isotopic imaging equipments, radiation detectors
CO03 – To learn about Development of NMR, relaxation processes and their measurements, MRI-Image
CO04 – To clear view Concept of object and image, general image processing problem,
CO05- To learn about Single / multi user system, transferring of images, processing speed

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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Course Contents

UNIT I
DIFFERENT MODES OF MEDICAL RECORDING
Quality assurance and image improvement in diagnostic radiology with X-Rays, specific Quality assurance tests for X-rays, need for sectional images, principles of sectional images recording, computer tomography with different trajectories.

UNIT II
RADIOISOTOPIC IMAGES
Radio isotopic imaging equipments, radiation detectors, radionuclide for imaging, static and dynamic planar scintillography.

UNIT III
NUCLEAR MAGNETIC RESONANCE IMAGING
Development of NMR, relaxation processes and their measurements, MRI-Image acquisition and reconstruction, MRI safety.

UNIT IV
MATHEMATICS OF IMAGE FORMATION AND IMAGE PROCESSING
Concept of object and image, general image processing problem, discrete fourier representation and models for imaging, image restoration, image sampling, perception of moving images.

UNIT V
COMPUTER REQUIREMENT FOR IMAGING SYSTEM
Single / multi user system, transferring of images, processing speed, display of medical images, 3-D image display and its clinical applications.

L = 45 TOTAL: 45 PERIODS

TEXT BOOK

BBM061 BIOSTATISTICS

OBJECTIVE
To learn about Handling univariate and bivariate data – Measures of central tendency. Probability concepts – conditional probability – Baye’s theorem. Chi-square test for goodness of fit, independence of attributes. Small sample tests based on t and F distribution - Test for, single mean, difference between means, Paired t-test, test

COURSE OUTCOMES
CO01 - To learn about Handling univariate and bivariate data – Measures of central tendency
CO02 – To clear view Probability concepts – conditional probability – Baye’s theorem
CO03 – To learn about Chi-square test for goodness of fit, independence of attributes.
CO04 – To clear view Small sample tests based on t and F distribution - Test for, single mean, difference between means, Paired t-test, test
CO05- To learn about Introduction – Process control – control charts for variables - X and R,

CO/PO Mapping
S – Strong, M – Medium, W – Weak

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**Course Contents**

**UNIT I - INTRODUCTION TO BIO-STATISTICS (numerical problems only)**

**UNIT II – PROBABILITY & THEORETICAL DISTRIBUTIONS**
Theoretical distributions: Binomial, Poisson, Normal (Problems only).

**UNIT III - TESTING OF HYPOTHESIS**
Introduction – Large sample tests based on normal distribution - Test for single mean, difference between means, proportion, difference between proportion, standard deviation, difference between standard deviation. Chi-square test for goodness of fit, independence of attributes.

**UNIT IV - ANALYSIS OF VARIANCE**
Small sample tests based on t and F distribution - Test for, single mean, difference between means, Paired t-test, test for equality of variances. ANOVA– one –way classification, Two-way classification.

**UNIT V - STATISTICAL QUALITY CONTROL**

TOTAL: 60 PERIODS

**TEXT BOOKS**
OBJECTIVES:
1. Introduction to IPR.
2. To know Intellectual Property, General Agreement on Trade and Tariff (GATT) and WIPO mission.

OUTCOMES:
The learner will be able to:
CO01- To learn Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property) of IPR.
CO02- Learn the Industrial Designs and Integrated circuits of IP patents.
Protection of Geographical Indications at national and International levels.
CO03- To learn International convention relating to Intellectual Property and Establishment of WIPO.
CO04- To learn Indian Position , WTO,their difference and Strategies and Indian IPR legislations.
CO05- Case Studies on Patents.

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<td>2 Faculty Survey</td>
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<td>3 Seminar</td>
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<td>5 Online test</td>
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<td>6 End Semester Examinations</td>
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Course Contents:

UNIT I
UNIT II

UNIT III

UNIT IV

UNIT V
Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES