NATIONAL ENGINEERING COLLEGE
(An Autonomous Institution – Affiliated to Anna University Chennai)
K.R.NAGAR, KOVILPATTI – 628 503
www.nec.edu.in

REGULATIONS – 2011

DEPARTMENT OF
ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM AND SYLLABI OF
B.E.- ELECTRICAL AND ELECTRONICS ENGINEERING
REGULATIONS 2011
CURRICULUM AND SYLLABI FOR FULL TIME
B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER – I (Common to all B.E. / B.Tech. Degree Programmes)

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- *Common to all B.E. / B.Tech. Programmes*
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### SEMESTER VII- ELECTIVES

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### SEMESTER VIII

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## SEMESTER VIII - ELECTIVES

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UNIT I


Suggested activities:

2. Changing sentences from active to passive voice & vice versa.
3. Skimming, cloze exercises, exercises transferring information from text to graphic form – bar charts, flow charts.
4. Writing descriptions using descriptive words & phrases, and technical vocabulary.
5. Role play, conversation exercises, discussions, oral reporting exercises.

Any other related relevant classroom activity.

UNIT II


Suggested Activities:

1. a. Vocabulary activities using prefixes and suffixes.
   b. Exercises using questions – asking & answering questions.
2. Scanning the text for specific information.
4. Discussion activities and exploring creative ideas.

Any other related relevant classroom activity.

UNIT III


Suggested activities:

1. Providing appropriate context for the use of tenses
2. Listening and note-taking
3. (a) Writing sentence definitions and instructions
   (b) Identifying the discourse links and sequencing jumbled sentences.
4. Speaking exercises, discussions, role play exercises using explaining, convincing and persuasive Strategies.

Any other related relevant classroom activity.

UNIT IV

Modal verbs and Probability – Concord subject verb agreement (Correction of errors) – Cause and effect expressions – Extended Definition – Speaking about the future plans.
Suggested activities:
1. a. Making sentences using modal verbs to express probability
   b. Gap filling using relevant grammatical form of words.
2. Writing extended definitions
3. Speaking – role play activities, discussions, extempore speaking exercises speculating about the future.
   Any other related relevant classroom activity

UNIT V

Suggested activities:
1. a) Sentence completion exercises using ‘If’ conditionals.
   b) Gap filling exercises using gerunds and present participle forms
2. Reading comprehension exercises.
3. Role play, discussion, debating and speaking activities for stating, discussing problems and suggesting solutions.
4. Writing letters to officials and to the editor in formal/official contexts.
   Any other related relevant classroom activity.

TOTAL: 60 PERIODS

AREAS TO BE COVERED UNDER DIFFERENT HEADINGS:

A) Language focus
1. Suffixes and Prefixes
2. Transformation of words from one form to another (Derivatives from root words)
3. Matching words & meanings (synonyms)
4. Compound nouns
5. Degrees of comparison
6. Active and passive voice-impersonal passive
7. Tenses: simple present, simple past, simple future, present continuous, past continuous, Present Perfect.
8. Modal verbs
9. ‘Wh’ Question forms
10. Conditional clause
11. Gerunds and infinitives
12. Expressing Cause and effect
13. Concord
14. Punctuation
15. Writing definitions

B) Reading
1. Reading in context
2. Skimming and scanning
3. Scanning the text for specific information
4. Reading and note-making
5. Intensive reading for making inferences
6. Reading comprehension
C) Listening:
1. Listening and transfer of information
2. Listening & note taking

D) Writing:
1. Transformation of information from graphical data to written form and from written form to graphical form.
2. Paragraph writing – Description
3. Paragraph Writing – comparison and contrast.
4. Note-making
5. Writing Instructions
6. Jumbled sentences
7. Letter writing – Formal letters (Invitation, Accepting, Declining, Permission Letters) Letters to the editor

E) Speaking:
1. Discussing as a group and making oral reports,
2. Role play- Conversation techniques – convincing others
3. Creative thinking and speaking, Exploring creative ideas
4. Persuasive strategies
5. Speaking about the future plans
6. Extempore speech – Speaking exercises speculating about the future
7. Presentation of problems and solutions
8. Debates

TEXT BOOK:

REFERENCES

Extensive Reading:
BMA101 MATHEMATICS – I

UNIT I MATRICES

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY

UNIT III DIFFERENTIAL CALCULUS
Curvature in Cartesian co-ordinates – 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 co-ordinates – Area as double integral – Volume as triple integral.

TOTAL: 60 PERIODS

TEXT BOOK:

REFERENCES
BPH101 ENGINEERING PHYSICS – I

UNIT I ULTRASONICS

UNIT II LASERS

UNIT III FIBER OPTICS & APPLICATIONS

UNIT IV QUANTUM PHYSICS

UNIT V CRYSTAL PHYSICS
Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – NaCl, ZnS, diamond and graphite structures – Polymorphism and allotropy – Crystal defects – point, line and surface defects – Burger vector.

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES
BCY101  ENGINEERING CHEMISTRY – I  L T P C
3 0 0 3

UNIT I  WATER TECHNOLOGY  9
Characteristics – alkalinity – types of alkalinity and determination – hardness – types and estimation
by EDTA method (problems), Domestic water treatment – disinfection methods (Chlorination, ozonation. UV
treatment) – Boiler feed water – requirements – disadvantages of using hard water in boilers – internal conditioning (phosphate, calgon and carbonate conditioning methods) – external
conditioning – demineralization process – desalination and reverse osmosis.

UNIT II  POLYMERS AND COMPOSITES  9
Polymers – definition – polymerization – types – addition and condensation polymerization – free
radical polymerization mechanism ,Plastics – classification – preparation, properties and uses of PVC,
Teflon, polycarbonate, polyurethane, nylon-6,6, PET, Rubber – vulcanization of rubber, synthetic
rubbers – butyl rubber, SBR, Composites – definition, types polymer matrix composites – FRP only.

UNIT III  SURFACE CHEMISTRY  9
isotherms – adsorption of solutes from solution – role of adsorbents in catalysis, ion-exchange
adsorption and pollution abatement.

UNIT IV  NON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES  9
Nuclear energy – fission and fusion reactions and 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 – alkaline batteries – lead-acid, nickel-cadmium and
lithium batteries.

UNIT V  ENGINEERING MATERIALS  9
Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness,
refractoriness under load, dimensional stability, porosity, thermal spalling) – manufacture of alumina,
magnesite and zirconia bricks, Abrasives – natural and synthetic abrasives – quartz, corundum, emery,
garnet, diamond, silicon carbide and boron carbide. Lubricants – mechanism of lubrication, liquid
lubricants – properties – viscosity index, flash and fire points, cloud and pour points, oilyness – solid
lubricants – graphite and molybdenum sulphide. Nanomaterials – introduction to nanochemistry –
carbon nanotubes and their Applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES
BCS101 FUNDAMENTALS OF COMPUTING AND PROGRAMMING   L T P C
3 0 0 3

UNIT I  INTRODUCTION TO COMPUTERS  9
Classification of Computers – Basic Computer Organization – Number Systems.

UNIT II  COMPUTER SOFTWARE  9
Computer Software – Types of Software – Software Development Steps – Internet Evolution – Basic
Internet Terminology – Getting connected to Internet – Applications.

UNIT III  PROBLEM SOLVING AND OFFICE AUTOMATION  9
Planning the Computer Program – Purpose – Algorithm – Flow Charts – Pseudocode – Application
Software Packages – Introduction to Office Packages (not detailed commands for examination).

UNIT IV  INTRODUCTION TO “C”  9
Overview of “C” – Constants, Variables and Data Types – Operators and Expressions – Managing
Input and Output operators – Decision Making – Branching and Looping.

UNIT V  FUNCTIONS AND POINTERS  9
Handling of Character Strings – User-defined functions – Definitions – Declarations – Call by
reference – Call by value – Structures and Unions – Pointers – Arrays – The Preprocessor –
Developing a “C” Program : Some Guidelines.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES
   Education Inc. (2005).
BME101  ENGINEERING GRAPHICS  L  T  P  C
2  3  0  4

UNIT I  PLANE CURVES AND FREE HAND SKETCHING  12
CURVES USED IN ENGINEERING PRACTICES:
Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of
cyloid – construction of involutes of square and circle – Drawing of tangents and normal to the
above curves.
FREE HAND SKETCHING:
Representation of Three Dimensional objects – General principles of orthographic projection – Need
for importance of multiple views and their placement – First angle projection – layout views –
Developing visualization skills through free hand sketching of multiple views from pictorial views of
objects.

UNIT II  PROJECTION OF POINTS, LINES AND PLANE SURFACES  12
Projection of points and straight lines located in the first quadrant – Determination of true lengths and
true inclinations – Projection of polygonal surface and circular lamina inclined to both reference
planes.

UNIT III  PROJECTION OF SOLIDS  12
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one
reference plane by change of position method.

UNIT IV  SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES  12
Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane
and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of
simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces
of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V  ISOMETRIC AND PERSPECTIVE PROJECTIONS  12
Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated
prisms, pyramids, cylinders and cones, Combination of any two simple solids. Perspective projection
of prisms, pyramids and cylinders by visual ray method and vanishing point method.

TOTAL: 60 PERIODS

TEXT BOOK:

REFERENCES
6. Dhananjay A. Jolhe, “Engineering Drawing with an introduction to AutoCAD” Tata
LIST OF EXERCISES

I. MS Office

a) WORD PROCESSING
   1. Document creation, Text manipulation with Scientific notations.
   2. Table creation, Table formatting and Conversion.

b) SPREAD SHEET
   1. Chart - Line, XY, Bar and Pie.
   2. Formula - formula editor.
   4. Sorting and Import / Export features.

II SIMPLE C PROGRAMMING
   1. Data types, Expression evaluation, Conditional statements.
   2. Arrays.
   4. Functions.

TOTAL: 45 PERIODS

For programming exercises Flow chart and pseudocode are essential.

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 60 STUDENTS

HARDWARE

- LAN System with 66 nodes (OR) Standalone PCs – 66 Nos.
- Printers – 3 Nos.

SOFTWARE

- OS – Windows / UNIX Clone
- Application Package – Office suite
- Compiler – “C”
PHYSICS LABORATORY – I

LIST OF EXPERIMENTS

1. (a) Particle size determination using Diode Laser.
   (b) Determination of Laser parameters – Wavelength and angle of divergence.
   (c) Determination of acceptance angle in an optical fiber.
2. Determination of thickness of a thin wire – Air wedge method.
6. Determination of Hysteresis loss in a ferromagnetic material.

B. CHEMISTRY LABORATORY – I

LIST OF EXPERIMENTS

1. Estimation of hardness of Water by EDTA method.
2. Estimation of Copper in brass by EDTA method.
3. Determination of DO in water (Winkler’s method)
4. Estimation of Chloride in Water sample (Argentometric)
5. Estimation of alkalinity of Water sample
6. Determination of molecular weight and degree of polymerization using viscometry.
BME131  ENGINEERING PRACTICES LABORATORY  L  T  P  C
0  0  3  2

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE

BUILDINGS:

(a) 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.
(a) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise:
   Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
(e) Demonstration of plumbing requirements of high-rise buildings.

CARPENTRY USING POWER TOOLS ONLY:

(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise:
   Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE

WELDING:

(a) Preparation of arc welding of butt joints, lap joints and tee joints.
(b) Gas welding practice.

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.

MACHINE ASSEMBLY PRACTICE:

(a) Study of centrifugal pump.
(b) Study of air conditioner.

DEMONSTRATION ON:

(a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step cone pulley.
(c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair-case wiring
5. Measurement of energy using single phase energy meter.

IV ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor colour coding, measurement of AC signal parameters (peak-peak value, rms value period, frequency) usindg CRO.
2. Study of logic gates AND, OR, EX-OR and NOT.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor for HWR and FWR.

TOTAL: 45 PERIODS

REFERENCES
BEG201  TECHNICAL ENGLISH – II  
(Common to all branches)

L  T  P  C  
3  0  0  3

AIM

To encourage students to actively involve in participative learning of English and to help them acquire communication skills.

OBJECTIVES

1. To help the students to develop listening skills for academic and professional purposes.
2. To help the students to acquire the ability of effective speaking in English in real-life situations.
3. To inculcate reading habit and to develop effective reading skills.
4. To help the students to improve their active and passive vocabulary.
5. To familiarize the students with different rhetorical functions of scientific English.
6. To enable the students to write letters and reports effectively in formal and business situations.

UNIT I  10
Technical Vocabulary – meanings in context, sequencing words, Articles – Prepositions, intensive reading and predicting content, Reading and interpretation, extended definitions, process description.

Suggested activities

1. Exercises on word formation using the prefix ‘self’ – Gap filling with preposition
   Exercises – Using sequence words
2. Reading comprehension exercise with questions based on inference – Reading heading and predicting the content – reading advertisements and interpretation
3. Writing extended definitions – Writing description of processes – Writing paragraphs based on discussions – Writing paragraphs describing the future

UNIT II  10

Suggested Activities

1. Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) – Reading comprehension exercises with texts including graphic communication – Exercises in interpreting non-verbal communication.
2. Listening comprehension exercises to categories data in tables.
3. Writing formal letters – quotations, placing orders, clarification, and complaint, Letter seeking permission for industrial visits, writing analytical paragraphs on different debatable issues.

UNIT III  10
Suggested Activities

1. Exercises combining sentences using cause and effect expressions – Gap filling exercises using the appropriate tense forms – Making sentences using different grammatical forms of the same word.
2. Speaking exercises involving the use of stress and intonation – Group discussions – analysis of problems and offering solutions.
3. Reading comprehension exercises with critical questions, multiple choice questions.

UNIT IV

Suggested Activities

1. Rewriting exercises using numerical adjectives.
2. Reading comprehension exercises with analytical questions on content – Evaluation of content.
3. Listening comprehension – entering information in tabular form, intensive listening exercise and completing the steps of a process.
4. Speaking – Role Play – group discussions – Activities giving oral instructions.
5. Writing descriptions, expanding hints – writing argumentative paragraphs – Writing formal letters – writing letter of application with CV/Bio-data – Writing general and safety instructions – Preparing checklists – Writing e-mail messages

UNIT V
Speaking – Discussion of problems and solutions – Creative and critical thinking – writing an essay, Writing a proposal.

Suggested Activities

1. Case Studies on problems and solutions
2. Brain storming and discussion
3. Writing Critical essays
4. Writing short proposals of 2 pages for starting a project, solving problems, etc.
5. Writing advertisements

TOTAL 45 periods

AREAS TO BE COVERED UNDER DIFFERENT HEADINGS

A. Language Focus
1. Technical vocabulary
2. Sequencing words
3. Articles
4. Prepositions
5. Word formation using prefixes
6. Phrases / Structure indicating purpose
7. Adverbs
8. Cause and effect expressions
9. Tense forms
10. Different grammatical forms of the same word  
11. Numerical adjectives  
12. Extended definitions  

B. Reading  
1. Intensive reading and predicting content  
2. Reading and interpretation  
3. Skimming  
4. Critical reading  
5. Reading comprehension exercises  

C. Listening  
1. Correlating verbal and non-verbal communication  
2. Listening comprehension  

D. Speaking  
1. Group Discussions  
2. Stress and intonation  
3. Role plays and giving oral instructions  
4. Discussion of problems and solutions  

E. Writing  
1. Process description  
2. Formal letter writing  
3. Writing analytical paragraphs  
4. Report Writing  
5. Descriptive writing  
6. Argumentative paragraphs  
7. Letter of application  
8. Instructions  
9. Recommendations  
10. Checklists preparation  
11. Email Communication  
12. Writing critical essays  
13. Writing proposals  

TEXT BOOK:  

REFERENCES  
Extensive Reading:


Note:
The book listed under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.
BMA201  MATHEMATICS – II  
(Common to all branches)  
3 1 0 4

UNIT I  ORDINARY DIFFERENTIAL EQUATIONS  
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  
Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields 
– Vector integration – Green’s theorem in a plane, Gauss divergence theorem and stoke’s 
theorem (excluding proofs) – Simple applications involving cubes and rectangular parallepipeds.

UNIT III  ANALYTIC FUNCTIONS  
Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – 
Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal 
properties of analytic function – Harmonic conjugate – Construction of analytic functions – 
Conformal mapping: w = z + c, cz, 1/z and bilinear transformation.

UNIT IV  COMPLEX INTEGRATION  
Complex integration – Statement and applications of Cauchy’s integral theorem and Cauchy’s 
integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – 
Application of residue theorem to evaluate real integrals – Unit circle and semi-circular 
contour (excluding poles on boundaries).

UNIT V  LAPLACE TRANSFORM  
Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties 
– Transform of derivatives and integrals – Transform of unit step function and impulse functions 
– Transform of periodic functions. Definition of Inverse Laplace transform as contour integral – 
Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear 
ODE of second order with constant coefficients using Laplace transformation techniques.

TOTAL: 60 PERIODS

TEXT BOOK:
(2007).

REFERENCES
New Delhi (2007).
BPH201 ENGINEERING PHYSICS – II
(Common to all branches)
L T P C
3 0 0 3

UNIT I CONDUCTING MATERIALS

UNIT II SEMICONDUCTING MATERIALS

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS

UNIT IV DIELECTRIC MATERIALS

UNIT V MODERN ENGINEERING MATERIALS

TOTAL: 45 PERIODS

TEXT BOOKS:
2. Charles P. Poole and Frank J.Ownen, 'Introduction to Nanotechnology’, Wiley India (2007) (for Unit V)
REFERENCES

BCY201  ENGINEERING CHEMISTRY – II  
(Common to all branches)  

L  T  P  C  
3  0  0  3

AIM
To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

OBJECTIVES
1. The student should be conversant with the principles of electrochemistry, electrochemical cells, emf and applications of emf measurements.
2. Principles of corrosion control.
3. Chemistry of Fuels and combustion.
4. Industrial importance of Phase rule and alloys.
5. Analytical techniques and their importance.

UNIT I  ELECTROCHEMISTRY  
9

UNIT II  CORROSION AND CORROSION CONTROL  
9

UNIT III  FUELS AND COMBUSTION  
9

UNIT IV  PHASE RULE AND ALLOYS  
9

UNIT V  ANALYTICAL TECHNIQUES  
9

TOTAL: 45 PERIODS
TEXT BOOKS:


REFERENCES

(a) BME201 ENGINEERING MECHANICS (For Mechanical & Civil Branches) 3 1 0 4

OBJECTIVE
At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

UNIT I BASICS & STATICS OF PARTICLES 12

UNIT II EQUILIBRIUM OF RIGID BODIES 12

UNIT III PROPERTIES OF SURFACES AND SOLIDS 12

UNIT IV DYNAMICS OF PARTICLES 12

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12

TOTAL: 60 PERIODS

TEXT BOOK:
REFERENCES
(b) BEE201 CIRCUIT THEORY (For EEE & EIE Branches) 

UNIT I BASIC CIRCUITS ANALYSIS

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS

UNIT III RESONANCE AND COUPLED CIRCUITS

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS
Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. input (Sinusoidal).

UNIT V ANALYSING THREE PHASE CIRCUITS
Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4- wire circuits with star and delta connected loads, balanced & unbalanced loads – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES
(c) BEC201 ELECTRIC CIRCUITS AND ELECTRON DEVICES  
(For ECE, CSE and IT Branches)  
\[ L \ T \ P \ C \quad 3 \ 1 \ 0 \ 4 \]

UNIT I  CIRCUIT ANALYSIS TECHNIQUES  

UNIT II  TRANSIENT & RESONANCE IN RLC CIRCUITS  

UNIT III  SEMICONDUCTOR DIODES  

UNIT IV  TRANSISTORS  
Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT V  SPECIAL SEMICONDUCTOR DEVICES (Qualitative Treatment only)  
Tunnel diodes, PIN diode, varactor diode – SCR characteristics and two transistor equivalent model – UJT – Diac and Triac – Laser, CCD, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES
(a) **BEE202  BASIC ELECTRICAL & ELECTRONICS ENGINEERING**  
(For Mechanical & Civil Branches)  
\[ L \quad T \quad P \quad C \]  
\[ 4 \quad 0 \quad 0 \quad 4 \]

**UNIT I  ELECTRICAL CIRCUITS & MEASURMENTS**  
12  

**UNIT II  ELECTRICAL MACHINES**  
12  

**UNIT III  SEMICONDUCTOR DEVICES AND APPLICATIONS**  
12  

**UNIT IV  DIGITAL ELECTRONICS**  
12  

**UNIT V  FUNDAMENTALS OF COMMUNICATION ENGINEERING**  
12  

**TOTAL: 60 PERIODS**

**TEXT BOOKS:**

**REFERENCES**
(b) BME202 BASIC CIVIL & MECHANICAL ENGINEERING
(For CSE, ECE, EEE, EIE & IT branches)
4 0 0 4

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS

UNIT II BUILDING COMPONENTS AND STRUCTURES

TOTAL: 30 PERIODS

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING

UNIT IV IC ENGINES
Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM

TOTAL: 30 PERIODS

REFERENCES
BCS231 COMPUTER PRACTICE LABORATORY – II
(Common to all branches)

L T P C
0 1 2 2

LIST OF EXPERIMENTS

1. UNIX COMMANDS

Study of Unix OS – Basic Shell Commands – Vi Editor.

2. SHELL PROGRAMMING


3. C PROGRAMMING ON UNIX

Dynamic Storage Allocation – Pointers – Functions – File Handling.

TOTAL: 45 PERIODS

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Hardware

- UNIX Clone Server – 1 No
- Nodes (thin client or PCs) – 33 Nos
- Printer – 3 Nos.

Software

- OS – UNIX Clone (33 user license or License free Linux)
- Compiler - C
PHYSICS LABORATORY – II

LIST OF EXPERIMENTS
1. Determination of Young’s modulus of the material – non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.
5. Spectrometer dispersive power of a prism.
6. Determination of Young’s modulus of the material – uniform bending.

• A minimum of FIVE experiments shall be offered.
• Laboratory classes on alternate weeks for Physics and Chemistry.

CHEMISTRY LABORATORY – II

LIST OF EXPERIMENTS
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⁺ Vs K₂Cr₂O₇)
5. pH Titration (Acid & Base)
6. Determination of water of crystallization of a crystalline salt (CuSO₄)
7. Estimation of Ferric ion by spectrophotometry.

• A minimum of FIVE experiments shall be offered.
• Laboratory classes on alternate weeks for Physics and Chemistry.
(a) BME231 COMPUTER AIDED DRAFTING AND MODELING LABORATORY
(For Mechanical & Civil Branches) 0 1 2 2

List of Exercises using software capable of Drafting and Modeling

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using B spline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

List of Equipments for a batch of 30 students:

1. Pentium IV computer or better hardware, with suitable graphics facility – 30Nos.
2. Licensed software for Drafting and Modeling – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 Nos.
(b) BEE231 ELECTRICAL CIRCUITS LABORATORY
(For EEE & EIE branches)

LIST OF EXPERIMENTS

- Verification of ohm’s laws and Kirchoff’s laws.
- Verification of Thevenin’s and Norton’s Theorem
- Verification of superposition Theorem
- Verification of maximum power transfer theorem.
- Verification of reciprocity theorem
- Measurement of self inductance of a coil
- Verification of mesh and nodal analysis.
- Transient response of RL and RC circuits for DC input.
- Frequency response of series and parallel resonance circuits.
- Frequency response of single tuned circuits.

TOTAL: 45 PERIODS
(c) BEC231 CIRCUITS AND DEVICES LABORATORY
(For ECE, CSE & IT branches)

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- Verification of KVL and KCL
- Verification of Thevenin and Norton Theorems.
- Verification of superposition Theorem.
- Verification of Maximum power transfer and reciprocity theorems.
- Frequency response of series and parallel resonance circuits.
- Characteristics of PN and Zener diode
- Characteristics of CE configuration
- Characteristics of CB configuration
- Characteristics of UJT and SCR
- Characteristics of JFET and MOSFET
- Characteristics of Diac and Triac.
- Characteristics of Photodiode and Phototransistor.

TOTAL: 45 PERIODS
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<tr>
<th>Course Code</th>
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<tr>
<td>BEG231</td>
<td>ENGLISH LANGUAGE SKILL LABORATORY (Skill of Listening)</td>
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**UNIT I (Micro Skills I)**

Tasks (Type I): Lexical word identification
- A. Identifying the homophones/words with silent letters/often mispronounced words
- B. Identifying the missing words in native speech (Native accent)

Tasks (Type II): Decompressing structures
- A. Expanding sound units into word clusters (Ex: verbs with multiple auxiliaries/contracted forms)
- B. Identifying the constituent words in collocations/compound words/idiomatic phrases

**UNIT II (Micro Skills II): Identifying tonal variations for meaning making**

Tasks:
- A. Punctuating the script after listening to it.
- B. Marking word chunks/tone groups in transcript after listening to it.
- C. Marking syllable stress in words.
- D. Identifying tonal variations expressing rhetorical questions/ information seeking Questions / Exclamations / General statements.

**UNIT III Content Comprehension and Making Inferences**

Tasks:
- A. Listening and filling in the chart
- B. Multiple choice questions (Negative/factual)
- C. True/False questions
- D. Questions with multiple answers (choosing two/three correct answers)
- E. Matching information
- F. Filling the blanks (not more than three words)
- G. Comprehending the text organization

**UNIT IV Listening and act**

Tasks:
- A. Locating spots in a map following the given directions
- B. Transferring data to graphs/diagrams/flow charts
- C. Diagram/Picture completing tasks
- D. Finding the answer through the process of elimination

**TOTAL: 30 PERIODS**
BMA301  TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS  L  T  P  C
(Common to all branches)  3  1  0  4

OBJECTIVES
The course objective is to develop the skills of the students in the areas of Transforms and
Partial Differential Equations. This will be necessary for their effective studies in a large
number of engineering subjects like heat conduction, communication systems, electro-optics
and electromagnetic theory. The course will also serve as a prerequisite for post graduate,
specialized studies and research.

UNIT I  FOURIER SERIES  (9L+3T)
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half range sine series –
Half range cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic analysis.

UNIT II  FOURIER TRANSFORMS  (9L+3T)
Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms –

UNIT III  PARTIAL DIFFERENTIAL EQUATIONS  (9L+3T)
Formation of partial differential equations – Lagrange’s linear equation – Solutions of standard types
of first order partial differential equations - Linear partial differential equations of second and higher
order with constant coefficients.

UNIT IV  APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS  (9L+3T)
Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady
state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier
series solutions in Cartesian coordinates.

UNIT V  Z - TRANSFORMS AND DIFFERENCE EQUATIONS  (9L+3T)
Z-transforms - Elementary properties – Inverse Z-transform – Convolution theorem - Formation of
difference equations – Solution of difference equations using Z-transform.

Lectures: 45  Tutorials: 15  Total: 60 Periods

TEXT BOOK

REFERENCES
Publications(P) Ltd. (2007)
limited, New Delhi (2007).
(2007).
BEE301 MEASUREMENTS AND INSTRUMENTATION

AIM
To provide adequate knowledge in electrical instruments and measurements techniques

OBJECTIVES
To make the student to have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working
i. Introduction to general instrument system, error, calibration etc.
ii. Emphasis is laid on analog and digital techniques to measure voltage, current, energy and power etc.
iii. To have an adequate knowledge of comparison methods of measurement.
iv. Elaborate discussion about storage and display devices.
v. Exposure to various transducers and data acquisition systems.

UNIT I INTRODUCTION
Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration

UNIT II ELECTRICAL AND ELECTRONICS INSTRUMENTS

UNIT III COMPARISON METHODS OF MEASUREMENTS
D.C & A.C potentiometers, D.C & A.C bridges, transformer ratio bridges, self-balancing bridges, Interference and screening – Multiple earth and earth loops - Electrostatic and electromagnetic interference – Grounding techniques

UNIT IV STORAGE AND DISPLAY DEVICES
Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD and dot matrix display – Data Loggers.

UNIT V TRANSDUCERS AND DATA ACQUISITION SYSTEMS

L = 45 Total = 45 Periods

TEXT BOOKS

REFERENCE BOOKS
BEE302 ELECTROMAGNETIC THEORY

AIM
This subject aims to provide the student an understanding of the fundamentals of electromagnetic fields and their applications in Electrical Engineering.

OBJECTIVES
To impart knowledge on
i. Concepts of electrostatics, electrical potential, energy density and their applications.
ii. Concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.
iii. Faraday’s laws, induced emf and their applications.
iv. Concepts of electromagnetic waves and Poynting vector.

UNIT I INTRODUCTION
Sources and effects of electromagnetic fields – Vector fields – Different co-ordinate systems- vector calculus – Gradient, Divergence and Curl - Divergence theorem – Stoke’s theorem.

UNIT II ELECTROSTATICS

UNIT III MAGNETOSTATICS

UNIT IV ELECTRODYNAMIC FIELDS

UNIT V ELECTROMAGNETIC WAVES

L = 45 T = 15 Total: 60 Periods

TEXT BOOKS

REFERENCE BOOKS
BEE303 ELECTRONIC DEVICES AND APPLICATIONS

AIM
To study the characteristics and applications of electronic devices

OBJECTIVES
To acquaint the students with construction, theory and characteristics of the following electronic devices:

i) p-n junction diode
ii) Bipolar transistor
iii) Field effect transistor
iv) LED, LCD and other photo electronic devices
v) Power control / regulator devices

UNIT I PN DIODE AND ITS APPLICATIONS 9
PN junction diode-VI characteristics – Rd, temperature effects – Drift and diffusion currents – switching – Rectifiers: HWR, FWR, BR, filters-Zener diode – VI characteristics, Regulators (series and shunt), LED, LCD characteristics and applications

UNIT II BJT AND ITS APPLICATIONS 9

UNIT III FET AND ITS APPLICATIONS 9

UNIT IV AMPLIFIERS AND OSCILLATORS 9

UNIT V PULSE CIRCUITS 9

TOTAL: 45 PERIODS

TEXT BOOKS
2. David Bell “Electronic Devices and Circuits” 2007, PHI

REFERENCES
AIM

The aim of this course is to create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make them sensitive to the environment problems in every professional endeavour that they participate.

OBJECTIVE

At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity. The role of government and non-government organization in environment managements.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

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

UNIT II ENVIRONMENTAL POLLUTION

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES

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

UNIT IV  SOCIAL ISSUES AND THE ENVIRONMENT  7

UNIT V  HUMAN POPULATION AND THE ENVIRONMENT  6

TOTAL: 45

TEXT BOOKS:

REFERENCES
BCS304   DATA STRUCTURES AND ALGORITHMS             L  T  P  C
(Co mmon to EEE & EIE)               3  0  0  3

AIM
To master the design and applications of linear, tree, and graph structures. To understand
various algorithm design and analysis techniques.

UNIT I  LINEAR STRUCTURES         9
Abstract Data Types (ADT) – List ADT – array-based implementation – linked list implementation –
cursor-based linked lists – doubly-linked lists – applications of lists – Stack ADT – Queue ADT –
circular queue implementation – Applications of stacks and queues

UNIT II  TREE STRUCTURES              9
Need for non-linear structures – Tree ADT – tree traversals – left child right sibling data structures for
general trees – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT

UNIT III  BALANCED SEARCH TREES AND INDEXING         9
AVL trees – Binary Heaps – B-Tree – Hashing – Separate chaining – open addressing – Linear
probing

UNIT IV  GRAPHS              9
Definitions – Topological sort – breadth-first traversal - shortest-path algorithms – minimum spanning
tree – Prim's and Kruskal's algorithms – Depth-first traversal – biconnectivity – euler circuits –
applications of graphs.

UNIT V  ALGORITHM DESIGN AND ANALYSIS         9
Greedy algorithms – Divide and conquer – Dynamic programming – backtracking – branch and
bound – Randomized algorithms – algorithm analysis – asymptotic notations – recurrences – NP-
complete problems

L = 45  Total = 45

TEXT BOOKS

REFERENCES
2000.
BEE331 ELECTRONIC DEVICES AND APPLICATIONS LABORATORY L T P C

0 0 3 2

AIM
To provide hands on experience in characterization of electronic devices and development of electronic circuits.

LIST OF EXPERIMENTS

1. PN Junction diode and Rectifier Applications
2. Bipolar Junction Transistor - CE, CB, CC characteristics
3. JFET – characteristics and parameter determination
4. UJT & SCR Characteristics
5. Characteristics of DIAC and TRIAC
6. Characteristics of BJT Amplifier frequency response
7. Characteristics of FET amplifier frequency response
8. Characteristics of Class B amplifier – Darlington pair
9. Characteristics of Differential amplifier
10. Class D – Totempole configuration
11. PSPICE modeling of electronic circuits

TOTAL: 45 PERIODS
BEE332  MEASUREMENTS AND INSTRUMENTATION LABORATORY  L  T  P  C
0  0  3  2

AIM
The aim of this lab is to fortify the students with an adequate work experience in the measurement of different quantities and also to expertise in handling the instruments involved.

OBJECTIVE
To train the students in the measurement of displacement, resistance, inductance, torque and angle etc., and to give exposure to AC, DC bridges and transient measurement.

LIST OF EXPERIMENTS

1. Study of displacement and pressure transducers
2. AC bridges
3. DC bridges
4. Instrumentation amplifiers
5. A/D and D/A converters
6. Study of transients
7. Calibration of single-phase energy meter
8. Calibration of current transformer
9. Measurement of three phase power and power factor
10. Measurement of iron loss

\[ P = 45 \text{ Total} = 45 \]
BCS334    DATA STRUCTURES AND ALGORITHMS LABORATORY               L T P C
           (Common to EEE & EIE)                           0 0 3 2

Aim

To develop skills in design and implementation of data structures and their applications

1. Implement singly and doubly linked lists.
2. Represent a polynomial as a linked list and write functions for polynomial addition.
3. Implement stack and use it to convert infix to postfix expression.
4. Implement array-based circular queue and use it to simulate a producer-consumer problem.
5. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.
6. Implement binary search tree.
7. Implement insertion in AVL trees.
9. Implement hashing techniques.
10. Perform topological sort on a directed graph to decide if it is acyclic.
11. Implement Dijkstra's algorithm using priority queues.
15. Implement any randomized algorithm.

P = 45 Total = 45
BEG331  COMMUNICATION SKILLS AND TECHNICAL SEMINAR – I  L T P C
(Common to all branches)  0 0 3 2
(To be conducted as a Practical Paper by the Depts of English for 3 hrs per week)

OBJECTIVES:
• To improve the learners’ oral fluency in English
• To help the learners to acquire the readiness to speak in English
• To develop the sub-skills required for paper presentations and group discussions
• To help the learners to improve their vocabulary related to specific fields of technology
• To facilitate the development of the learners’ proficiency in meaningful interaction
• To provide them linguistic support for managing vital sub-functions of Communication

COURSE CONTENT:
A) Phonetic practice (7 hrs)
• English phonemes with special emphasis on the diphthongs
• Stress patterns for words that end with specific suffixes.

B) Speech practice (8 hrs)
• Speaking on the themes by developing the hints provided.
The themes are:
  1. Cloning
  2. Artificial satellites
  3. Renewable sources
  4. Telecommunication
  5. Cyber Revolution
  6. Space research
  7. Polythene pollution
  8. Fossil fuels
  9. Climate change
 10. Ecological threats
 11. Water resources
 12. Nuclear technology
 13. Scientific farming
 14. Thermal power plants
 15. Natural calamities
 16. Robotics
 17. Artificial intelligence
 18. Role of Fibre Optics
 19. Exploration of Mars
 20. Gas turbines

C) Group Quiz on technical aspects related to the themes (4hrs)

D) Language Functions (8 hrs)
  1. comparing and contrast
  2. reporting the conversation of others.
  3. talking about future plans and intentions
  4. giving reasons
  5. expressing preferences
  6. quantifying
  7. expressing certainty and uncertainty
  8. expressing opinions and impressions
  9. making suggestions
10. expressing assumptions
11. evaluating options
12. hypothesising/deducing
13. defending a point of view

E) Seminar presentation on the themes allotted (18 hrs)

PROCEDURE:
A) Phonetic practice
All the speech sounds should be taught. The learners should be given drills in the pronunciation of at least 30 words for each sound. While practicing stress patterns, they should be encouraged to identify as many words as possible for each suffix ending.

B) Speech practice
Every student should be allowed to choose one theme to specialize in. (However not more than 4 students in a section can choose the same theme). The teacher has to prepare at least 4 hints development tasks on each theme and should provide chance to each learner to speak on those hints related to his/her theme (5 minutes). The hints may be supplied to the students in advance. When a student speaks, the class should be encouraged to ask questions as well as note down the words related to the different fields.

C) Group Quiz on technical phrases related to the themes.
The class should be divided into groups that specialize on a particular theme. Each group should conduct a quiz (question & answer session) which will be answered by the other groups.

D) Language Functions
The teacher should build micro activities to develop the use of language required to handle these sub-functions of communication. In the process, the learners should get used to the linguistic elements needed for these functions.

E) Seminar presentation on the themes allotted
Each student should collect materials from books, journals and newspapers for his/her theme and prepare a short seminar paper. The presentation should be for 10 minutes. It should be followed ‘open house’ during which others should come forward to question, clarify, supplement or evaluate.

RECORD LAYOUT:
Every student has to maintain a record in which he/she has to incorporate the following details.

- First page containing learner details and the topic of specialization.
- Twenty words for each phoneme
- Twenty words with stress marks for each suffix ending
- Vocabulary list (technical words and compound words) related to the 20 themes identified for this semester.
- Three newspaper items, two journal items and three internet sources related to the special theme selected by the student. (To be pasted on the pages)
- The Quiz questions of the group with expected answers.
- The seminar paper presented by the learner with details about the open house.
- Notes of observation. (Details about any three seminar paper presentations by others)
- The record should be duly signed by the course teacher and submitted to the External Examiner for verification during the semester practicals.

\[ P = 45 \text{ Total } = 45 \]
BMA404  NUMERICAL METHODS  (Common to EEE, Civil)

AIM

With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

OBJECTIVES

At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses are summarized as follows:

- The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution.
- When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.
- The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.
- Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

UNIT I  SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS  (9L+3T)

UNIT II  INTERPOLATION AND APPROXIMATION  (9L+3T)
Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton’s forward and backward difference formulas.

UNIT III  NUMERICAL DIFFERENTIATION AND INTEGRATION  (9L+3T)

UNIT IV  INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS  (9L+3T)

UNIT V  BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS  (9L+3T)
Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations

Lectures: 45   Tutorials: 15   Total: 60 Periods
TEXT BOOKS

REFERENCE BOOKS
BEE401  ELECTRICAL MACHINES – I  

**L T P C**  3 1 0 4

**AIM**  

To expose the students to the basic principles of Electro mechanical Energy Conversion in Electrical Apparatus and the operation of Transformers and DC Machines.

**OBJECTIVES**  

- To familiarize the constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer connections.
- To introduce the principles of electromechanical energy conversion in singly and multiply excited systems.
- To study the working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
- To study the working principles of DC machines as Generator and Motor, types, determination of their no-load/load characteristics, starting and methods of speed control of motors.
- To estimate the various losses taking place in D.C. machines and to study the different testing methods to arrive at their performance.

**UNIT I  INTRODUCTION**  

Electrical machine types – Magnetic circuits – Inductance – Statically and Dynamically induced EMF - Torque – Hysteresis- Core losses - AC operation of magnetic circuits

**UNIT II  TRANSFORMERS**  


**UNIT III  ELECTROMECANICAL ENERGY CONVERSION**  

Energy in magnetic systems – field energy, coenergy and mechanical force – singly and multiply excited systems.

**UNIT IV  BASIC CONCEPTS IN ROTATING MACHINES**  

Generated voltages in ac and dc machines, mmf of distributed windings – magnetic fields in rotating machines – rotating mmf waves – torque in ac and dc machines.

**UNIT V  DC MACHINES**  


**TEXT BOOKS**  


**REFERENCES**  

BEE402  CONTROL SYSTEMS  L T P C
(Common to EEE & EIE)  3 1 0 4

AIM
To provide sound knowledge in the basic concepts of linear control theory and design of control system.

OBJECTIVES
• To understand the methods of representation of systems and to desire their transfer function models.
• To provide adequate knowledge in the time response of systems and steady state error analysis.
• To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of systems.
• To understand the concept of stability of control system and methods of stability analysis.
• To study the three ways of designing compensation for a control system.

UNIT I  SYSTEMS AND THEIR REPRESENTATION  9

UNIT II  TIME RESPONSE  9

UNIT III  FREQUENCY RESPONSE  9
Frequency response – Bode plot – Polar plot – Determination of closed loop response from open loop response – Correlation between frequency domain and time domain specifications.

UNIT IV  STABILITY OF CONTROL SYSTEM  9

UNIT V  COMPENSATOR DESIGN  9
Performance criteria – Lag, lead and lag-lead networks – Compensator design using bode plots.

L = 45  T = 15  Total = 60

TEXT BOOKS

REFERENCE BOOKS
3. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2004
BEE403  DIGITAL LOGIC CIRCUITS  L T P C  3 1 0 4

AIM
To introduce the fundamentals of Digital Circuits, combinational and sequential circuit.

OBJECTIVES
- To study various number systems and to simplify the mathematical expressions using Boolean functions – simple problems.
- To study implementation of combinational circuits
- To study the design of various synchronous and asynchronous circuits.
- To expose the students to various memory devices.
- To introduce digital simulation techniques for the development of application oriented logic circuit.

UNIT I  BOOLEAN ALGEBRA AND COMBINATIONAL CIRCUITS  9
Boolean algebra: De-Morgan’s theorem, switching functions and simplification using K-maps & Quine McCluskey method, Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers.

UNIT II  SYNCHRONOUS SEQUENTIAL CIRCUITS  9
Flip flops - SR, D, JK and T. Analysis of synchronous sequential circuits; design of synchronous sequential circuits – Counters, state diagram; state reduction; state assignment.

UNIT III  ASYNCHRONOUS SEQUENTIAL CIRCUIT  9
Analysis of asynchronous sequential machines, state assignment, asynchronous design problem.

UNIT IV  PROGRAMMABLE LOGIC DEVICES, MEMORY AND LOGIC FAMILIES  9
Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

UNIT V  VHDL  9

L = 45  T = 15  Total = 60

TEXT BOOKS

REFERENCES
**BEI404  LINEAR INTEGRATED CIRCUITS AND APPLICATIONS**  
(Common to EEE & EIE)  

**AIM**  
To introduce the concepts for realizing functional building blocks in ICs, fabrications & applications of ICs.

**OBJECTIVES**  
- To study the IC fabrication procedure.
- To study characteristics; realize circuits; design for signal analysis using Op-amp ICs.
- To study the applications of Op-amp.
- To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, ADCs.

**UNIT I  IC FABRICATION**  
IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance and FETs.

**UNIT II  CHARACTERISTICS OF OPAMP**  
Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – summer, differentiator and integrator.

**UNIT III  APPLICATIONS OF OPAMP**  
Instrumentation amplifier, first and second order active filters, V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter - R-2R ladder and weighted resistor types, A/D converter - Dual slope, successive approximation and flash types.

**UNIT IV  SPECIAL ICs**  
555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs

**UNIT V  APPLICATION ICs**  
IC voltage regulators - LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic ICs.

**TEXT BOOKS**  

**REFERENCE BOOKS**  
BME405  POWER PLANT ENGINEERING  L T P C
3  1  0  4

AIM
Expose the students to basics of various power plants so that they will have the comprehensive idea of power system operation.

OBJECTIVES
To become familiar with operation of various power plants

UNIT I  THERMAL POWER PLANTS  9
Basic thermodynamic cycles, various components of steam power plant-layout pulverized coal burners- Fluidized bed combustion-coal handling systems-ash handling systems- Forced draft and induced draft fans- Boilers-feed pumps-super heater regenerator- condenser- deaerator -cooling tower.

UNIT II  HYDRO ELECTRIC POWER PLANTS  9
Layout-dams-selection of water turbines-types-pumped storage hydel plants.

UNIT III  NUCLEAR POWER PLANTS  9
Principles of nuclear energy- Fission reactions-nuclear reactor-nuclear power plants.

UNIT IV  GAS AND DIESEL POWER PLANTS  9
Types, open and closed cycle gas turbine, work output & thermal efficiency, methods to improve performance-reheating, intercoolings, regeneration-advantage and disadvantages- Diesel engine power plant-component and layout.

UNIT V  NON-CONVENTIONAL POWER GENERATION  9
Solar energy collectors, OTEC, wind power plants, tidal power plants and geothermal resources, fuel cell, MHD power generation-principle, thermoelectric power generation, thermionic power generation.

L = 45 T = 15 Total = 60

TEXT BOOKS

REFERENCES
BEE431  CONTROL SYSTEMS LABORATORY  L  T  P  C
0   0   3   2

LIST OF EXPERIMENTS
1. Determination of transfer function of DC Servomotor
2. Determination of transfer functions of AC Servomotor.
3. Analog simulation of Type - 0 and Type – 1 system
4. Determination of transfer function of DC Generator
5. Determination of transfer function of DC Motor
6. Stability analysis of linear systems
7. DC and AC position control systems
8. Stepper motor control system
9. Digital simulation of first order system
10. Digital simulation of second order system

P = 45 Total = 45
BEE432  INTEGRATED CIRCUITS LABORATORY       L  T  P  C
0  0  3  2

AIM
To study various digital & linear integrated circuits used in simple system configuration.

LIST OF EXPERIMENTS

1. Study of Basic Digital IC’s. (Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS FF, D FF)
2. Implementation of Boolean Functions, Adder/Subtractor circuits.
3. a. Code converters, Parity generator and parity checking, Excess-3, 2’s complement, Binary to Gray Code using suitable IC’s.
b. Encoders and Decoders: Decimal and Implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC’s.
4. Counters: Design and implementation of 4-bit modulo counters as synchronous and asynchronous types using FF IC’s and specific counter IC.
5. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC’s.
7. Timer IC application: Study of NE/SE 555 timer in Astable, Monostable operation.
9. Study of Analog to Digital Converter and Digital to Analog Converter: Verification of A/D conversion using dedicated IC’s.
10. Study of VCO and PLL ICs:
    i. Voltage to frequency characteristics of NE/SE 566 IC.
    ii. Frequency multiplication using NE/SE 565 PLL IC.

P = 45 Total = 45
BEE433  ELECTRICAL MACHINES LABORATORY – I  

L T P C
0 0 3 2

AIM
To expose the students to the operation of D.C. machines and transformers and give them experimental skills.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of separately and self excited DC shunt generators.
2. Load characteristics of DC compound generator with differential and cumulative connection.
3. Load characteristics of DC shunt and compound motor.
4. Load characteristics of DC series motor.
5. Swinburne’s test and speed control of DC shunt motor.
7. Load test on single-phase transformer and three phase transformer connections.
8. Open circuit and short circuit tests on single phase transformer.
9. Sumpner’s test on transformers.
10. Separation of no-load losses in single phase transformer.

TOTAL: 45 PERIODS
BEG431  COMMUNICATION SKILLS AND TECHNICAL SEMINAR – II  L T P C  0 0 3 2
(Common to all branches)
(To be conducted as a Practical Paper by the Depts of English for 3 hrs per week)

OBJECTIVES:
1. To improve the learners’ oral fluency in English
2. To help the learners to acquire the readiness to speak in English
3. To develop the sub-skills required for paper presentations and group discussions
4. To help the learners to improve their vocabulary related to specific fields of technology
5. To facilitate the development of the learners’ proficiency in meaningful interaction
6. To provide them linguistic support for managing vital sub-functions of communication.

COURSE CONTENT:
A) Phonetic practice (7 hrs)
All the English phonemes with special emphasis on the following
1. /ae/ and /ei/
2. /e/ and /i/
3. First syllable and second syllable stress
4. Three different ways of pronouncing ‘ed’ past tense endings eg. ‘played’, ‘walked’, ‘wanted’
5. Correct pronunciation of commonly used words (A list of 1000 words will be suggested by the university)
6. Silent letters

B) Speech practice (8 hrs)
Speaking on the themes by developing the hints provided.
The themes are:
1. Indian space missions
2. Converting agricultural wastes for useful purposes
3. Developments in transportation
4. Technology and agriculture
5. Impact of global warming
6. Desalination of water
7. Technology for national security
8. Industrial development and ecological issues
9. Applications of nano technology
10. Hazards of e-waste

C) Preparation of power point frames on the given topic (2 hrs)
(Only pictures, graphs, equations should be given through power point and not the text of the presentation as such)

D) Language Functions (14 hrs)
Reporting the conversation of others
Using the third conditional
Expressing agreement and disagreement
Numerical expressions
Describing manner and frequency
Evaluating different standpoints
Developing an argument
Describing daily routines, events, and weather

D) Seminar presentation on the themes allotted using power point frames (14 hrs)
PROCEDURE:

A) Phonetic practice
The learners should be given drills in the pronunciation of at least 30 words for each sound. While practising stress patterns, they should be encouraged to identify as many words as possible for each pattern.

B) Speech practice
Every student should be allowed to choose one theme to specialize in. (However not more than 7 students in a section can choose the same theme). The teacher has to prepare at least 4 hints development tasks on each theme and should provide chance to each learner to speak on those hints related to his/ her theme (5 minutes). The hints may be supplied to the students in advance. When a student speaks, the class should be encouraged to ask questions as well as note down the words related to the different fields.

C) Language Functions
The teacher should build micro activities to develop the use of language required to handle these sub-functions of communication. In the process, the learners should get used to the linguistic elements needed for these functions.

D) Seminar presentation on the themes allotted
Each student should collect materials from books, journals and newspapers for his/her theme and prepare a short seminar paper. The presentation should be for 10 minutes using power point frames. It should be followed by an ‘open house’ during which others should come forward to question, clarify, supplement or evaluate.

RECORD LAY OUT:
Every student has to maintain a record in which he/she has to incorporate the following details.

- First page containing learner details and the topic of specialization.
- Twenty words for each phoneme /æ/, /ei/, /i/ and /e/
- Fifty words with first syllable stress and fifty for second syllable stress (The learner will be required to pronounce some of these words during the practical exam)
- Vocabulary list (technical words and compound words) related to the 10 themes identified for this semester.
- Three newspaper items, two journal items and three internet sources related to the special theme is selected by the student.(To be pasted on the pages)
- The seminar paper is presented by the learner with a soft copy of the power point frames.
- Notes of observation. (Details about any two seminar paper presentations by others)
- The record should be duly signed by the course teacher and submitted to the External Examiner for verification during the semester practicals.

P = 45 Total = 45
BEE501    ELECTRICAL MACHINES – II    L T P C

OBJECTIVES
To impart knowledge on
i. Construction and performance of salient and non-salient type synchronous generators.
  iii. Construction, principle of operation and performance of induction machines.
  iv. Starting and speed control of three-phase induction motors.

UNIT I THREE PHASE INDUCTION MACHINES    12

UNIT II STARTING AND SPEED CONTROL OF INDUCTION MOTORS 12

UNIT III SINGLE PHASE INDUCTION MOTORS 12

UNIT IV SYNCHRONOUS GENERATOR 12
Types - Constructional features – EMF equation – Armature reaction – Voltage regulation – Predetermination of regulation by synchronous impedance, EMF, MMF, ZPF and ASA methods – Load characteristics – Parallel operation – Active and reactive power – Determination of Xd and Xq.

UNIT V SYNCHRONOUS MOTOR AND SPECIAL MACHINES 12

TEXT BOOK :

REFERENCES
BEE502 TRANSMISSION AND DISTRIBUTION SYSTEM L T P C
3 1 0 4

OBJECTIVES
i. To understand the operation of the different transmission system & distribution schemes
ii. To develop expressions for the computation of transmission line parameters.
iii. To obtain the equivalent circuits for the transmission lines based on distance and operating voltage for determining voltage regulation and efficiency. Also to improve the voltage profile of the transmission system.
iv. To analyse the voltage distribution in insulator strings and cables and methods to improve the same.

UNIT I TRANSMISSION SYSTEMS 12
Structure of electric power system – Various levels of Generation, Transmission and distribution – HVDC and EHVAC transmission – Comparison of economics of transmission – Technical performance and reliability – Application of HVDC transmission system – FACTS (qualitative treatment only) – TCSC – SVC – STATCOM – UPFC.

UNIT II TRANSMISSION LINE PARAMETERS 12
Parameters of single and three phase transmission lines with single and double circuits – Resistance, Inductance and Capacitance of solid, stranded and bundled conductors – Symmetrical and unsymmetrical spacing – Transposition – Application of self and mutual GMD – Skin and proximity effects.

UNIT III MODELLING AND PERFORMANCE OF TRANSMISSION LINES 12

UNIT IV INSULATORS AND CABLES 12

UNIT V SUBSTATION GROUNDING SYSTEM AND DISTRIBUTION SYSTEM 12

L = 45  T = 15  Total = 60 Periods

TEXT BOOKS:

REFERENCES
BEE503   DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS  L  T  P  C  
3   1   0   4

OBJECTIVES

i. To classify signals and systems & their mathematical representation.
ii. To analyze the discrete time systems.
iii. To study various transformation techniques & their computation.
iv. To study about filters and their design for digital implementation.
v. To study about a programmable digital signal processor & quantization effects.

UNIT I INTRODUCTION  12
Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; Classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect, digital signal representation, analog to digital conversion.

UNIT II DISCRETE TIME SYSTEM ANALYSIS  12
Z-transform and its properties, inverse z-transforms; difference equation - Solution by z-transform, application to discrete systems - Stability analysis, frequency response - Convolution - Fourier transform of discrete sequence - Discrete Fourier series.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION  12
DFT properties, magnitude and phase representation - Computation of DFT using FFT algorithm - DIT & DIF - FFT using radix 2 - Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS  12
FIR & IIR filter realization - Parallel & cascade forms; FIR design: Windowing Techniques - Need and choice of windows - Linear phase characteristics; IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping - Frequency transformation.

UNIT V PROGRAMMABLE DSP CHIPS  12
Architecture and features of TMS 320C5X signal processor - Addressing Modes - Overview of instruction set – DSP based Stepper motor and DC motor control.

L =45  T = 15  Total = 60 Periods

TEXT BOOKS:

REFERENCES
Objective:

i. To get an overview of different types of power semi-conductor devices and their switching characteristics.

ii. To understand the operation, characteristics and performance parameters of controlled rectifiers.

iii. To study the operation, switching techniques and basic topologies of DC-DC switching regulators.

iv. To learn the different modulation techniques of pulse width modulated inverters and to understand the harmonic reduction methods.

v. To study the operation of AC voltage controller and Matrix converters.

Unit I: Power Semiconductor Devices

Basic structure and characteristics of SCR, DIAC and TRIAC, Power BJT, Power MOSFET and IGBT – Driver, snubber circuit and commutation circuit of switching devices.

Unit II: Phase-Controlled Converters

2-pulse, 3-pulse and 6-pulse converters – Effect of source inductance – Performance parameters – Reactive power control of converters – Dual converters.

Unit III: DC to DC Converter

Step-down and step-up chopper – Time ratio control and current limit control – Switching mode regulators - Buck, Boost, Buck-Boost and Cuk converters - Concept of resonant switching.

Unit IV: Inverters

Single phase and three phase (both 120° mode and 180° mode) inverters – PWM techniques: Sinusoidal PWM, modified sinusoidal PWM – Multiple PWM – Voltage and harmonic control – Series resonant inverter – Current source inverter - Uninterrupted power supply topologies.

Unit V: AC to AC Converters

Single phase AC voltage controllers – Multistage sequence control - Single and three phase cycloconverters – Introduction to Integral cycle control, Power factor control and Matrix converters.

Text Books:


References:


OBJECTIVES
i. Generation and Measurement of high voltages.
ii. Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics
iii. Testing of power apparatus and insulation coordination
iv. To understand the various types of over voltages in power system and protection methods.

UNIT I OVER VOLTAGE PHENOMENON AND INSULATION COORDINATION 9
Natural causes for over voltages – Lightning phenomenon, overvoltage due to switching surges, system faults and other abnormal conditions – Principles of insulation coordination.

UNIT II GENERATION OF HIGH VOLTAGES AND CURRENTS 9

UNIT III BREAK DOWN IN SOLID, GASEOUS AND LIQUID DIELECTRICS 9
Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice - Breakdown in composite dielectrics - Solid dielectrics used in practice – Gases as insulating media, collision process, ionization process - Townsend’s criteria of breakdown in gases - Paschen’s law – Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND CURRENTS 9
Measurement of high direct current voltages – Measurement of high voltages alternating and impulse – Measurement of high currents – Oscilloscope for impulse voltage and current measurements.

UNIT IV HIGH VOLTAGE TESTING 9
Testing of insulators and bushings, Testing of isolators and circuit breakers, Testing of cables - Testing of transformers - Testing of surge arresters

TEXT BOOKS:

REFERENCES
**BGE501 PROFESSIONAL ETHICS AND HUMAN VALUES**

*Common to 5th Sem – EEE, EIE, Civil & IT 6th Sem – CSE & ECE*

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**OBJECTIVES:**

i. To create awareness on Engineering Ethics and Human Values.

ii. To install Moral and Social Values and Loyalty.

iii. To appreciate the rights of others.

**UNIT I HUMAN VALUES**


**UNIT II ENGINEERING ETHICS**


**UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION**

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

**UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS**


**UNIT V GLOBAL ISSUES**

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

**TOTAL: 45 PERIODS**

**TEXT BOOKS**


**REFERENCE BOOKS**

LIST OF EXPERIMENTS

1. Study of AC Motor Starters
2. Load test on alternator
3. Regulation of three phase alternator by EMF and MMF methods
4. Regulation of three phase alternator by ZPF and ASA methods
5. Regulation of three phase salient pole alternator by slip test
6. Measurements of negative sequence and zero sequence impedance of alternators.
8. Load test on three phase slip ring induction motor.
10. Equivalent circuit of single phase induction motor
11. Equivalent circuit of three phase induction motor
12. Load characteristics of induction generator

Total = 45 Periods
BEE532  POWER ELECTRONICS AND DRIVES LABORATORY  

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LIST OF EXPERIMENTS

1. VI Characteristics of SCR and TRIAC
2. VI Characteristics of MOSFET and IGBT
3. AC to DC fully controlled converter
4. AC to DC half controlled converter
5. Step down and Step up MOSFET based choppers
6. Resonant DC-DC converter
7. IGBT based single phase PWM inverter
8. IGBT based three phase PWM inverter
9. AC Voltage Controller
10. Cycloconverter
11. AC to DC converter based DC drive.

Total = 45 Periods
BEE601  DESIGN OF ELECTRICAL APPARATUS  

OBJECTIVES  
i. To provide sound knowledge about constructional details and design of various electrical machines.  
ii. To study mmf calculation and thermal rating of various types of electrical machines.  
iii. To design armature and field systems for D.C. machines, commutator and brushes.  
iv. To design core, yoke, windings and cooling systems of transformers.  
v. To design stator and rotor of induction machines and magnetic leakage.  
vi. To design stator and rotor of synchronous machines, turbo alternators  

UNIT I INTRODUCTION  

UNIT II DC MACHINES  

UNIT III TRANSFORMERS  

UNIT IV INDUCTION MOTORS  

UNIT V SYNCHRONOUS MACHINES  

L =45, T = 15, Total = 60 Periods  

TEXT BOOKS:  

REFERENCE  
BEE602   POWER SYSTEM ANALYSIS   L T P C  
3   0   0   3

OBJECTIVES
i.  To perform load flow studies in power system.
ii. To perform symmetrical and unsymmetrical fault analysis in power system.
iii. To understand the stability of power system.

UNIT I POWER SYSTEM MODELLING  
Need for system analysis in planning and operation of power system - per phase analysis of symmetrical three-phase system. General aspects relating to power flow, short circuit and stability analysis - per unit representation - symmetrical component transformation - sequence impedances.

UNIT II NETWORK MODELLING  

UNIT III SHORT CIRCUIT ANALYSIS  

UNIT IV POWER FLOW ANALYSIS  
Problem definition - bus classification - derivation of power flow equation - solution by Gauss Seidel and Newton Raphson methods - P V bus adjustments for both methods - computation of slack bus power, transmission loss and line flow.

UNIT V STABILITY AND SECURITY ANALYSIS  

L =45, Total = 45 Periods

TEXT BOOKS:

REFERENCES
BEE603 SOLID STATE DRIVES AND CONTROL  L T P C
3 0 0 3

OBJECTIVES
i. To understand the stable steady-state operation and transient dynamics of a motor-load system.
ii. To study and analyze the operation of the converter / chopper fed DC drive and to solve simple problems.
iii. To study and understand the operation of both classical and modern induction motor drives.
iv. To study and analyze the operation of the inverter fed AC drives.
v. To analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

UNIT I DRIVE CHARACTERISTICS  9
Equations governing motor load dynamics - steady state stability - Multiquadrant dynamics - Acceleration, deceleration, starting and stopping - load torque characteristics of various drives.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE  9
Steady state analysis of the single and three phase fully controlled converter fed separately excited DC motor drive - Continuous and discontinuous conduction - Time ratio and current limit control - 4 quadrant operation of converter.

UNIT III DESIGN OF CONTROLLERS FOR DRIVES  9
Transfer function for DC motor, load and converter - Closed loop control with current and speed feedback - Armature voltage control and field weakening mode control, Design of controllers: Current controller and speed controller - Converter selection and characteristics.

UNIT IV INDUCTION MOTOR DRIVES  9
Stator voltage control - energy efficient drive - V/F control, constant air-gap flux - field weakening mode - voltage/current fed inverters - block diagram of vector control - closed loop control.

UNIT V SYNCHRONOUS MOTOR DRIVES  9
V/F control and self-control of synchronous motor – Marginal angle control and power factor control - Permanent magnet synchronous motor.

L =45, Total = 45 Periods

TEXT BOOKS:

REFERENCES
BEE604 MICROPROCESSORS AND MICROCONTROLLER WITH APPLICATIONS

OBJECTIVES
i. To study the Architecture of 8085 & 8086, 8051
ii. To study the addressing modes & instruction set of 8085 & 8051.
iii. To introduce the need & use of Interrupt structure 8085 & 8051.
iv. To develop skills in simple program writing for 8085, 8051 and applications
v. To introduce commonly used peripheral and interfacing ICs

UNIT I 8085 PROCESSOR

UNIT II PROGRAMMING OF 8085 PROCESSOR
Instruction format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions – Programming: Looping, Branching, Code conversion bit manipulation– Look up table – Subroutine instructions- Counters and time delays.

UNIT III PERIPHERAL INTERFACING
8255 Programmable peripheral interface, block diagram, operating modes & control words, programming examples- ADC and DAC –Traffic light interfacing-8279 Keyboard and Display interface, block diagram, operating modes & control words- 8251 USART, block diagram and control words- 8259 Programmable interrupt controller, block diagram, operating modes & control words – 8253 timer operating modes & control words.

UNIT IV 8051 MICROCONTROLLER
8051Architecture- memory organization –special function registers- Instruction format and addressing modes – hardware features of 8051-Parallel ports- Timers- Interrupt structure - Serial communication -Timing Diagram.

UNIT V MICROCONTROLLER PROGRAMMING & APPLICATIONS
Data Transfer, Manipulation, Control & I/O instructions – Simple programming exercises key board and seven segment and LCD display interface- Interfacing ADC, DAC and stepper motor control- Introduction to DC / Servo Motor Interface - Washing Machine Control.

L =45 Total = 45 Periods

TEXT BOOKS:

REFERENCES
BCS302 OBJECT ORIENTED PROGRAMMING L T P C
(Common to 3rd Sem – CSE & IT, 5th Sem – EIE, 6th Sem – EEE) 3 0 0 3

OBJECTIVES
- To explore the OOP concepts
- To illustrate the techniques which form the OOP paradigm
- To develop ability to apply OOP concepts using C++
- To work with real-time applications using advanced features of C++ such as Exception handling, Templates and File Streams.

UNIT I BASICS OF OBJECT – ORIENTED PROGRAMMING 9

UNIT II CONSTRUCTORS AND FUNCTION OVERLOADING 9

UNIT III TEMPLATES AND EXCEPTION HANDLING 9

UNIT IV INHERITANCE 9

UNIT V I/O STREAMS 9

TEXT BOOK:

REFERENCES
LIST OF EXPERIMENTS

8-bit Microprocessor (8085)
1. Simple arithmetic operations: Multiprecision addition / subtraction / multiplication / division (8 & 16 bit manipulation)
2. Programming with control instructions: Increment / decrement, ascending / descending order, maximum / minimum of numbers
3. Rotate instructions, Hex / ASCII / BCD code conversions
4. Interface Experiments:
   - A/D Interfacing
   - D/A Interfacing
5. Interface Experiments:
   - Keyboard display
   - Traffic light controller
6. Interface Experiments:
   - Simple experiments using 8251, 8279, 8254

8-bit Microcontroller (8051)
7. Demonstration of basic instructions with 8051 Microcontroller execution, including:
   - Addition / subtraction / multiplication / division
   - Conditional jumps, looping
   - Calling subroutines
   - Hex / ASCII / BCD code conversions
8. Parallel port programming with 8051 using port 1 facility:
   - Stepper motor Interfacing
   - D / A converter
9. Programming exercise on
   - RAM Direct Addressing
   - Bit Addressing
10. Programming Practice using simulation Tools and C Complier
    - Initialize Timer
    - Enable Interrupts
11. Study of Microcontroller with FLASH memory
12. Programming Practice on Assembler and Simulator tools in 8085

Total = 45 Periods
BCS332 OBJECT ORIENTED PROGRAMMING LABORATORY
(Common to 3rd Sem – CSE & IT, 5th Sem – EIE, 6th Sem – EEE)
L T P C 0 0 3 2

OBJECTIVES
- To provide fundamental knowledge and skills to practice C++ programming.
- To develop ability to solve real-time problems using OOPs concepts.
- To have an understanding and hands-on practice in advanced concepts of C++

LIST OF EXPERIMENTS
1. Design C++ classes with static members, methods with default arguments, friend functions. (For example, design matrix and vector classes with static allocation, and a friend function to do matrix-vector multiplication).
2. Implement complex number class with necessary operator overloading and type conversions such as integer to complex, double to complex, complex to double etc.
3. Implement matrix class with dynamic memory allocation and necessary methods. Give proper constructor, destructor, copy constructor, and overloading of assignment operator.
4. Overload the new and delete operators to provide custom dynamic allocation of memory.
5. Develop a template of linked-list class and its methods.
6. Develop templates of standard sorting algorithms such as bubble sort, insertion sort, merge sort, and quick sort.
7. Design stack and queue classes with necessary exception handling.
8. Define Point class and an Arc class. Define a Graph class which represents graph as a collection of Point objects and Arc objects. Write a method to find a minimum cost spanning tree in a graph.
9. Develop with suitable hierarchy, classes for Point, Shape, Rectangle, Square, Circle, Ellipse, Triangle, Polygon, etc. Design a simple test application to demonstrate dynamic polymorphism and RTTI.
10. Write a C++ program that randomly generates complex numbers (use previously designed Complex class) and writes them two per line in a file along with an operator (+, -, *, or /). The numbers are written to file in the format (a + ib). Write another program to read one line at a time from this file, perform the corresponding operation on the two complex numbers read, and write the result to another file (one per line).

Total = 45 Periods
BEE701 POWER SYSTEM OPERATION AND CONTROL  L T P C  3 0 0 3

OBJECTIVES
- To have an overview of power system operation and control.
- To model power-frequency dynamics and to design power-frequency controller.
- To model reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load.
- To study the economic operation of power system.
- To teach about SCADA and its application for real time operation and control of power systems.

UNIT I INTRODUCTION  9
System load variation: System load characteristics, load curves - daily, weekly and annual, load-duration curve, load factor, diversity factor - Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves - Overview of system operation: Load forecasting, unit commitment, load dispatching.

UNIT II REAL POWER - FREQUENCY CONTROL  9
Fundamentals of speed governing mechanism and modelling: Speed-load characteristics – Load sharing between two synchronous machines in parallel; concept of control area, LFC control of a single-area system; Static and dynamic analysis of uncontrolled and controlled cases, Economic Dispatch Control. Multi-area systems: Two-area system modelling; static analysis, uncontrolled case; tie line with frequency bias control of two-area system derivation, state variable model.

UNIT III REACTIVE POWER CONTROL  9
Generation and absorption of reactive power; Relation between voltage, power and reactive power at a node; Injection of reactive power. Tap-changing transformer – numerical problems - System level control using generator voltage magnitude setting – tap setting of OLTC transformer – MVAR injection of switched capacitors to maintain acceptable voltage profile – to minimize transmission loss.

UNIT IV EXCITATION SYSTEMS  9

UNIT V COMPUTER CONTROL OF POWER SYSTEMS  9
Energy control centre: Functions – Monitoring, data acquisition and control. System hardware configuration – SCADA and EMS functions: Network topology determination, state estimation, security analysis and control. Various operating states: Normal, alert, emergency, inextremis and restorative. State transition diagram showing various state transitions and control strategies.

TOTAL: 45 PERIODS

TEXT BOOKS
REFERENCES

BEE702  PROTECTION AND SWITCHGEAR  L T P C  3 0 0 3

OBJECTIVES
- To discuss the causes of abnormal operating conditions (faults, lightning and switching surges) of the apparatus and system.
- To understand the characteristics and functions of relays and protection schemes.
- To understand the problems associated with circuit interruption by a circuit breaker.

UNIT I   INTRODUCTION  9
Importance of protective schemes for electrical apparatus and power system. Qualitative review of faults and fault currents - relay terminology – definitions and essential qualities of protection. Protection against over voltages due to lightning and switching - arcing grounds - Peterson Coil - ground wires - surge absorber and diverters - Power System earthing – neutral Earthing - basic ideas of insulation coordination.

UNIT II   OPERATING PRINCIPLES AND RELAY CHARACTERISTICS 9
Electromagnetic relays – over current, directional and non-directional, distance, negative sequence, differential and under frequency relays – Introduction to static relays.

UNIT III   APPARATUS PROTECTION 9
Main considerations in apparatus protection - transformer, generator and motor protection - protection of busbars. Transmission line protection - zones of protection. CTs and PTs and their applications in protection schemes.

UNIT IV   THEORY OF CIRCUIT INTERRUPTION 9
Physics of arc phenomena and arc interruption. DC and AC circuit breaking - restriking voltage and recovery voltage - rate of rise of recovery voltage - resistance switching - Control switching - current chopping - interruption of capacitive current.

UNIT V   CIRCUIT BREAKERS 9
Types of circuit breakers – air blast, air break, oil, SF6 and vacuum circuit breakers – Comparative merits of different circuit breakers – testing of circuit breakers – routine test and type test – operation of gas insulated substation.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
BEE703 ELECTRICAL ENERGY UTILIZATION AND CONSERVATION  

OBJECTIVES
To impart knowledge on
- Generation of electrical power by conventional and non–conventional methods.
- Electrical energy conservation, energy auditing and power quality.
- Principle and design of illumination systems and methods of heating and welding.
- Electric traction systems and their performance.
- Industrial applications of electric drives.

UNIT I CONSERVATION OF ELECTRICAL ENERGY

UNIT II ECONOMIC ASPECTS OF GENERATION

UNIT III ILLUMINATION

UNIT IV INDUSTRIAL HEATING AND WELDING

UNIT V ELECTRIC TRACTION

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
BEE704  EMBEDDED SYSTEM DESIGN AND APPLICATIONS  L T P C  3 0 0 3

OBJECTIVES
To provide a clear understanding of
- Embedded system terminologies and its devices.
- Various embedded software tools, design and architecture of memories.
- Architecture of processor and memory organizations.
- Input/output interfacing and processor scheduling algorithms.
- Basics of Real time operating systems.
- PIC and its applications.

UNIT I  INTRODUCTION TO EMBEDDED SYSTEMS  9
Introduction to embedded real time systems – The build process for embedded systems – Types of memory – Memory management methods.

UNIT II  EMBEDDED SYSTEM ORGANIZATION  9

UNIT III  PROGRAMMING AND SCHEDULING  9

UNIT IV  REAL TIME OPERATING SYSTEMS  9
Introduction to basic concepts of RTOS, Unix as a Real Time Operating system – Unix based Real Time operating system - Windows as a Real time operating system – POSIX – RTOS-Interrupt handling - A Survey of contemporary Real time Operating systems: PSOS, VRTX, VxWorks, QNX, micro controller/OS-II, RT Linux – Benchmarking Real time systems – Basics.

UNIT V  PIC MICROCONTROLLER BASED EMBEDDED SYSTEM DESIGN  9

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
BEE731  POWER SYSTEM SIMULATION LABORATORY         L T P C
0 0 3 2

OBJECTIVES

i. To develop simple software programs for the following basic requirements:
   a. Formation of bus admittance and impedance matrices and network solution.
   c. Unit Commitment and Economic Dispatch.

ii. To acquire experience in the usage of standard packages for the following analysis / simulation / control functions.
   a. Steady-state analysis of large system using NRPF and FDPF methods.
   b. Quasi steady-state (Fault) analysis for balanced and unbalanced faults.
   c. Transient stability simulation of multimachine power system.
   d. Simulation of Load-Frequency Dynamics and control of power system.

LIST OF EXPERIMENTS

2. Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
5. Symmetrical and unsymmetrical Fault Analysis
7. Transient Stability Analysis of Multimachine Power Systems
8. Electromagnetic Transients in Power Systems

TOTAL: 45 PERIODS
BEE732  DRIVES AND CONTROL DESIGN LABORATORY  L T P C
                        0  0  3  2

OBJECTIVES
To introduce the concept of dynamic simulation and design of controllers for
  •  Power Converters
  •  DC and AC machines using appropriate software packages.

LIST OF EXPERIMENTS
  1.  Design of  Phase controlled rectifiers
  2.  Design of Inverters
  3.  Design of DC choppers
  4.  Design of AC Voltage controllers
  5.  Design of Cycloconverters.
  6.  Design of Regulated Power supply (Dual)
  7.  Design of Transformer
  8.  Design of PID controllers
  9.  Design of speed control of DC machines
 10. Design of speed control of Induction machines

TOTAL: 45 PERIODS
OBJECTIVES
The course would develop confidence in Electrical and Electronics Engineering concepts to the student to appear any competitive examinations like GATE, IES.

DETAILED SYLLABUS

Electric Circuits and Fields: Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac networks; sinusoidal steady-state analysis, resonance, basic filter concepts; ideal current and voltage sources, Thevenin’s, Norton’s and Superposition and Maximum Power Transfer theorems, two-port networks, three phase circuits; Gauss Theorem, electric field and potential due to point, line, plane and spherical charge distributions; Ampere’s and Biot-Savart’s laws; inductance; dielectrics; capacitance.

Signals and Systems: Representation of continuous and discrete-time signals; shifting and scaling operations; linear, time-invariant and causal systems; Fourier series representation of continuous periodic signals; sampling theorem; Fourier, Laplace and Z transforms.

Electrical Machines: Single phase transformer – equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers – connections, parallel operation; auto-transformer; energy conversion principles; DC machines – types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors; three phase induction motors – principles, types, performance characteristics, starting and speed control; single phase induction motors; synchronous machines – performance, regulation and parallel operation of generators, motor starting, characteristics and applications; servo and stepper motors.

Power Systems: Basic power generation concepts; transmission line models and performance; cable performance, insulation; corona and radio interference; distribution systems; per-unit quantities; bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis; principles of over-current, differential and distance protection; solid state relays and digital protection; circuit breakers; system stability concepts, swing curves and equal area criterion; HVDC transmission and FACTS concepts.

Control Systems: Principles of feedback; transfer function; block diagrams; steady-state errors; Routh and Niquist techniques; Bode plots; root loci; lag, lead and lead-lag compensation; state space model; state transition matrix, controllability and observability.

Electrical and Electronic Measurements: Bridges and potentiometers; PMMC, moving iron, dynamometer and induction type instruments; measurement of voltage, current, power, energy and power factor; instrument transformers; digital voltmeters and multimeters; phase, time and frequency measurement; Q-meters; oscilloscopes; potentiometric recorders; error analysis.

Analog and Digital Electronics: Characteristics of diodes, BJT, FET; amplifiers – biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers – characteristics and applications; simple active filters; VCOs and timers; combinational and sequential logic circuits; multiplexer; Schmitt trigger; multi-vibrators; sample and hold circuits; A/D and D/A converters; 8-bit microprocessor basics, architecture, programming and interfacing.
**Power Electronics and Drives:** Semiconductor power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs – static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters – fully controlled and half controlled; principles of choppers and inverters; basis concepts of adjustable speed dc and ac drives.

**TOTAL: 45 PERIODS**

**TEXT BOOK:**

**REFERENCES:**
BEE801 NON CONVENTIONAL ENERGY RESOURCES

OBJECTIVES

- Understand and analyze the pattern of renewable energy resources
- Suggest methodologies/technologies for its utilization.
- Economics of the utilization and environmental merits.

UNIT I SOLAR ENERGY


UNIT II WIND ENERGY

Wind data and energy estimation – Wind energy conversion systems – Wind energy generators and its performance – Wind energy storage – Applications – Hybrid systems.

UNIT III BIO - ENERGY


UNIT IV OTEC, TODAL, GEOTHERMAL AND HYDEL ENERGY


UNIT V ENERGY MANAGEMENT


TOTAL: 45 PERIODS

TEXT BOOKS


REFERENCES

BMG601   PRINCIPLES OF MANAGEMENT       L T P C
         3 0 0 3

OBJECTIVES

• To get the skills needed to successfully manage an organization.
• To understand concepts of strategic and tactical organizational planning.
• Implement employee motivational approaches and conflict management skills.
• To describe common performance appraisal processes.
• To understand group and team management, management development, and employee training.
• Describe concepts of controlling and control systems.

UNIT I  FOUNDATIONS

UNIT II  MANAGERS AND ENVIRONMENT

UNIT III  FUNCTIONAL AREA OF ORGANISATION

UNIT IV  MOTIVATION AND DIRECTIONS

UNIT V  CONTROLLING STRATEGIES

TOTAL: 45 PERIODS

TEXT BOOKS
REFERENCES
BEE001 LINEAR AND NONLINEAR CONTROL SYSTEMS  
L T P C  3 0 0 3

OBJECTIVES
To impart knowledge on
i. Modelling of physical systems using transfer function and state space model
ii. Realization and response of state model
iii. Time domain and frequency response analysis using transfer function
iv. Analysis of nonlinear system
v. Stability concepts

UNIT I MODELLING OF PHYSICAL SYSTEM  9
Introduction –Transfer function- State Space Model- Electrical system, Mechanical system- Hydraulic system- Pneumatic system- Thermal system- Modelling of DC Machines- Inverted Pendulum

UNIT II STATE SPACE ANALYSIS  9
Realization of State models: – Non-uniqueness, Minimal realization, Balanced realization- State transition matrix and its properties- Free and forced responses- Controllability and observability

UNIT III TRANSFER FUNCTION ANALYSIS  9

UNIT IV NONLINEAR SYSTEM  9
Types of nonlinearity with examples- Equivalent linearization- Phase plane analysis, Limit cycles- Describing functions, Analysis using Describing functions- Jump resonance.

UNIT V STABILITY ANALYSIS  9
Stability concepts, Equilibrium points- Direct method of Lyapunov (without proof) and Application to non-linear problems- Frequency domain stability criteria- Popov’s method and its extensions.

L =45  Total = 45 Periods

TEXT BOOKS:

REFERENCES
BEE002 SWITCHED MODE POWER CONVERSIONS

OBJECTIVE
i. To study the operation, switching techniques and different topologies of DC-DC switching regulators.

UNIT I INTRODUCTION

UNIT II BASIC SWITCHING CONVERTER TOPOLOGIES
Basic concepts of SMPS - DC-DC converters – characteristics - constituent elements - operating principles.

UNIT III RESONANT CONVERTERS
Classification of resonant converters - basic resonant circuit concepts - load resonant converters - resonant switches converters - zero voltage switching.

UNIT IV CONTROL SCHEME AND DYNAMIC ANALYSIS OF SWITCHING CONVERTER
Steady state analysis - stress and sizing of elements - control methods - duty ratio - current programmed - frequency programmed - sliding mode control - dynamic analysis - frequency domain models - Standard available controllers (76494 or SG3524).

UNIT V UNITY POWER FACTOR RECTIFIER
Unity power factor rectifier - resistor emulation principle – applications.

TEXT BOOKS:

REFERENCES
BMG701       TOTAL QUALITY MANAGEMENT         L T P C

OBJECTIVES:
   i. To introduce the principles of business and social excellence
   ii. To generate knowledge and skills of students to use models and quality management
       methodology for the implementation of total quality management in any sphere of business
       and public sector.

UNIT I INTRODUCTION          9
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of
manufacturing and service quality - Basic concepts of TQM - Definition of TQM — Contributions of
Deming, Juran and Crosby – Cost of Quality, Analysis Techniques for Quality Costs -Barriers to
TQM.

UNIT II TQM PRINCIPLES       9
Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality,
Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and
Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA
Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating,
Relationship Development, Performance Measures – Basic Concepts, Strategy, - Business Excellence
Model-Rajiv Gandhi National Quality Award

UNIT III TQM TOOLS & TECHNIQUES I   9
The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology,
applications to manufacturing, service sector including IT – Bench marking– Reason to bench mark,
Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II  9
Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality
Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA –
Stages of FMEA.

UNIT V QUALITY SYSTEMS         9
Need for ISO 9000 - ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing -
QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation
in manufacturing and service sectors including IT.

L =45 Total = 45 Periods

TEXT BOOKS:
   Indian Reprint (2010).
2. James R. Evans and William M. Lindsay, “The Management and Control of Quality” 6th

REFERENCE
BEC521 PRINCIPLES OF COMMUNICATION SYSTEMS L T P C 3 0 0 3

OBJECTIVES
i. To have understanding about different types of AM Communication systems (Transmitters & Receivers)
ii. To study in detail the different types of FM transmitters & Receivers and PM Transmitters and Receivers
iii. To gain knowledge about different digital modulation techniques for digital transmission.
iv. To have knowledge about base band transmission ISI and distortion free base band transmission
v. To know the spread spectrum modulation techniques and different multiple access methods.

UNIT I AMPLITUDE MODULATION: TRANSMISSION AND RECEPTION 9
Principles of amplitude modulation – AM envelope, frequency spectrum and bandwidth, modulation index and percent modulation, AM power distribution, AM modulator circuits – low level AM modulator, medium power AM modulator, AM transmitters – low level transmitters, high level transmitters, Receiver parameters. AM reception: AM receivers – TRF, Superheterodyne receivers, Double Conversion AM receivers.

UNIT II ANGLE MODULATION: TRANSMISSION AND RECEPTION 9
Angle Modulation – FM and PM waveforms, phase deviation and modulation index, frequency deviation, phase and frequency modulators and demodulators, frequency spectrum of a angle modulated waves, Bandwidth requirement, Broadcast band FM, Average power FM and PM modulators – Direct FM and PM, Direct FM transmitters, Indirect transmitters, Angle modulation Vs. amplitude modulation. FM receivers: FM demodulators, PLL FM demodulators, FM noise suppression, Frequency Vs. phase Modulation.

UNIT III DIGITAL MODULATION TECHNIQUES 9
Introduction, Binary PSK, DPSK, Differentially encoded PSK, QPSK, M-ary PSK, QASK, Binary FSK, MSK, Duobinary encoding – Performance comparison of various systems of Digital Modulation.

UNIT IV BASEBAND DATA TRANSMISSION 9
Sampling theorem, Quadrature sampling of bandpass signals, reconstruction of message from its samples, Signal distortion in sampling, Discrete PAM signals, power spectra of Discrete PAM signals, ISI Nyquist Criterion for Distortionless baseband binary transmission, eye pattern, baseband M-ary PAM systems, adaptive equalization for data transmission.

UNIT V SPREAD SPECTRUM AND MULTIPLE ACCESS TECHNIQUES 9
Introduction, Pseudo-noise sequence, DS spread spectrum with coherent binary PSK, Processing gain, FH spread spectrum, multiple access techniques, wireless communications, TDMA and CDMA, wireless communication systems, source coding of speech for wireless communications.

TEXT BOOKS:

REFERENCES
BEI021  FIBRE OPTICS AND LASER INSTRUMENTS  L T P C  3 0 0 3

OBJECTIVES
i. To expose the students to the basic concepts of optical fibres and their properties.
ii. To provide adequate knowledge about the Industrial applications of optical fibres.
iii. To expose the students to the Laser fundamentals.
iv. To provide adequate knowledge about Industrial application of lasers.
v. To provide adequate knowledge about holography and Medical applications of Lasers.

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES  9

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES  9

UNIT III LASER FUNDAMENTALS  9

UNIT IV INDUSTRIAL APPLICATION OF LASERS  9
Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect – Material processing – Laser heating, welding, melting and trimming of material – Removal and vaporization.

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS  9

L =45 Total = 45 Periods

TEXT BOOKS

REFERENCE BOOKS
BEE003  POWER SYSTEM TRANSIENTS           L T P C
                                                   3 0 0 3

OBJECTIVES
• To study the generation of switching transients and their control using circuit – theoretical
  concept.
• To study the mechanism of lightning strokes and the production of lightning surges.
• To study the propagation, reflection and refraction of travelling waves.
• To study the impact of voltage transients caused by faults, circuit breaker action, load
  rejection on integrated power system.

UNIT I  INTRODUCTION AND SURVEY
Review and importance of the study of transients - causes for transients. RL circuit transient with sine
wave excitation - double frequency transients – basic transforms of the RLC circuit transients.
Different types of power system transients - effect of transients on power systems – role of the study
of transients in system planning.

UNIT II  SWITCHING TRANSIENTS
Over voltages due to switching transients - resistance switching and the equivalent circuit for
interrupting the resistor current - load switching and equivalent circuit - waveforms for transient
voltage across the load and the switch - normal and abnormal switching transients. Current
suppression – current chopping - effective equivalent circuit. Capacitance switching - effect of source
regulation - capacitance switching with a restrike, with multiple restrikes. Illustration for multiple
restriking transients - ferro resonance.

UNIT III  LIGHTNING TRANSIENTS
Formation of charge cloud formation - rate of charging of thunder clouds – mechanism of lightning
discharges and characteristics of lightning strokes – model for lightning stroke – factors contributing
to good line design - protection using ground wires - tower footing resistance - Interaction between
lightning and power system.

UNIT IV  TRAVELLING WAVES ON TRANSMISSION LINE COMPUTATION OF
TRANSIENTS
Computation of transients - transient response of systems with series and shunt lumped parameters
and distributed lines. Travelling wave concept – step response - Bewely’s lattice diagram - standing
waves and natural frequencies - reflection and refraction of travelling waves.

UNIT V  TRANSIENTS IN INTEGRATED POWER SYSTEM
The short line and kilometric fault - distribution of voltages in a power system -Line dropping and
load rejection - voltage transients on closing and reclosing lines - over voltage induced by faults -
switching surges on integrated system qualitative application of EMTP for transient computation.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCE
   2000.
BEE004  ADVANCED CONTROL THEORY  L T P C
                                    3 0 0 3

OBJECTIVES

- To study the state space, describing function.
- To study the phase plane and stability analysis including controllability and observability.
- To known the modern control and optimal control systems.

UNIT I  STATE VARIABLE TECHNIQUES  9

Concept of state – State Variable and State Model – State models for linear and continuous time systems – Solution of state and output equation Transfer function from state variable model – controllability and observability - Pole Placement – State observer Design of Control Systems with observers.

UNIT II  PHASE PLANE ANALYSIS  9


UNIT III  SAMPLED DATA SYSTEMS  9

Sampling process, impulse modulation, mathematical analysis of sampling process, application of Laplace transform, Shannon’s theorem, reconstruction of sampled signal zero order & first order hold, Z-transform, definition, evaluation of Z-transform, Inverse Z-transform, pulse transfer function, limitations of Z-transform, state variable formulation of discrete time systems. Solution of discrete time state equations, stability, definition, the Schur-Cohn stability criterion, Jury’s test of stability of extension of Routh-Hurwitz criterion to discrete time systems.

UNIT IV  STABILITY ANALYSIS  9

Introduction – Liapunov’s stability concept – Liapunov’s direct method – Lure’s transformation – Aizerman’s and Kalman’s conjecture – Popov’s criterion – Circle criterion.

UNIT V  OPTIMAL CONTROL  9


TOTAL: 45 PERIODS

TEXT BOOKS


REFERENCES

BEE005  EHV POWER TRANSMISSION  L T P C
                                      3 0 0 3

OBJECTIVES

• To develop expressions for the computation of transmission line parameters.
• To improve the voltage profile of the EHV transmission system.

UNIT I  INTRODUCTION  9
Standard transmission voltages – different configurations of EHV and UHV lines – average
values of line parameters – power handling capacity and line loss – costs of transmission lines
and equipments – mechanical considerations in line performance – Comparison of HVDC and
HVAC.

UNIT II  CALCULATION OF LINE PARAMETERS  9
Calculation of resistance, inductance and capacitance for multi-conductor lines – calculation of
sequence inductances and capacitances – line parameters for different modes of propagation –
resistance and inductance of ground return, numerical example involving a typical 400/220kV line
using line constant program.

UNIT III  VOLTAGE GRADIENTS OF CONDUCTORS  9
Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors –
gradient factors and their use – distribution of voltage gradient on sub conductors of bundle - voltage
gradients on conductors in the presence of ground wires on towers.

UNIT IV  CORONA EFFECTS  9
Methods to identify corona - Power losses and audible losses: I^2R loss and corona loss - audible noise
generation and characteristics - limits for audible noise - Day-Night equivalent noise level- radio
interference: corona pulse generation and properties - limits for radio interference fields.

UNIT V  ELECTROSTATIC FIELD OF EHV LINES  9
Effect of EHV line on heavy vehicles - calculation of electrostatic field of AC lines - effect of
high field on humans, animals and plants - measurement of electrostatic fields - electrostatic induction
in unenergised circuit of a d/c line - induced voltages in insulated ground wires - electromagnetic
interference.

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES
Association, October 2002.
Canada. (Website: www.microtran.com).
BEE006 SOFT COMPUTING FOR ELECTRICAL ENGINEERING L T P C 3 0 0 3

OBJECTIVES
• To study the importance of various soft computing approaches.
• To study the neural network concepts and its classifications.
• To introduce the concepts of fuzzy logic system and its application.
• To study about genetic algorithm.
• To apply the soft computing techniques for Electrical Engineering problems.

UNIT I INTRODUCTION 9

UNIT II ARTIFICIAL NEURAL NETWORKS 9

UNIT III FUZZY LOGIC SYSTEM 9
Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modelling and control. Fuzzification, inferencing and defuzzification. Fuzzy knowledge and rule bases. Fuzzy modelling and control schemes for nonlinear systems. Self-organizing fuzzy logic control. Fuzzy logic control for nonlinear time-delay system.

UNIT IV GENETIC ALGORITHM 9
Basic concept of Genetic algorithm and detail algorithmic steps, adjustment of free parameters. Search operators and selection schemes, Solution of typical control problems using genetic algorithm.

UNIT V APPLICATIONS FOR ELECTRICAL ENGINEERING 9

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES
BEE007  INDUSTRIAL AUTOMATION AND CONTROL  L T P C
3 0 0 3

OBJECTIVES
• To study the importance of various automation strategy
• To study the concept of PLC and SCADA
• To apply the concepts of PLC and SCADA
• To study about distributed control system
• To apply automation strategy to various industries

UNIT I  CONTROL SYSTEMS AND AUTOMATION STRATEGY  9
Evolution of instrumentation and control, Role of automation in industries, Benefits of automation, Introduction to automation tools PLC, DCS, SCADA, Hybrid DCS/PLC, Automation strategy evolution, Control system audit, performance criteria, Safety Systems.

UNIT II  PROGRAMMABLE LOGIC CONTROLLERS (PLC)  9
Introduction, architecture, definition of discrete state process control, PLC Vs PC, PLC Vs DCS, relay diagram, ladder diagram, ladder diagram examples, relay sequencers, timers/counters, PLC design, Study of at least one industrial PLC.

UNIT III  ADVANCE APPLICATIONS OF PLC AND SCADA  9
PLC programming methods as per IEC 61131, PLC applications for batch process using SFC, Analog Control using PLC, PLC interface to SCADA/DCS using communication links (RS232, RS485) and protocols (Modbus ASCII/RTU)

UNIT IV  DISTRIBUTED CONTROL SYSTEMS  9
DCS introduction, functions, advantages and limitations, DCS as an automation tool to support Enterprise Resources Planning, DCS Architecture of different makes, specifications, configuration and programming, functions including database management, reporting, alarm management, communication, third party interface, control, display etc. Enhanced functions viz. Advance Process Control, Batch application, Historical Data Management, OPC support, Security and Access Control etc.

UNIT V  AUTOMATION  9
Power, Water and Waste Water Treatment, Food and Beverages, Cement, Pharmaceuticals, Automobile and Building Automation.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
BEE008  SPECIAL ELECTRICAL MACHINES  

OBJECTIVES:
To impart knowledge on
- Construction, principle of operation and performance of synchronous reluctance motors.
- Construction, principle of operation, control and performance of stepping motors.
- Construction, principle of operation, control and performance of switched reluctance motors.
- Construction, principle of operation, control and performance of permanent magnet brushless DC motors.
- Construction, principle of operation and performance of permanent magnet synchronous motors

UNIT I   SYNCHRONOUS RELUCTANCE MOTORS

UNIT II  STEPPER MOTORS

UNIT III  SWITCHED RELUCTANCE MOTORS

UNIT IV  PERMANENT MAGNET BRUSHLESS DC MOTORS

UNIT V  PERMANENT MAGNET SYNCHRONOUS MOTORS

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
BME022 SOLAR PHOTOVOLTAIC FUNDAMENTALS AND APPLICATIONS  

**OBJECTIVES**

To impart knowledge on
- Capability of understanding the fundamentals of solar cells
- Proficient to recognize various technology up gradations along with their benefits
- Competent to design & analyze on-grid PV applications
- Skilled to design & analyze off-grid PV applications
- Ability to realize cost benefit analysis of PV installations

**UNIT I** ESSENTIAL BASICS OF SOLAR CELL  

**UNIT II** COMMERCIAL AND DEVELOPING TECHNOLOGIES  
Commercial technologies - Mono crystalline and Multi crystalline, Silicon - Wafer based Solar cell, Thin film solar cells – A-Si, Cd-Te and CIGS, Concentrated PV cells, Developing technologies – Organic cells, Dye sensitized cells.

**UNIT III** SOLAR PV FOR ON-GRID APPLICATIONS  

**UNIT IV** SOLAR PV FOR OFF-GRID APPLICATIONS  
Off-Grid stand alone PV system - System sizing – Module and Battery - Storage – Batteries for PV systems – Sun Tracking mechanism – Types of tracking – One-axis, Two-axis - Maximum power point tracking – Design and analysis - Performance evaluation and monitoring - Field visit – Off-grid PV system

**UNIT V** COST BENEFIT ANALYSIS FOR SOLAR PV INSTALLATIONS  

**TOTAL: 45 PERIODS**

**TEXT BOOK**


**REFERENCES**

2. “Solar Electricity: Engineering of Photovoltaic Systems” by Eduardo Lorenzo, PROGENSA.
4. www.pveducation.org
BEI045    ROBOTICS AND AUTOMATION                                             L  T  P  C
(Common to EIE, EEE)                        3  0   0   3

OBJECTIVES
Upon completion of the course, students will be able to
• Describe the fundamental of robotics, various types of industrial sensors and sources.
• Analyze and perform kinematics of robot systems.
• Understand the control of robots using programming languages.
• Demonstrate the function of robot and automation in industrial activities.

UNIT I  INTRODUCTION  9
Fundamental concepts of robotics: robotics and automation – robot anatomy – types of robotics
Asimov’s laws of robotics - robot coordinates and control system, specification of Robots: Resolution,
Repeatability, Accuracy, degrees of freedom and speed.

UNIT II  SENSORS AND POWER SOURCES  9
Internal state sensors: position sensors and velocity sensors - External state sensors: contact type –
Tactile sensors and Force/Torque sensors, Non-contact type: Visual sensors and Proximity/Range sensors - Hydraulic, Pneumatic and Electric drives - Determination of HP of motor and gearing ratio -
power transmission systems and control.

UNIT III  MANIPULATORS AND GRIPPERS  9
Manipulators: Manipulator Dynamic and Force Control - Electronic and Pneumatic manipulators –
manipulator control circuits, Types of End Effector: Mechanical gripper and gripper mechanism - end
effector interfaces - Design consideration.

UNIT IV  KINEMATICS AND PATH PLANNING  9
Homogeneous coordinates, Homogeneous transformation and manipulator, Forward and Inverse
Kinematic problems, Solutions of Inverse Kinematic problems, Jacobian control –Hill climbing
techniques - Robot programming languages

UNIT V  CASE STUDIES  9
Multiple robots, Machine interface, Robots in manufacturing and non manufacturing applications,
Robot cell design, Selection of robot.

TOTAL: 45 PERIODS

TEXT BOOKS
India/Pearson Education, Asia, second edition 2010.

REFERENCE BOOKS
Digitized Dec 4, 2007
Digitized Dec 5, 2007
BEI802  BIOMEDICAL INSTRUMENTATION  L T P C
(Common to EIE, EEE)  3 0 0 3

OBJECTIVES
Upon completion of the course, students will be able to
• Describe the physiology of the heart, lung and blood circulation.
• Select the suitable transducers/electrodes for bio-medical applications.
• Identify the various electro-physiological parameters and its measurement procedures.
• Analyze the concept of non-electrical parameter measurement
• Evaluate the effect of different therapeutic and prosthetic devices

UNIT I    PHYSIOLOGY AND TRANSDUCERS         9

UNIT II    ELECTRO-PHYSIOLOGICAL MEASUREMENT        9

UNIT III   NON-ELECTRICAL PARAMETER MEASUREMENT        9

UNIT IV    MEDICAL IMAGING AND TELEMETRY          9

UNIT V    ASSISTING AND THERAPEUTIC DEVICES         9

TOTAL: 45 PERIODS

TEXT BOOKS

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**UNIT I  PROCESSES AND THREADS**


**UNIT II  PROCESS SCHEDULING AND SYNCHRONIZATION**


**UNIT III  STORAGE MANAGEMENT**


**UNIT IV  FILE SYSTEMS**


**UNIT V  I/O SYSTEMS**


**TOTAL: 45 PERIODS**

**TEXT BOOK**


**REFERENCES**

### BCS030 DATA COMMUNICATION AND COMPUTER NETWORKS

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#### OBJECTIVES
- To study the concepts of data communications and network architecture.
- To understand the network classifications and design principles.
- To learn about various multiple access techniques used in networking.
- To study about the switching concepts and routing protocols.
- To learn about the various protocols.

#### UNIT I DATA COMMUNICATIONS

Data communications and networking overview - Data transmission – Guided and wireless transmission- Signal encoding - Multiplexing – Spread spectrum

#### UNIT II NETWORK FUNDAMENTALS

OSI model - TCP/IP protocol suite- Repeaters –Hubs - Bridges-Switches-Router – Brouters - Topologies – Ethernet - Token ring, FDDI, Wireless LANs

#### UNIT III DATA LINK LAYER

Link level error control-Checksum-CRC- Flow control mechanisms- Stop and wait ARQ- Go-Back N ARQ-Selective repeat ARQ.

#### UNIT IV NETWORK LAYER

Routing – Distance Vector Routing-Link State Routing- Inter-domain routing-BGP-IP –ARP-RARP- ICMP-IGMP.

#### UNIT V TRANSPORT AND APPLICATION LAYER

TCP- UDP - DNS, Telnet - Rlogin - FTP - SMTP - WWW - HTTP- SNMP.

**TOTAL: 45 PERIODS**

#### TEXT BOOKS

#### REFERENCES
BEE009  VLSI DESIGN AND TECHNOLOGY  L T P C
3 0 0 3

OBJECTIVES
- To give clear idea about the basics of VLSI design and its importance.
- To know about the operating principles of MOS transistor.
- To study about construction of NMOS, CMOS and Bi-CMOS based logic gates.
- To understand the functioning of programmable and Reprogrammable devices.
- To learn about the programming of Programmable device using VHDL.

UNIT I  BASIC MOS TRANSISTOR  9
Enhancement mode & Depletion mode – Fabrication (NMOS, PMOS, CMOS, BiCMOS) Technology
- NMOS transistor current equation – second order effects – MOS Transistor Model

UNIT II  NMOS AND CMOS INVERTER AND GATES  9
NMOS & CMOS inverter – Determination of pull up / pull down ratios. Stick diagram – lamda based
rules - Super buffers – BiCMOS & steering logic

UNIT III  SUB SYSTEM DESIGN AND LAYOUT  9
Structured design of combinational circuits – Dynamic CMOS & clocking- Tally circuits – (NAND-NAND,
NOR-NOR and AOI logic) – EXOR structure - Multiplexer structures – Barrel shifter

UNIT IV  DESIGN OF COMBINATIONAL ELEMENTS AND REGULAR ARRAY LOGIC  9
NMOS PLA – Programmable Logic Devices – Finite State Machine PLA – Introduction to FPGA

UNIT V  VHDL PROGRAMMING  9
RTL Design – combinational logic – Types – Operators – Packages – Sequential circuit – Sub
programs – Test benches. (Examples: address, counters, flipflops, FSM, Multiplexers / Demultiplexers

TOTAL: 45 PERIODS

TEXT BOOKS
Delhi, 2003.

REFERENCES
BEE010 ELECTRICAL POWER SYSTEM QUALITY

OBJECTIVES

- To study the production of voltages sags, over voltages and harmonics and methods of control.
- To study various methods of power quality monitoring.

UNIT I INTRODUCTION

Terms and definitions – Overloading, under voltage, over voltage - Concepts of transients - Short duration variations such as interruption - Long duration variation such as sustained interruption - Sags and swells - Voltage sag - Voltage swell - Voltage imbalance – Voltage fluctuation - Power frequency variations - International standards of power quality – Computer Business Equipment Manufacturers Associations (CBEMA) curve.

UNIT II VOLTAGE SAGS AND INTERRUPTIONS

Sources of sags and interruptions - Estimating voltage sag performance - Thevenin’s equivalent source - Analysis and calculation of various faulted condition - Voltage sag due to induction motor starting - Estimation of the sag severity - Mitigation of voltage sags, active series compensators - Static transfer switches and fast transfer switches.

UNIT III OVERVOLTAGES

Sources of over voltages - Capacitor switching – Lightning - Ferro resonance - Mitigation of voltage swells - Surge arresters - Low pass filters - Power conditioners - Lightning protection – Shielding - Line arresters - Protection of transformers and cables - An introduction to computer analysis tools for transients, PSCAD and EMTP.

UNIT IV HARMONICS


UNIT V POWER QUALITY MONITORING

Monitoring considerations - Monitoring and diagnostic techniques for various power quality problems - Modeling of power quality (harmonics and voltage sag) problems by mathematical simulation tools - Power line disturbance analyzer – Quality measurement equipment - Harmonic / spectrum analyzer - Flicker meters - Disturbance analyzer - Applications of expert systems for power quality monitoring.

TOTAL: 45 PERIODS

TEXT BOOKS


REFERENCES

7. PSCAD User Manual
BEE011   HVDC TRANSMISSION   L T P C
                          3 0 0 3

OBJECTIVES

- To understand the concept, planning of DC power transmission and comparison with AC power transmission.
- To analyze HVDC converters.
- To study about compounding and regulation.
- To analyze harmonics and design of filters.
- To learn about HVDC cables and simulation tools.

UNIT I   INTRODUCTION

Introduction of DC Power transmission technology – Comparison of AC and DC transmission – Application of DC transmission – Description of DC transmission system – Planning for HVDC transmission – Modern trends in DC transmission.

UNIT II   ANALYSIS OF HVDC CONVERTERS


UNIT III   COMPOUNDING AND REGULATIONS


UNIT IV   HARMONICS AND FILTERS


UNIT V   HVDC CABLES AND SIMULATION OF HVDC SYSTEMS


TOTAL: 45 PERIODS

TEXT BOOKS


REFERENCES

BEE012 MICRO ELECTRO MECHANICAL SYSTEMS L T P C
3 0 0 3

OBJECTIVES
At the end of this course the student will be able to

- integrate the knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
- understand the rudiments of Microfabrication techniques.
- identify and understand the various sensors and actuators
- different materials used for MEMS
- applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

UNIT I INTRODUCTION 9
Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators –
Introduction to Microfabrication - Silicon based MEMS processes – New Materials – Review of
Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis –
Flexural beam bending - Torsional deflection.

UNIT II SENSORS AND ACTUATORS-I 9
Electrostatic sensors – Parallel plate capacitors – Applications – Interdigitated Finger capacitor –
Comb drive devices – Thermal Sensing and Actuation – Thermal expansion – Thermal couples –
Thermal resistors – Applications – Magnetic Actuators – Micromagnetic components – Case studies
of MEMS in magnetic actuators.

UNIT III SENSORS AND ACTUATORS-II 9
Piezoresistive sensors – Piezoresistive sensor materials - Stress analysis of mechanical elements –
Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators –
piezoelectric effects – piezoelectric materials – Applications to Inertia - Acoustic, Tactile and Flow
sensors.

UNIT IV MICROMACHINING 9
Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching –
Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies -
Basic surface micromachining processes – Structural and sacrificial Materials – Acceleration of
sacrificial Etch – Striction and Antistriction methods – Assembly of 3D MEMS – Foundry process.

UNIT V POLYMER AND OPTICAL MEMS 9
Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene
– Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS –
Lenses and Mirrors – Actuators for Active Optical MEMS.

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES
deVICES, John Wiley and son Limited,2002
BEE013  CAD OF ELECTRICAL APPARATUS  L T P C
3 0 0 3

OBJECTIVES:
At the end of this course the student will be able to
• Learn the importance of computer aided design method.
• Understand the basic electromagnetic field equations and the problem formulation for CAD applications.
• Become familiar with Finite Element Method as applicable for Electrical Engineering.
• Know the organization of a typical CAD package.
• Apply Finite Element Method for the design of different Electrical apparatus.

UNIT I  INTRODUCTION  9
Conventional design procedures – Limitations – Need for field analysis based design – Review of Basic principles of energy conversion – Development of Torque/Force.

UNIT II  MATHEMATICAL FORMULATION OF FIELD PROBLEMS  9

UNIT III  PHILOSOPHY OF FEM  9

UNIT IV  CAD PACKAGES  9

UNIT V  DESIGN APPLICATIONS  9

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
5. User Manuals of MAGNET, MAXWELL & ANSYS Softwares.
BEE014  FLEXIBLE AC TRANSMISSION SYSTEMS  L T P C
3 0 0 3

OBJECTIVES
• To understand the concept of flexible AC transmission and the associated problems.
• To review the static devices for series and shunt control.
• To study the operation of controllers for enhancing the transmission capability.

UNIT I  INTRODUCTION
The concept of flexible AC transmission - reactive power control in electrical power transmission lines - uncompensated transmission line – series and shunt compensation. Overview of FACTS devices - Static Var Compensator (SVC) – Thyristor Controlled Series capacitor (TCSC) – Unified Power Flow controller (UPFC) - Integrated Power Flow Controller (IPFC).

UNIT II  STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS

UNIT IV EMERGING FACTS CONTROLLERS

UNIT V  CO-ORDINATION OF FACTS CONTROLLERS
FACTs Controller interactions – SVC–SVC interaction - co-ordination of multiple controllers using linear control techniques – Quantitative treatment of control coordination.

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES
BEE015 POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS L T P C
3 0 0 3

OBJECTIVES
- To study the importance of renewable energy, renewable energy based energy conversion systems, and distributed power generation
- To overview about the wind energy basics and the existing Power Electronics interface requirements and techniques have been addressed qualitatively.
- To integrate the different methods of these systems to the grid have been briefly described.

UNIT I INTRODUCTION
Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION
Review of reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

UNIT III POWER CONVERTERS
Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing - Wind: three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS
Stand alone operation of fixed and variable speed wind energy conversion systems and solar system-Grid connection Issues - Grid integrated PMSG and SCIG Based WECS Grid Integrated solar system

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS
Need for Hybrid Systems - Range and type of Hybrid systems - Case studies of Wind-PV- Maximum Power Point Tracking (MPPT).

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
BEE016 ELECTROMAGNETIC INTERFERENCE AND ELECTROMAGNETIC COMPATIBILITY

OBJECTIVES
- Describe the characteristics and design of electromagnetic compatibility.
- Discuss the methods of coupling and grounding.
- Summarize filtering, shielding and coating methods.
- Explain the digital logic noise and ground noise.
- List the standard and laboratory techniques.

UNIT I INTRODUCTION
Sources of EMI – Conducted and radiated interference – Characteristics – Designing for electromagnetic compatibility (EMC) - EMC regulation - typical noise path - use of network theory - methods of eliminating interferences.

UNIT II METHOD OF HARDENING

UNIT III BALANCING, FILTERING AND SHIELDING
Power supply decoupling - decoupling filters-amplifier filtering – high frequency filtering shielding – near and far fields - shielding effectiveness - absorption and reflection loss - Shielding with magnetic material - conductive gaskets - windows and coatings - grounding of shields.

UNIT IV DIGITAL CIRCUIT NOISE AND LAYOUT

UNIT V ELECTROSTATIC DISCHARGE, STANDARDS AND LABORATORY TECHNIQUES
Static Generation - human body model - static discharges -ED protection in equipment design - ESD versus EMC - Industrial and Government standards – FCC requirements – CISPR recommendations - Laboratory techniques - Measurement methods for field strength - EMI.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
BEE017   POWER SYSTEM DYNAMICS   L T P C
3 0 0 3

OBJECTIVES

- To review the modelling of synchronous machine, the excitation system and speed governing Controllers.
- To study small signal stability analysis of a single machine infinite bus system with excitation system and power system stabilizer.
- To study transient stability simulation of multimachine power system

UNIT I  INTRODUCTION  9
Basics of system dynamics – numerical techniques – introduction to software packages for studying the responses. Concept and importance of power system stability in the operation and design distinction between transient and dynamic stability - complexity of stability problem in large system – necessity for reduced models - stability of interconnected systems.

UNIT II  SYNCHRONOUS MACHINE MODELLING  9
Synchronous machine - flux linkage equations - Park’s transformation - per unit conversion - normalizing the equations – equivalent circuit - current space model – flux linkage state space model. Sub-transient and transient inductances - time constants - Simplified models (one axis and constant flux linkage) - steady state equations and phasor diagrams.

UNIT III  MACHINE CONTROLLERS  9
Exciter and voltage regulators - function and types of excitation systems – typical excitation system configuration - block diagram and state space representation of IEEE type 1 excitation system - saturation function – stabilizing circuit.

UNIT IV  TRANSIENT STABILITY  9
State equation for multimachine system with one axis model and simulation – modelling of multimachine power system with one axis machine model including excitation system and speed governing system and simulation using R-K method of fourth order (Gill’s technique) for transient stability analysis – power system stabilizer.

UNIT V  DYNAMIC STABILITY  9

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
## OBJECTIVES

- Understand the FPGA based design.
- Get exposed to Real-Time Operating System.
- Understand the purpose of Processor and Software architecture.
- Learn about the development tools and debugging techniques.

### UNIT I  INTRODUCTION TO ASICs, CMOS LOGIC AND ASIC LIBRARY DESIGN

Types of ASICs - Design Flow - CMOS transistors, CMOS design rules - Combinational Logic Cell - Sequential logic cell - Data path logic cell - Transistors as Resistors - Transistor Parasitic Capacitance - Logical effort - Library cell design - Library architecture.

### UNIT II  PROGRAMMABLE LOGIC CELLS AND I/O CELLS

Anti fuse - static RAM - EPROM and EEPROM technology - PREP bench marks - Actel ACT - Xilinx LCA - Altera FLEX - Altera MAX DC & AC inputs and outputs - Clock and power inputs - Xilinx I/O blocks.

### UNIT III  INTERCONNECTS AND ASIC DESIGN SOFTWARE


### UNIT IV  LOGIC SYNTHESIS, SIMULATION AND TESTING


### UNIT V  FLOOR PLANNING, PLACEMENT AND ROUTING

System partition - FPGA partitioning - partitioning methods - floor planning - placement - physical design flow - global routing - detailed routing - special routing - circuit extraction - DRC.

**TOTAL: 45 PERIODS**

### TEXT BOOKS


### REFERENCES

2. Design manuals of Altera, Xilinx and Actel. (From the web)
BEE019  ENERGY AUDITING AND MANAGEMENT  L T P C
3 0 0 3

OBJECTIVES
- The objective of Energy Management is to achieve and maintain optimum energy procurement and utilisation, throughout the organization and
- To minimise energy costs / waste without affecting production & quality
- To minimise environmental effects.

UNIT I  INTRODUCTION  9

UNIT II  ELECTRICAL ENERGY SYSTEMS  9

UNIT III  ENERGY CONSERVATION  9

UNIT IV  PERFORMANCE EVALUATION AND OPTIMIZATION OF ELECTRICAL UTILITIES  9
Principle – Types – Performance evaluation of transformers, energy distribution - Cable selection and cable losses, capacitors, electric motors, electrical heating and lighting systems.

UNIT V  ENERGY MANAGEMENT  9
Importance of energy management, energy economics – Discount rate, payback period, internal rate of return, life cycle costing risk and sensitivity analysis, financing, energy performance.

TOTAL: 45 PERIODS

TEXT BOOK

REFERENCES
BIT801 MOBILE COMMUNICATION L T P C 3 0 0 3

OBJECTIVES
- To learn the basics of Wireless voice and data communications technologies.
- To study the working principles of wireless LAN and its standards.
- To build working knowledge on various telephone and satellite networks.
- To build knowledge on various Mobile Computing algorithms.
- To build skills in working with Wireless application Protocols to develop mobile content applications.

UNIT I WIRELESS COMMUNICATION FUNDAMENTALS 9

UNIT II TELECOMMUNICATION SYSTEMS 9

UNIT III WIRELESS LAN 9

UNIT IV NETWORK AND TRANSPORT LAYEWR 9
Mobile Network Layer: Mobile IP, Dynamic Host Configuration Protocol, ad hoc networks
Mobile Transport Layer: Tradition TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/ Fast recovery Transmission / timeout freezing, selective retransmission, Transaction oriented TCP.

UNIT V WIRELESS ATM 9
Motivation for ATM, wireless ATM, Working group, WATM services, reference model, functions, radio access layer, handover, location management, Addressing, mobile quality of service, access point control protocol.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
1. S.Rappapart Wireless Communication; Prentice Hall, NJ 2002
BIT014 COMPUTER ARCHITECTURE

OBJECTIVES

- To have a thorough understanding of the basic structure and operation of a Digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study in detail the different types of control and the concept of pipelining.
- To study the hierarchical memory system including cache memories and virtual memory.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I INSTRUCTION SET ARCHITECTURE

Introduction to computer architecture - Review of digital design – Instructions and addressing – procedures and data – assembly language programs – instruction set variations

UNIT II ARITHMETIC/LOGIC UNIT

Number representation – design of adders – design of simple ALUs – design of Multipliers and dividers – design of floating point arithmetic unit

UNIT III DATA PATH AND CONTROL

Instruction execution steps – control unit synthesis – microprogramming – pipelining – pipeline Performance

UNIT IV MEMORY SYSTEM

Main Memory concepts – types of memory – cache memory organization – secondary storage – virtual memory – paging

UNIT V I/O AND INTERFACES


TOTAL: 45 PERIODS

TEXT BOOKS


REFERENCES

BGE002       INDUSTRIAL SAFETY ENGINEERING       L T P C

3  0  0  3

OBJECTIVE

• To understand the basic concepts and Principles in the area Safety, health and hazards.

UNIT I  ACCIDENT INVESTIGATION AND ANALYSIS       9
Concept of an Accident, reportable and non reportable accidents, reporting to statutory authorities. Principles of accident prevention - accident investigation and analysis - Unsafe act and unsafe condition - Domino sequence-cost of accidents - permanent total disabilities, Permanent partial disabilities, Temporary total disabilities - Calculation of frequency rate and severity rate of accidents.

UNIT II  ERGONOMICS AND HUMAN BEHAVIOUR       9

UNIT III  HAZARDS AND THEIR CONTROL       9
Physical hazards - Noise, heat, vibration, ionizing and non ionizing radiations, and effects. Chemical hazards-dusts, fumes, mist, vapor, fog, gases, types, concentration, exposure Vs. dose, TLV. Mechanical hazards. Engineering control methods- use of personal protective equipment’s.

UNIT IV  FIRE PREVENTION AND PROTECTION       9
Fire triangle-principles of fire extinguishing - various classes of fires - A, B, C, D types of fire extinguishers - Industrial fire protection systems. Sprinklers - Fire hydrants - Alarm and detection systems - other suppression systems - CO₂ system, foam system and DCP system.

UNIT V  SAFETY MANAGEMENT TECHNIQUES, EDUCATION AND TRAINING       9

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
BME014  FUNDAMENTALS OF NANO TECHNOLOGY  L T P C
3 0 0 3

OBJECTIVE
• To study the basics and important applications of nanotechnology.

UNIT I  INTRODUCTION  9
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-
Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfils-
multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic,
Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study
(qualitative only).

UNIT II  PREPARATION METHODS  9
Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-
assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy,
Atomic Layer Epitaxy, MOMBE.

UNIT III  PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES  5
Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching,
dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV  PREPARATION ENVIRONMENTS  9
Clean rooms: specifications and design, air and water purity, requirements for particular processes,
Vibration free environments: Services and facilities required. Working practices, sample cleaning,
Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic
hazards, biohazards.

UNIT V  CHARACTERISATION TECHNIQUES  9
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission
Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM,
STM, SNOM, ESCA, SIMS-Nanoindentation

TOTAL: 45 PERIODS

TEXT BOOKS
1. A.S. Edelstein and R.C. Cammearata, eds., “Nanomaterials: Synthesis, Properties and

REFERENCES
2. Akhlesh Lakhtakia (Editor), “The Hand Book of Nano Technology, Nanometer Structure -
   Theory, Modeling and Simulations”, Prentice-Hall of India Private Limited, New Delhi,
   2007.