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)

S.No	Course Code	Course Title	L	T	P	C
THEORY						
1.	BEG101	Technical English – I	3	1	0	4
2.	BMA101	Mathematics – I	3	1	0	4
3.	BPH101	Engineering Physics – I	3	0	0	3
4.	BCY101	Engineering Chemistry – I	3	0	0	3
5.	BCS101	Fundamentals of Computing and Programming	3	0	0	3
6.	BME101	Engineering Graphics	2	3	0	4
PRACTICAL						
7.	BCS131	Computer Practice Laboratory – I	0	0	3	2
8.	BPC131	Physics and Chemistry Laboratory –I	0	0	3	2
9.	BME131	Engineering Practices Laboratory	0	0	3	2
Total Number of Credits :						**27**

SEMESTER – II

S.No	Course Code	Course Title	L	T	P	C
THEORY						
1.	BEG201	Technical English – II*	3	0	0	3
2.	BMA201	Mathematics – II*	3	1	0	4
3.	BPH201	Engineering Physics – II *	3	0	0	3
4.	BCY201	Engineering Chemistry – II *	3	0	0	3
5. a.	BME201	Engineering Mechanics (For Mechanical & Civil branches)	3	1	0	4
b.	BEE201	Circuit Theory (For EEE & EIE branches)	3	1	0	4
c.	BEC201	Electric Circuits and Electron Devices (For CSE, IT & ECE branches)	3	1	0	4
6. a.	BEE202	Basic Electrical & Electronics Engineering (For Mechanical & Civil branches)	4	0	0	4
b.	BME202	Basic Civil & Mechanical Engineering (For CSE, IT, EEE, EIE & ECE branches)	4	0	0	4
PRACTICAL						
7.	BCS231	Computer Practice Laboratory – II*	0	1	2	2
8.	BPC231	Physics & Chemistry Laboratory – II*	0	0	3	2
9. a.	BME231	Computer Aided Drafting and Modeling Laboratory (For Mechanical & Civil branches)	0	1	2	2
b.	BEE231	Electrical Circuits Laboratory (For EEE & EIE branches)	0	0	3	2
c.	BEC231	Circuits and Devices Laboratory (For ECE, CSE & IT branches)	0	0	3	2
10.	BEG231	English Language Skill Laboratory* (Skill of Listening)	0	0	3	2
		Total Number of Credits :				**29**

- *** Common to all B.E. / B.Tech. Programmes**

SEMESTER – III

S.No	Course Code	Course Title	L	T	P	C
THEORY						
1.	BMA301	Transforms and Partial Differential Equations	3	1	0	4
2.	BEE301	Measurements and Instrumentation	3	0	0	3
3.	BEE302	Electromagnetic Theory	3	1	0	4
4.	BEE303	Electronic Devices and Applications	3	0	0	3
5.	BCE301	Environmental Science and Engineering	3	0	0	3
6.	BCS304	Data Structures and Algorithms	3	0	0	3
PRACTICAL						
1.	BEE331	Electronic Devices and Applications Laboratory	0	0	3	2
2.	BEE332	Measurements and Instrumentation Laboratory	0	0	3	2
3.	BCS334	Data Structures and Algorithms Laboratory	0	0	3	2
4.	BEG331	Communication Skills and Technical Seminar – I	0	0	3	2
TOTAL			**18**	**2**	**12**	**28**

SEMESTER – IV

S.No	Course Code	Course Title	L	T	P	C
THEORY						
1.	BMA404	Numerical Methods (Common to EEE, Civil)	3	1	0	4
2.	BEE401	Electrical Machines – I	3	1	0	4
3.	BEE402	Control Systems (Common to EEE and EIE)	3	1	0	4
4.	BEE403	Digital Logic Circuits	3	1	0	4
5.	BEI404	Linear Integrated Circuits and Applications (Common to EEE and EIE)	3	0	0	3
6.	BME405	Power Plant Engineering	3	1	0	4
PRACTICAL						
7.	BEE431	Control Systems Laboratory	0	0	3	2
8.	BEE432	Integrated Circuits Laboratory	0	0	3	2
9.	BEE433	Electrical Machines Laboratory – I	0	0	3	2
10.	BEG431	Communication Skills and Technical Seminar – II	0	0	3	2
TOTAL			**18**	**5**	**12**	**31**

SEMESTER – V

S.No	Course Code	Course Title	L	T	P	C
THEORY						
1.	BEE501	Electrical Machines – II	3	1	0	4
2.	BEE502	Transmission and Distribution System	3	1	0	4
3.	BEE503	Digital Signal Processing and its Applications	3	1	0	4
4.	BEE504	Power Electronics	3	0	0	3
5.	BEE505	High Voltage Engineering	3	0	0	3
6.	BGE501	Professional Ethics and Human Values	3	0	0	3
PRACTICAL						
7.	BEE531	Electrical Machines Laboratory – II	0	0	3	2
8.	BEE532	Power Electronics and Drives Laboratory	0	0	3	2
		TOTAL	**18**	**3**	**6**	**25**

SEMESTER – VI

S. No	Course Code	Course Title	L	T	P	C
THEORY						
1.	BEE601	Design of Electrical Apparatus	3	1	0	4
2.	BEE602	Power System Analysis	3	0	0	3
3.	BEE603	Solid State Drives and Control	3	0	0	3
4.	BEE604	Microprocessors and Microcontroller with Applications	3	0	0	3
5.	BCS302	Object Oriented Programming	3	0	0	3
6.		Elective – I	3	0	0	3
PRACTICAL						
1.	BEE631	Microprocessors and Microcontroller Laboratory	0	0	3	2
2.	BCS332	Object Oriented Programming Laboratory	0	0	3	2
		TOTAL	**18**	**1**	**6**	**23**

ELECTIVE – I

S. No	Course Code	Course Title	L	T	P	C
1.	BEE001	Linear and Nonlinear Control Systems	3	0	0	3
2.	BEE002	Switched Mode Power Conversions	3	0	0	3
3.	BMG701	Total Quality Management	3	0	0	3
4.	BEC521	Principles of Communication Systems	3	0	0	3
5.	BEI021	Fibre Optics and Laser Instruments	3	0	0	3

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	BEE701	Power System Operation and Control	3	0	0	3
2.	BEE702	Protection and Switchgear	3	0	0	3
3.	BEE703	Electrical Energy Utilization and Conservation	3	0	0	3
4.	BEE704	Embedded System Design and Applications	3	0	0	3
5.		Elective – II	3	0	0	3
6.		Elective – III	3	0	0	3
PRACTICAL						
1.	BEE731	Power System Simulation Laboratory	0	0	3	2
2.	BEE732	Drives and Control Design Laboratory	0	0	3	2
3.	BEE733	Comprehension	0	0	3	1
		TOTAL	**18**	**0**	**9**	**23**

SEMESTER VII- ELECTIVES

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	BEE003	Power System Transients	3	0	0	3
2.	BEE004	Advanced Control Theory	3	0	0	3
3.	BEE005	EHV Power Transmission	3	0	0	3
4.	BEE006	Soft Computing for Electrical Engineering	3	0	0	3
5.	BEE007	Industrial Automation and Control	3	0	0	3
6.	BEE008	Special Electrical Machines	3	0	0	3
7.	BME022	Solar Photovoltaic Fundamentals and Applications	3	0	0	3
8.	BEI802	Biomedical Instrumentation	3	0	0	3
9.	BEI045	Robotics and Automation	3	0	0	3
10.	BCS404	Operating Systems	3	0	0	3
11.	BCS030	Data Communication and Computer Networks	3	0	0	3

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	BEE801	Non Conventional Energy Resources	3	0	0	3
2.	BMG601	Principles of Management	3	0	0	3
3.		Elective – IV	3	0	0	3
4.		Elective – V	3	0	0	3
5.	BEE831	Project Work	0	0	18	12
		TOTAL	**12**	**0**	**18**	**24**

SEMESTER VIII- ELECTIVES

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	BEE009	VLSI Design and Technology	3	0	0	3
2.	BEE010	Electrical Power System Quality	3	0	0	3
3.	BEE011	HVDC Transmission	3	0	0	3
4.	BEE012	Micro Electro Mechanical Systems	3	0	0	3
5.	BEE013	CAD of Electrical Apparatus	3	0	0	3
6.	BEE014	Flexible AC Transmission Systems	3	0	0	3
7.	BEE015	Power Electronics for Renewable Energy Systems	3	0	0	3
8.	BEE016	Electromagnetic Interference and Electromagnetic Compatibility	3	0	0	3
9.	BEE017	Power System Dynamics	3	0	0	3
10.	BEE018	FPGA based Design	3	0	0	3
11.	BEE019	Energy Auditing and Management	3	0	0	3
12.	BIT801	Mobile Communication	3	0	0	3
13.	BIT014	Computer Architecture	3	0	0	3
14.	BGE002	Industrial Safety Engineering	3	0	0	3
15.	BME014	Fundamentals of Nano Technology	3	0	0	3

BEG101 TECHNICAL ENGLISH – I L T P C
3 1 0 4

UNIT I 12

General Vocabulary – Changing words from one form to another – Adjectives, Comparative adjectives – Active and Passive voice – Tenses – simple present, present continuous – Nouns – compound nouns – Skimming and scanning – Listening and transfer of information – bar chart, flowchart – Paragraph writing, description – Discussing as a group and making an oral report on the points discussed, Conversation techniques – convincing others.

Suggested activities:

1. Matching words & meanings - Using words in context – Making sentences.
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 12

Vocabulary – prefixes & suffixes – simple past tense – Spelling and punctuation – 'wh' Question forms – Scanning, inference – Listening & note-taking – Paragraph writing – Comparison and contrast – Creative thinking and speaking.

Suggested Activities:

1. a. Vocabulary activities using prefixes and suffixes.
   b. Exercises using questions – asking & answering questions.
2. Scanning the text for specific information.
3. Listening and note-taking – Writing paragraphs using notes, giving suitable headings and subheadings for paragraphs. Using expressions of comparison and contrast.
4. Discussion activities and exploring creative ideas.

Any other related relevant classroom activity.

UNIT III 12

Tenses – simple past, simple future and past perfect – Reading in Context – Reading & note-making – single line – Definitions – sequencing of sentences – instruction writing – Persuasive speaking.

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 12

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 **12**

'If' conditionals – Gerunds – Intensive reading – Speaking – Presentation of problems & solutions – Itinerary – planning for an industrial visit – Formal Letter writing – Letter to the editor, invitation letter, accepting, declining letter and permission letter.

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:

1. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 1– 4 (Resources, Energy, Computer, Transport)

REFERENCES

1. Meenakshi Raman and Sangeeta Sharma, 'Technical Communication English skills for Engineers', Oxford University Press, 2008.
2. Andrea, J. Rutherford, 'Basic Communication Skills for Technology', 2nd Edition, Pearson Education, 2007.

***Extensive Reading*:**

A.P.J.Abdul Kalam with Arun Tiwari, 'Wings of Fire' An Autobiography, University Press (India) Pvt. Ltd.,1999, 30th Impression 2007.

BMA101 MATHEMATICS – I L T P C
3 1 0 4

UNIT I MATRICES 12

Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY 12

Equation of a sphere – Plane section of a sphere – Tangent Plane – Equation of a cone – Right circular cone – Equation of a cylinder – Right circular cylinder.

UNIT III DIFFERENTIAL CALCULUS 12

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 12

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Differentiation of implicit functions – Jacobians – Taylor's expansion – Maxima and Minima – Method of Lagrangian multipliers.

UNIT V MULTIPLE INTEGRALS 12

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:

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", 3rd Edition, Laxmi Publications (P) Ltd., (2008).

REFERENCES

1. Grewal. B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, Delhi, (2007).
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2007).
3. Glyn James, "Advanced Engineering Mathematics", 7th Edition, Wiley India, (2007).
4. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

BPH101 ENGINEERING PHYSICS – I L T P C
3 0 0 3

UNIT I ULTRASONICS 9

Introduction – Production – magnetostriction effect – Magnetostriction generator– piezoelectric effect – piezoelectric generator – Detection of ultrasonic waves – properties – Cavitations – Velocity measurement – acoustic grating – Industrial applications – drilling, welding, soldering and cleaning – SONAR – Non Destructive Testing – pulse echo system through transmission and reflection modes – A,B and C – scan displays, Medical applications – Sonograms.

UNIT II LASERS 9

Introduction – Principle of Spontaneous emission and stimulated emission, Population inversion, pumping, Einsteins A and B coeffcients – derivation. Types of lasers – He-Ne, CO_2, Nd-YAG, Semiconductor lasers (homojunction & heterojunction) Qualitative Industrial Applications - Lasers in welding, heat treatment, cutting – Medical applications – Holography (construction & reconstruction).

UNIT III FIBER OPTICS & APPLICATIONS 9

Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – Double crucible technique of fibre drawing – Splicing, Loss in optical fibre – attenuation, dispersion, bending – Fibre optical communication system (Block diagram) – Light sources – Detectors – Fibre optic sensors – temperature & displacement – Endoscope.

UNIT IV QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jean's Law from Planck's theory – Compton effect – Theory and experimental verification – Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box – Electron microscope – Scanning electron microscope – Transmission electron microscope.

UNIT V CRYSTAL PHYSICS 9

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:

1. R. K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi (2003)
2. M.N.Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics' S.Chand and company, Ltd., New Delhi, 2005.

REFERENCES

1. Serway and Jewett, 'Physics for Scientists and Engineers with Modern Physics', 6th Edition, Thomson Brooks/Cole, Indian reprint (2007)
2. Rajendran, V and Marikani A, 'Engineering Physics' Tata Mc Graw Hill Publications Ltd, III Edition, New Delhi (2004).
3. Palanisamy, P.K., 'Engineering Physics' Scitech publications, Chennai (2007).
4. Jayakumar. S, 'Engineering Physics', R.K. Publishers, Coimbatore (2003).
5. Chitra Shadrach and Sivakumar Vadivelu, 'Engineering Physics', Pearson Education, New Delhi (2007).

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

Adsorption – types – adsorption of gases on solids – adsorption isotherms – Frendlich and Langmuir 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:

1. P.C.Jain and Monica Jain, “Engineering Chemistry” Dhanpat Rai Pub.Co., New Delhi (2002).
2. S.S. Dara “A text book of engineering chemistry” S.Chand & Co. Ltd., New Delhi (2006).

REFERENCES

1. B.K.Sharma “Engineering chemistry” Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. B. Sivasankar “Engineering Chemistry” Tate McGraw-Hill Pub.Co.Ltd., New Delhi (2008).

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

UNIT I INTRODUCTION TO COMPUTERS 9

Introduction – Characteristics of Computers – Evolution of Computers – Computer Generations – 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:

1. Ashok.N.Kamthane, "Computer Programming", Pearson Education (India) (2008).
2. Behrouz A.Forouzan and Richard.F.Gilberg, "A Structured Programming Approach Using C", Second Edition, Brooks-Cole Thomson Learning Publications (2007).

REFERENCES

1. Pradip Dey and Manas Ghoush, "Programming in C", Oxford University Press (2007).
2. Byron Gottfried, "Programming with C", 2nd Edition, (Indian Adapted Edition), TMH publications (2006). (Unit II, III, IV, and V).
3. Stephen G.Kochan, "Programming in C", Third Edition, Pearson Education India (2005).
4. Brian W.Kernighan and Dennis M.Ritchie, "The C Programming Language", Pearson Education Inc. (2005).
5. E.Balagurusamy,"Computing fundamentals and C Programming", Tata McGRaw-Hill Publishing Company Limited (2008).
6. S.Thamarai Selvi and R.Murugan, "C for All", Anuradha Publishers (2008).

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 cycloid – 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:

N.D. Bhatt, “Engineering Drawing” Charotar Publishing House, 46th Edition, (2003).

REFERENCES

1. K.V.Natarajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai (2006).
2. M.S. Kumar, “Engineering Graphics”, D.D. Publications (2007).
3. K. Venugopal & V. Prabhu Raja, “Engineering Graphics”, New Age International (P) Limited (2008).
4. M.B. Shah and B.C. Rana, “Engineering Drawing”, Pearson Education (2005).
5. K. R. Gopalakrishnana, “Engineering Drawing” (Vol. I & II), Subhas Publications (1998).
6. Dhananjay A.Jolhe, “Engineering Drawing with an introduction to AutoCAD” Tata McGraw Hill Publishing Company Limited (2008).
7. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi (2008).

BCS131 COMPUTER PRACTICE LABORATORY – I L T P C
0 0 3 2

LIST OF EXERCISES
I. MS Office

a) WORD PROCESSING

1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
3. Mail merge and Letter preparation.
4. Drawing - Flow Chart.

b) SPREAD SHEET

1. Chart - Line, XY, Bar and Pie.
2. Formula - formula editor.
3. Spread sheet - inclusion of object, picture and graphics, protecting the document and sheet.
4. Sorting and Import / Export features.

II SIMPLE C PROGRAMMING

1. Data types, Expression evaluation, Conditional statements.
2. Arrays.
3. Structures and Unions.
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"**

BPC131 PHYSICS AND CHEMISTRY LABORATORY – I **L T P C**
0 0 3 2

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.
3. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
4. Determination of wavelength of mercury spectrum – spectrometer grating.
5. Determination of thermal conductivity of a bad conductor – Lee's Disc 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
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

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.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor for HWR and FWR.

TOTAL: 45 PERIODS

REFERENCES

1. K.Jeyachandran, S.Natarajan & S, Balasubramanian, “A Primer on Engineering Practices Laboratory” Anuradha Publications (2007).
2. T.Jeyapoovan, M.Saravanapandian & S.Pranitha, “Engineering Practices Lab Manual”, Vikas Publishing House Pvt. Ltd, (2006)
3. H.S. Bawa, “Workshop Practice”, Tata McGraw – Hill Publishing Company Limited (2007).
4. A. Rajendra Prasad & P.M.M.S. Sarma, “Workshop Practice”, Sree Sai Publication (2002).
5. P.Kannaiah & K.L.Narayana, “Manual on Workshop Practice”, Scitech Publications (1999).

BEG201 TECHNICAL ENGLISH – II **L T P C**

(*Common to all branches)* **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**

Phrases / structure indicating cause/purpose – Adverbs – Skimming – Non-verbal communication – Listening – correlating verbal and non-verbal communication – speaking in group discussion – Formal Letter writing – Writing analytical paragraphs.

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**

Cause and effect expressions – Different grammatical forms of the same word – speaking – stress and intonation, Group Discussions – reading – critical reading – listening – writing – using connectives, report writing – types, structure, data collection, content, form, recommendations.

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.
4. Sequencing of jumbled sentences using connectives – Writing different types of reports like industrial accident report and survey report – writing recommendations.

UNIT IV **10**

Numerical adjectives – Oral instructions – Descriptive writing – Argumentative paragraphs – Letter of application – content, format (CV/Bio-data) – instructions, imperative forms – preparing checklists, Yes/No question form – Email communication

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 **5**

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:

1. 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Department of Humanities & Social Sciences, Anna University, Chennai: Orient Longman Pvt. Ltd., 2006. Themes 5 – 8 (Technology, Communication, Environment, Industry)

REFERENCES

1. Mark Abbot son, "Technical English for professionals" (2009).
2. P.K. Dutt, G. Rajeevan and C.L.N Prakash, 'A Course in Communication Skills', Cambridge University Press, India 2007.
3. Krishna Mohan and Meera Banerjee, 'Developing Communication Skills', Macmillan India Ltd., (Reprinted 1994 – 2007).
4. Edgar Thorpe, Showick Thorpe, 'Objective English', Second Edition, Pearson Education, 2007.
5. Rodney Huddleston and Geoffrey Pullum, 'A students introduction to English Grammar', Cambridge University Press, 2007.
6. Jack C.Richards, Jonathan Hull and Susan Protor, 'English for International Communication', Third Edition, Cambridge University Press, 2004.

Extensive Reading:

1. Robin Sharma**, '**The Monk Who Sold His Ferrari', Jaico Publishing House, 2007

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	L T P C
	(*Common to all branches)*	3 1 0 4

UNIT I ORDINARY DIFFERENTIAL EQUATIONS 12

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 12

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 parallelpipeds.

UNIT III ANALYTIC FUNCTIONS 12

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 12

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 12

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:

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", 3rd Edition, Laxmi Publications (P) Ltd., (2008).
2. Grewal.B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications', Delhi (2007).

REFERENCES

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi (2007).
2. Glyn James, "Advanced Engineering Mathematics", 3rd Edition, Pearson Education (2007).
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 7th Edition, Wiley India (2007).
4. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

BPH201 ENGINEERING PHYSICS – II **L T P C**
(*Common to all branches)* **3 0 0 3**

UNIT I CONDUCTING MATERIALS 9

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

UNIT II SEMICONDUCTING MATERIALS 9

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

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti-ferromagnetic materials – Ferrites – applications – magnetic recording and readout – storage of magnetic data – tapes, floppy and magnetic disc drives. Superconductivity – Properties – Types of super conductors – BCS theory of superconductivity (Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – Internal field – Claussius-Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferro electricity and applications.

UNIT V MODERN ENGINEERING MATERIALS 9

Metallic glasses: preparation, properties and applications. Shape Memory Alloys (SMA): Characteristics, properties of Ni-Ti alloy, application, advantages and disadvantages of SMA. Nanomaterials: synthesis – plasma arcing – chemical vapour deposition – sol-gels – electrodeposition – ball milling – properties of nanoparticles and applications. Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition – structure – properties and applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Charles Kittel ‘Introduction to Solid State Physics’, John Wiley & sons 7th Edition, Singapore (2007)
2. Charles P. Poole and Frank J.Ownen, ‘Introduction to Nanotechnology’, Wiley India (2007) (for Unit V)

REFERENCES

1. G.Senthil Kumar, 'Engineering Physics – II' VRB Publishers Pvt Ltd., Chennai (2010)
2. B.N.Sankar and S.O.Pillai, 'Engineering Physics', New Age International Publishers (2008) New Delhi.
3. Jayakumar .S. 'Materials Science', R.K. Publishers, Coimbatore (2008).
4. Palanisamy.P.K, 'Materials Science', Scitech publications (India) Pvt. Ltd., Chennai, 2nd Edition (2007).
5. M. Arumugam, 'Materials Science' Anuradha Publications, Kumbakonam (2006).
6. Rajendran.V and Marikani.A, 'Materials Science' Tata McGraw Hill publications, New Delhi (2004).

BCY201 ENGINEERING CHEMISTRY – II **L T P C**

(*Common to all branches)* **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

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes –Standard Hydrogen electrode – calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometric titrations (redox Fe^{2+} vs dichromate and precipitation – Ag+ vs Cl^- titration) and conductometric titrations – acid-base (HCI vs NaOH) titrations.

UNIT II CORROSION AND CORROSION CONTROL 9

Chemical corrosion – Pilling-Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed current cathodic methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating.

UNIT III FUELS AND COMBUSTION 9

Calorific value – classification – Coal – proximate and ultimate analysis – metallurgical coke – manufacture by Otto-Hoffmann by product oven method – Petroleum processing and fractions – cracking – catalytic cracking and methods. knocking – octane number and cetane number – synthetic petrol – Fischer Tropsch and Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG – Flue gas analysis – Orsat apparatus – theoretical air for combustion.

UNIT IV PHASE RULE AND ALLOYS 9

Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

UNIT V ANALYTICAL TECHNIQUES 9

Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (problem) (block diagram only) – estimation of iron by Colorimetry. flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry. atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub. Co., New Delhi, 15th Edition (2009).
2. S.S.Dara "A text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2006)

REFERENCES

1. A Text book of Physical Chemistry by A.S.Negi & S.C. Anand, New Age International Pvt. Ltd., New Delhi (2009)
2. B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd., New Delhi (2008)
3. Principles of Physical Chemistry, AR Puri, LR Sharma, M.S. Pathania, Vishal Publication, (2005)
4. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001)

(a) BME201 ENGINEERING MECHANICS L T P C
(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

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations: additions, subtraction, dot product, cross product – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT II EQUILIBRIUM OF RIGID BODIES 12

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples

UNIT III PROPERTIES OF SURFACES AND SOLIDS 12

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, Angle section, Hollow section by using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia – Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 12

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12

Frictional force – Laws of Coloumb friction – simple contact friction – Rolling resistance – Belt friction. Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

TOTAL: 60 PERIODS

TEXT BOOK:

1. Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers", Vol. 1 Statics and Vol. 2 Dynamics, McGraw-Hill International Edition, 9th edition (2010)

REFERENCES

1. Rajasekaran.S, Sankarasubramanian.G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., 3rd Edition (2010).
2. Hibbeller, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 12th Edition (2010).
3. Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd., (2003).
4. Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd., (2002).
5. Palanichamy.M.S., Nagam, S., "Engineering Mechanics – Statics & Dynamics", Tata McGraw-Hill (2001).

(b) BEE201 CIRCUIT THEORY (For EEE & EIE Branches)

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UNIT I BASIC CIRCUITS ANALYSIS 12

Ohm's Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits.

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS 12

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS 12

Series and parallel resonance – their frequency response – Quality factor and Bandwidth – Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 12

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 12

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:

1. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGraw Hill, (2007).
2. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill publishers, 6th edition, New Delhi, (2002).

REFERENCES

1. John Bird "Electrical Circuit Theory and Technology" Fourth Edition, Newnes Publications (2010)
2. Charles K.Alexander, Mathew N.O.Sadik, "Fundamentals of Electric circuits", 2nd Edition, McGraw Hill (2003).
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi (2001).
4. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, (1996).
5. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi (1999).

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

UNIT I CIRCUIT ANALYSIS TECHNIQUES 12

Kirchoff's current and voltage laws – series and parallel connection of independent sources – R, L and C – Network Theorems – Thevenin, Superposition, Norton, Maximum power transfer and duality – Star-delta conversion.

UNIT II TRANSIENT & RESONANCE IN RLC CIRCUITS 12

Basic RL, RC and RLC circuits and their responses to pulse and sinusoidal inputs – frequency response – Parallel and series resonances – Q factor – single tuned and double tuned circuits.

UNIT III SEMICONDUCTOR DIODES 12

Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode – Energy band structure – current equation – space charge and diffusion capacitances – Effect of temperature and breakdown mechanism – Zener diode and its characteristics.

UNIT IV TRANSISTORS 12

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) 12

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:

1. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series, Tata McGraw Hill (2001)
2. Salivahanan, N. Suresh kumar and A.Vallavaraj, "Electronic Devices and Circuits", Tata McGraw Hill, 2nd Edition (2008).
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition (2008).

REFERENCES

1. William H. Hayt, J.V. Jack, E. Kemmebly and Steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill (2011.)
2. A.Sudhakar, Shyammohan S Palli, "Circuits and Networks-Analysis and Synthesis", Tata McGraw Hill, 4th edition (2010)
3. Robert T.Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Education (2008).
4. J.Millman & Halkins, Satyebranta Jit, "Electronic Devices & Circuits", Tata McGraw Hill, 2nd Edition (2008).
5. William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill, 6th Edition (2002).

(a) BEE202 BASIC ELECTRICAL & ELECTRONICS ENGINEERING L T P C
(For Mechanical & Civil Branches) 4 0 0 4

UNIT I ELECTRICAL CIRCUITS & MEASURMENTS 12

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits. Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II ELECTRICAL MACHINES 12

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

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier

UNIT IV DIGITAL ELECTRONICS 12

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (simple concepts)

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 12

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

TOTAL: 60 PERIODS

TEXT BOOKS:

1. R.S. Sedha, "Applied Electronics" S. Chand & Co., 2006.
2. V.N. Mittle "Basic Electrical Engineering", Tata McGraw Hill Edition, New Delhi, 1990.

REFERENCES

1. Gnanavadivel,C. Senthilkumar, A. Vijaykumar, S. Joseph Gladwin, "Basic Electrical and Electronics Engineering", Anuradha Publishers (2011).
2. Muthusubramanian.R, Salivahanan.S and Muraleedharan.K.A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition (2006).
3. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press (2005).
4. Premkumar N, "Basic Electrical Engineering", Anuradha Publishers (2003).
5. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum Outline Series, McGraw Hill (2002).
6. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd., (1994).

(b) BME202 BASIC CIVIL & MECHANICAL ENGINEERING L T P C
(For CSE, ECE, EEE, EIE & IT branches) 4 0 0 4

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 15

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

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

UNIT II BUILDING COMPONENTS AND STRUCTURES 15

Foundations: Types – Bearing capacity – Requirement of good foundations.

Superstructure: Brick masonry – stone masonry – Beams –Columns – Lintels – Roofing – Flooring – Plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

TOTAL: 30 PERIODS

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING 10

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV IC ENGINES 10

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 10

Terminology of Refrigeration and Air Conditioning: Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL: 30 PERIODS

REFERENCES

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

BCS231	COMPUTER PRACTICE LABORATORY – II	L	T	P	C
	(*Common to all branches)*	**0**	**1**	**2**	**2**

LIST OF EXPERIMENTS

1. UNIX COMMANDS

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

2. SHELL PROGRAMMING

Simple Shell program – Conditional Statements – Testing and Loops.

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

BPC231 PHYSICS AND CHEMISTRY LABORATORY – II **L T P C**

(Common to all branches) **0 0 3 2**

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.
4. Determination of viscosity of liquid – Poiseuille's method.
5. Spectrometer dispersive power of a prism.
6. Determination of Young's modulus of the material – uniform bending.
7. Torsional pendulum – Determination of rigidity modulus.

• **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 $BaCl_2$ Vs Na_2SO_4
4. Potentiometric Titration (Fe^{2+} Vs $K_2Cr_2O_7$)
5. pH Titration (Acid & Base)
6. Determination of water of crystallization of a crystalline salt ($CuSO_4$)
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 L T P C
(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 Bspline 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,
9. Drawing isometric projection of simple objects.
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 – 30 Nos.
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 **L T P C**

(For EEE & EIE branches) **0 0 3 2**

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 **L T P C**
(For ECE, CSE & IT branches) **0 0 3 2**

- 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

BEG231 ENGLISH LANGUAGE SKILL LABORATORY (Skill of Listening) L T P C
(*Common to all branches)* 0 0 3 2

UNIT I (Micro Skills I) 4

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 6

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 12

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 8

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 – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

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

1. Grewal, B.S, "Higher Engineering Mathematics", 40th Edition, Khanna publishers, Delhi, (2007)

REFERENCES

1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications(P) Ltd. (2007)
2. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company limited, New Delhi (2007).
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education (2007).
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, Wiley India (2007).

BEE301 MEASUREMENTS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

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 9

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 9

Principle and types of analog and digital voltmeters, ammeters, multimeters – Single and three phase wattmeters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Instrument transformers – Instruments for measurement of frequency and phase.

UNIT III COMPARISON METHODS OF MEASUREMENTS 9

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 9

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 9

Classification of transducers – Selection of transducers – Resistive, capacitive and inductive transducers – Piezoelectric, optical and digital transducers – Elements of data acquisition system – A/D, D/A converters – Smart sensors.

L = 45 Total = 45 Periods

TEXT BOOKS

1. E.O. Doebelin, ‘Measurement Systems – Application and Design’, Tata McGraw Hill publishing company, 2003.
2. A.K. Sawhney, ‘A Course in Electrical & Electronic Measurements & Instrumentation’, Dhanpat Rai and Co, 2004.

REFERENCE BOOKS

1. A.J. Bouwens, ‘Digital Instrumentation’, Tata McGraw Hill, 1997.
2. D.V.S. Moorthy, ‘Transducers and Instrumentation’, Prentice Hall of India Pvt Ltd, 2007.
3. H.S. Kalsi, ‘Electronic Instrumentation’, Tata McGraw Hill, 2nd Edition 2004.
4. Martin Reissland, ‘Electrical Measurements’, New Age International (P) Ltd., Delhi, 2001.
5. J. B. Gupta, ‘A Course in Electronic and Electrical Measurements’, S.K. Kataria & Sons, Delhi, 2003.

BEE302 ELECTROMAGNETIC THEORY **L T P C**
3 1 0 4

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 **8**

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 **10**

Coulomb's Law – Electric field intensity – Field due to point and continuous charges – Gauss's law and application – Electric potential – Electric field and equipotential plots – Electric field in free space, conductors, dielectric -Dielectric polarization – Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson's and Laplace's equations – Capacitance- Energy density.

UNIT III MAGNETOSTATICS **10**

Lorentz Law of force, magnetic field intensity – Biot–savart Law - Ampere's Law – Magnetic field due to straight conductors, circular loop, infinite sheet of current – Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization – Magnetic field in multiple media – Boundary conditions – Scalar and vector potential – Magnetic force – Torque – Inductance – Energy density – Magnetic circuits.

UNIT IV ELECTRODYNAMIC FIELDS **8**

Faraday's laws, induced emf – Transformer and motional EMF – Forces and Energy in quasi-stationary Electromagnetic Fields - Maxwell's equations (differential and integral forms) – Displacement current – Relation between field theory and circuit theory.

UNIT V ELECTROMAGNETIC WAVES **9**

Generation – Electro Magnetic Wave equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors-skin depth, Poynting vector – Plane wave reflection and refraction – Transmission lines – Line equations – Input impedances – Standing wave ratio and power.

L = 45 T = 15 Total: 60 Periods

TEXT BOOKS

1. Mathew N. O. Sadiku, 'Elements of Electromagnetics', Oxford University press Inc. 1st India Edition, 2007.
2. Ashutosh Pramanik, 'Electromagnetism – Theory and Applications', Prentice-Hall of India Private Limited, New Delhi, 2006.

REFERENCE BOOKS

1. Joseph A. Edminister, 'Theory and Problems of Electromagnetics', 2nd Edition, Schaum Series, Tata McGraw Hill, 1993.
2. William.H.Hayt, 'Engineering Electromagnetics', Tata McGraw Hill Edition, 2001.
3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, 5th Edition, 1999.

BEE303 ELECTRONIC DEVICES AND APPLICATIONS L T P C
3 0 0 3

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

Junction transistor – Transistor construction – Input and output characteristics – CE, CB and CC configurations – hybrid model – Analytical expressions – switching – RF application – Power transistors – Opto couplers.

UNIT III FET AND ITS APPLICATIONS 9

FET – VI characteristics, JFET – small signal model – LF and HF equivalent circuits – CS and CD amplifiers – Cascade and Darlington connection – MOSFET - Characteristics – enhancement and depletion.

UNIT IV AMPLIFIERS AND OSCILLATORS 9

Differential amplifiers: CM and DM –feedback amplifiers – stability –Voltage/current, series / shunt feedback – condition for oscillation - oscillators -– LC, RC, crystal.

UNIT V PULSE CIRCUITS 9

RC wave shaping circuits – Diode clampers and clippers – Multivibrators – Schmitt triggers – UJT based saw tooth oscillators.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Paynter, “Introductory electronic devices and circuits, 2006, PHI
2. David Bell “Electronic Devices and Circuits” 2007, PHI

REFERENCES

1. Theodre F.Boghert, “Electronic Devices & Circuits” Pearson Education, VI Edition, 2003
2. Rashid, “Microelectronic circuits” Thomson Publication, 1999
3. B.P.Singh & Rekha Sing, “Electronic Devices and Integrated Circuits” Pearson Education, 2006.

BCE301 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
(Common to 3rd Sem – Civil, CSE, IT, EEE and EIE 3 0 0 3
5th Sem – Mechanical, 7th Sem - ECE)

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 14

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 definition: 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 8

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 10

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

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of nongovernmental organization – environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation – central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV /AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45

TEXT BOOKS:

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd Edition, Pearson Education, 2008.
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

REFERENCES

1. R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media, BS Publications, 2004.
2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publishing House, Mumbai, 2001.
3. Dharmendra S. Sengar, "Environmental law", Prentice Hall of India (P) Ltd., New Delhi, 2007.
4. Rajagopalan R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.

BCS304 DATA STRUCTURES AND ALGORITHMS L T P C
(Common 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

1. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education Asia, 2011.
2. ISRD Group, “Data Structures using C”, Tata McGraw-Hill Publishing Company Ltd., 2006.

REFERENCES

1. R. F. Gilberg, B. A. Forouzan, “Data Structures: A Pseudocode approach with C”, 2nd Edition, Thomson India Edition, 2005.
2. Sara Baase and A. Van Gelder, “Computer Algorithms”, 3rd Edition, Pearson Education, 2000.
3. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", 2nd Edition, Prentice Hall of India Ltd, 2008.

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 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.
8. Implement priority queue using heaps
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
12. Implement Prim's and Kruskal's algorithms
13. Implement a backtracking algorithm for Knapsack problem
14. Implement a branch and bound algorithm for traveling salesperson problem
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.
  ('ion' , 'ic' 'ical' 'ious','ate' , 'ise/-ize', 'fy', 'logy', 'ity')

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. hypothesing/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 endings.

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 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
- 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 news paper 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 Total = 45

BMA404 NUMERICAL METHODS L T P C
(Common to EEE, Civil) **3 1 0 4**

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)

Solution of equation - Fixed point iteration: x=g(x) method – Newton's method – Solution of linear system by Gaussian elimination and Gauss-Jordon methods – Iterative methods - Gauss-Seidel methods - Inverse of a matrix by Gauss Jordon method – Eigen value of a matrix by power method and by Jacobi method for symmetric matrix.

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)

Differentiation using interpolation formulae –Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two and Three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpsons's rules.

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

Single step methods: Taylor series method – Euler methods for First order Runge – Kutta method for solving first and second order equations – Multi step methods: Milne's and Adam's predictor and corrector methods.

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

1. T.Veerarjan and T.Ramachandran, 'Numerical mehods with programming in 'C' 2nd Edition Tata McGraw Hill Pub. Co. Ltd, 1st reprint 2007.
2. K. Sankar rao Numerical methods for scientists and engineers – 3rd Edition Prentice Hall of India Private Limited, New Delhi, 2007.

REFERENCE BOOKS

1. P. Kandasamy, K.Thilagavathy and K.Gunavathy, 'Numerical Methods', S.Chand Co. Ltd., New Delhi, 2003.
2. C.F.Gerald and P.O. Wheate 'Applied numerical analysis' Pearson Education Asia, New Delhi.

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 6

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

UNIT II TRANSFORMERS 10

Construction – principle of operation – equivalent circuit – losses – testing – efficiency and voltage regulation – auto transformer – three phase connections – parallel operation of transformers – tap changing.

UNIT III ELECTROMECHANICAL ENERGY CONVERSION 9

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

UNIT IV BASIC CONCEPTS IN ROTATING MACHINES 9

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 11

Construction – EMF and torque – circuit model – armature reaction – commutation – methods of excitation – characteristics of generators – characteristics of motors – starting and speed control – testing and efficiency – parallel operation.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. Nagrath I. J and Kothari D. P. ‘Electric Machines’, Tata McGraw Hill Pub. Co. Ltd., 2008.
2. P.S. Bimbhra, ‘Electrical Machinery’, Khanna Publishers, 2003.

REFERENCES

1. Fitzgerald.A.E., Charles Kingsely Jr, Stephen D.Umans, ‘Electric Machinery’, McGraw Hill Books Company, 1992.
2. P. C. Sen., ‘Principles of Electrical Machines and Power Electronics’, John Wiley & Sons, 1997.
3. K. Murugesh Kumar, ‘Electric Machines’, Vikas publishing house Pvt. Ltd., 2002.

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

Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Synchros – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

UNIT II TIME RESPONSE 9

Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – P, PI, PID modes of feed back control.

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

Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability criterion.

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

1. I.J. Nagrath and M. Gopal, ‘Control Systems Engineering’, New Age International Publishers, 2003.
2. Benjamin C. Kuo, Automatic Control systems, Pearson Education, New Delhi, 2003.

REFERENCE BOOKS

1. K. Ogata, ‘Modern Control Engineering’, 4th edition, PHI, New Delhi, 2009.
2. Norman S. Nise, Control Systems Engineering, 4th Edition, John Wiley, New Delhi, 2007.
3. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2004
4. M. Gopal, ‘Control Systems, Principles and Design’, Tata McGraw Hill, New Delhi, 2006.

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 SEQUENCTIAL 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

RTL Design – combinational logic – Types – Operators – Packages – Sequential circuit – Sub programs – Test benches. (Examples: adders, counters, flipflops, FSM, Multiplexers / Demultiplexers).

L = 45 T = 15 Total = 60

TEXT BOOKS

1. Raj Kamal, 'Digital systems-Principles and Design', Pearson education 2nd Edition, 2007
2. M. Morris Mano, 'Digital Design', Pearson Education, 2006.
3. John M.Yarbrough, 'Digital Logic, Application & Design', Thomson, 2002.

REFERENCES

1. Charles H.Roth, 'Fundamentals Logic Design', Jaico Publishing, 4th Edition, 2002.
2. Floyd and Jain, 'Digital Fundamentals', 8th Edition, Pearson Education, 2003.
3. John F.Wakerly, 'Digital Design Principles and Practice', 3rd Edition, Pearson Education, 2002.
4. Tocci, "Digital Systems: Principles and applications", 8th Edition, Pearson Education.

BEI404 LINEAR INTEGRATED CIRCUITS AND APPLICATIONS L T P C
(Common to EEE & EIE) **3 0 0 3**

AIM

To introduce the concepts for realizing functional building blocks in ICs, fabrications & application 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 9

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 9

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 9

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 9

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 9

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.

L = 45 Total = 45

TEXT BOOKS

1. Ramakant A.Gayakwad, 'Op-amps and Linear Integrated Circuits', 4th Edition, Pearson Education, 2003 / PHI. (2000)
2. D.Roy Choudhary, Sheil B.Jani, 'Linear Integrated Circuits', 2nd Edition, New Age, 2004.

REFERENCE BOOKS

1. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.
2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th Edition, 2002 / PHI.
3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd Edition, 2006.

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

1. A Course in Power Plant Engineering by Arora and Domkundwar, Dhanpat Rai and Co.Pvt. Ltd., New Delhi.
2. Power Plant Engineering by P.K. Nag, Tata McGraw Hill, Second Edition , Fourth reprint 2003.

REFERENCES

1. Power station Engineering and Economy by Bernhardt G.A.Skrotzki and William A.Vopat-Tata McGraw Hill Publishing Company Ltd., New Delhi, 20th reprint 2002.
2. An introduction to power plant technology by G.D. Rai-Khanna Publishers, Delhi -110 005.
3. Power Plant Technology, M.M. El-Wakil McGraw Hill 1984.

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.
6. Multiplex/ De-multiplex: Study of 4:1; 8:1 multiplexer and Study of 1:4; 1:8 demultiplexer
7. Timer IC application: Study of NE/SE 555 timer in Astable, Monostable operation.
8. Application of Op-Amp:Slew rate verifications, inverting and non-inverting amplifier, Adder, comparator, Integrater and Differentiator.
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.
6. Hopkinson's test on DC motor – generator set.
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
(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:

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 /ae/, /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
3 1 0 4

OBJECTIVES

To impart knowledge on

i. Construction and performance of salient and non – salient type synchronous generators.
ii. Principle of operation and performance of synchronous motor.
iii. Construction, principle of operation and performance of induction machines.
iv. Starting and speed control of three-phase induction motors.
v. Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I THREE PHASE INDUCTION MACHINES 12

Principle of operation of Three phase induction motor – Types of construction – Torque equation – Torque-Slip characteristics – Maximum torque – Equivalent circuit – Phasor diagram – Circle diagram – Principle of operation Induction Generator.

UNIT II STARTING AND SPEED CONTROL OF INDUCTION MOTORS 12

Need for starter – Types of starters – Starting methods of three phase induction motor – Cogging and Crawling – Speed control – Voltage control – Rotor resistance control – Pole changing – Frequency control– Slip energy recovery scheme

UNIT III SINGLE PHASE INDUCTION MOTORS 12

Single phase induction motors – Double field revolving theory – Split phase induction motor, Capacitor motors – Shaded pole motor– Principle of operation

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

Principle of operation – Methods of starting – Torque equation – Equivalent circuit – V-curves and Inverted V-curves – Hunting- Special machines –Universal motor, Stepper motor, Reluctance motor, Repulsion motor, Hysteresis motor and AC series motor

L =45 T = 15 Total = 60 Periods

TEXT BOOK :

1. Kothari D.P., and Nagrath I.J., “Electric Machines”, Tata McGraw Hill Publishing Company Ltd, 2002.

REFERENCES

1. Gupta J.B., “Theory and Performance of Electrical Machines”, S.K.Kataria and Sons, 2005.
2. Theraja B.L., Theraja A.K., “A text book on Electrical Technology”, Volume–II, S. Chand company & Ltd, 2008.
3. Rajput R.K., “A Text Book of Electrical Machines”, Firewall Media, 2006.
4. Fitzgerald, “Electric Machinery”, Tata McGraw-Hill Education, 2002.

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

Classification of lines – Short, medium and long line – Equivalent circuits, attenuation constant – Phase constant – Surge impedance – Transmission efficiency and voltage regulation – Surge impedance loading– Shunt and series Compensation – Ferranti effect and corona loss.

UNIT IV INSULATORS AND CABLES 12

Insulators – Types – Voltage distribution in insulator string and grading – Improvement of string efficiency – Underground cables – Constructional features of LT and HT cables – Capacitance – Dielectric stress and grading – Thermal characteristics.

UNIT V SUBSTATION GROUNDING SYSTEM AND DISTRIBUTION SYSTEM 12

Types of substations – Bus-bar arrangements – Substation bus schemes – Single bus scheme – Double bus with double breaker – Double bus with single breaker – Main and transfer bus – Ring bus – Breaker-and-a-half with two main buses – Double bus-bar with bypass isolators – Resistance of grounding systems – Resistance of driven rods, resistance of grounding point electrode – Grounding grids – Design principles of substation grounding system – Neutral grounding.

L =45 T = 15 Total = 60 Periods

TEXT BOOKS:

1. Wadhwa C.L., “Electric Power Systems”, New Age International (P) Ltd., 2000.
2. Gupta B.R., “Power System Analysis and Design”, S. Chand Company & Ltd, New Delhi, 2003.

REFERENCES

1. Singh S.N., “Electric Power Generation, Transmission and Distribution”, Prentice Hall of India, New Delhi, 2002.
2. Mehta V. K. and Rohit Mehta, “Principles of Power System”, S. Chand Company & Ltd, New Delhi, 2006.
3. Kothari D.P. and Nagarath I.J., “Power System Engineering”, Tata McGraw-Hill Publishing Company limited, New Delhi, 2007.
4. Hadi Saadat, “Power System Analysis”, Tata McGraw Hill Publishing Company, 2003.

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:

1. Proakis J.G. and Manolakis D.G., “Digital Signal Processing Principles, Algorithms and Applications”, Pearson Education, New Delhi, 2003.
2. Mitra S.K., “Digital Signal Processing – A Computer Based Approach”, Tata McGraw-Hill, New Delhi, 2001.

REFERENCES

1. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, “Discrete – Time Signal Processing”, Pearson Education, New Delhi, 2003.
2. Venkataramani B. and Bhaskar M., “Digital Signal Processors, Architecture, Programming and Applications”, Tata McGraw-Hill, New Delhi, 2003.
3. Salivahanan S., Vallavaraj A. and Gnanapriya C., “Digital Signal Processing”, Tata McGraw-Hill, New Delhi, 2003.
4. Chitode J.S., “Digital Signal Processing”, Technical Publications, 2009.

BEE504 POWER ELECTRONICS L T P C
3 0 0 3

OBJECTIVES

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 SEMI-CONDUCTOR DEVICES 9

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 9

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 9

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 9

Single phase and three phase (both 120^{o} mode and 180^{o} 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 9

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

L =45 Total = 45 Periods

TEXT BOOKS:

1. Rashid M.H., “Power Electronics: Circuits, Devices and Applications”, Pearson Education, PHI Third edition, New Delhi 2004.
2. Philip T. Krein, “Elements of Power Electronics”, Oxford University Press, 2004.

REFERENCES

1. Ashfaq Ahmed, “Power Electronics for Technology”, Pearson Education, Indian reprint,2003.
2. Bimbra P.S., “Power Electronics”, Khanna Publishers, Third Edition, 2003.
3. Ned Mohan, Tore M. Undeland, William P. Robbins, “Power Electronics: Converters, Applications and Design”, John Wiley and sons, Third edition, 2003.
4. Bimal K. Bose, “Modern Power Electronics and AC Drives”, Pearson Education, 2003.

BEE505 HIGH VOLTAGE ENGINEERING L T P C
3 0 0 3

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

Generation of high direct current voltages– Generation of high alternating voltages– Generation of impulse voltages– Generation of impulse currents– Tripping and control of impulse generators

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–direct, alternating and Impulse - 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

L =45 Total = 45 Periods

TEXT BOOKS:

1. Naidu M.S. and Kamaraju V., "High Voltage Engineering", TMH Publications, 4th Edition, 2009.
2. Kuffel E., Zaengl W.S. and Kuffel J., "High Voltage Engineering: Fundamentals", Elsevier, 2nd Edition, 2000.

REFERENCES

1. Wadhwa C.L., "High Voltage Engineering", New Age Internationals Private Limited, 1997.
2. Ravindra Arora, Wolfgang Mosch, "High Voltage Insulation Engineering", New Age International Private Limited, 1995.
3. Alston L. L., "High Voltage Technology", Oxford University Press, New Delhi, First Indian Edition, 2006.
4. Subir Roy, "An introduction to High Voltage Engineering", Prentice Hall Private Limited, 2004.

BGE501 PROFESSIONAL ETHICS AND HUMAN VALUES

	L	T	P	C
(Common to 5th Sem – EEE, EIE, Civil & IT 6th Sem – CSE & ECE)	**3**	**0**	**0**	**3**

OBJECTIVES:

i. To create awareness on Engineering Ethics and Human Values.
ii.To instill Moral and Social Values and Loyalty.
iii. To appreciate the rights of others.

UNIT I HUMAN VALUES **10**

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

UNIT II ENGINEERING ETHICS **9**

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION **9**

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

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS **9**

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES **8**

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

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

REFERENCE BOOKS

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

BEE531 ELECTRICAL MACHINES LABORATORY – II

L	T	P	C
0	0	3	2

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.
7. V and inverted V curves of three phase synchronous motor.
8. Load test on three phase slip ring induction motor.
9. Parallel operation of two alternators.
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

L	T	P	C
0	0	3	2

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

L	T	P	C
3	1	0	4

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 **12**

Major considerations in Electrical Machine Design - Space factor – Choice of Specific Electrical and Magnetic loadings – Thermal considerations - Heat flow – Temperature rise - Rating of machines – Standard specifications.

UNIT II DC MACHINES **12**

Output Equations – Main Dimensions - Magnetic circuit calculations - Carter's Coefficient - Net length of Iron –Real & Apparent flux densities – Selection of number of poles – Design of Armature – Design of commutator and brushes – performance prediction using design values.

UNIT III TRANSFORMERS **12**

Output Equations – Main Dimensions - KVA output for single and three phase transformers – Window space factor – Overall dimensions – Operating characteristics – Regulation – No load current – Temperature rise in Transformers – Design of Tank - Methods of cooling of Transformers.

UNIT IV INDUCTION MOTORS **12**

Output equation of Induction motor – Main dimensions – Length of air gap- Rules for selecting rotor slots of squirrel cage machines – Design of rotor bars & slots – Design of end rings – Design of wound rotor -– Magnetic leakage calculations – Leakage reactance of polyphase machines- Magnetizing current - Short circuit current – Operating characteristics.

UNIT V SYNCHRONOUS MACHINES **12**

Output equations – choice of loadings – Design of salient pole machines – Short circuit ratio – shape of pole face – Armature design – Armature parameters – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field mmf – Design of field winding – Design of turbo alternators – Rotor design.

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

TEXT BOOKS:

1. Sawhney A.K., "A Course in Electrical Machine Design", Dhanpat Rai & Sons, New Delhi, 1984.
2. Sen S.K., "Principles of Electrical Machine Designs with Computer Programmes", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

REFERENCE

1. Shanmugasundaram A., Gangadharan G. and Palani R., "Electrical Machine Design Data Book", New Age International Pvt. Ltd., Reprint 2007.

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 **9**

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 **9**

Primitive network and its matrices - bus impedance matrix - bus admittance and bus impedance matrix formation - equivalent circuit of transformer with off-nominal-tap ratio. Modelling of generator, load, shunt capacitor, transmission line, shunt reactor for short circuit, power flow and stability studies.

UNIT III SHORT CIRCUIT ANALYSIS **9**

Need for short circuit study. Approximations in modelling - calculation for radial networks. Symmetrical short circuit analysis - Z bus in phase frame and in sequence frame fault matrices – unsymmetrical fault analysis.

UNIT IV POWER FLOW ANALYSIS **9**

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 **9**

Distinction between steady state and transient state – Concepts of Stability and Security – Swing equation-solution to swing equation – step by step method – power angle equation – equal area criterion – critical clearing angle and time. Stability analysis of single machine connected to infinite bus by modified Euler's method – Multi-machine stability analysis using Runge Kutta method.

L =45, Total = 45 Periods

TEXT BOOKS:

1. John J. Grainger and Stevenson Jr.W.D., "Power System Analysis", Tata McGraw Hill,2003.
2. Nagarath I.J., Kothari D.P., "Power System Engineering", Tata McGraw Hill, 2nd Edition, 2008.

REFERENCES

1. Stagg G.W. and El-Abaid A.H., "Computer Methods in Power System Analysis", Tata McGraw-Hill International Book Company, 1994.
2. Nagarath I.J. and Kothari D.P., "Modern Power System Analysis", 3rd Edition, Tata McGraw Hill Publishing Company, 2003.
3. Hadi Saadat, "Power System Analysis", Tata McGraw Hill Publishing Company, 2nd Edition, 2009.

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:

1. Gopal K. Dubey, “Power Semi conductor controlled drives “Prentice Hall Inc., New Jersey, 1989.
2. Bimal K. Bose. “Modern Power Electronics and AC Drives”, PHI / Pearson Education, 2002.

REFERENCES

1. De N. K. and Sen P. K., “Electrical Drives”, Prentice Hall Pvt. Ltd, 2006.
2. Murphy J.M.D. and Turnbull, “Thyristor control of AC Motor”, Pergamon Press Oxford, 1988.
3. Krishnan R., “Electric Motor Drives: Modeling, Analysis, and Control”, Prentice Hall of India, 2001.

BEE604 MICROPROCESSORS AND MICROCONTROLLER WITH APPLICATIONS

L	T	P	C
3	0	0	3

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 **9**

Origin of Microprocessors- Architecture of 8085 – Pin Layout and Description of Signals – Memory interfacing – interfacing memory chips with 8085- Address decoding Techniques – Memory mapping – Examples - I/O ports and data transfer concepts – Interfacing I/Os using Decoders – Timing Diagram – Interrupt structure- Introduction to 8086 processor (Architecture and operation only).

UNIT II PROGRAMMING OF 8085 PROCESSOR **9**

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 **9**

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 **9**

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 **9**

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:

1. Krishna Kant, “Microprocessor and Microcontrollers”, Eastern Company Edition, Prentice – Hall of India, New Delhi, 2007.
2. Senthil Kumar N., Saravanan M. and Jeevananthan S., “Microprocessors and Microcontrollers”, Oxford university press, New Delhi, 2011.

REFERENCES

1. Ramesh Gaonkar, “Microprocessor Architecture Programming and Application with the 8085”, Prentice Hall, 2002.
2. Walter A. Tribal and Avtar Singh, “The 8088 & 8086 Microprocessors”, Pearson, Fourth Edition, 2007.
3. Muhammad Ali Mazidi, Janice Mazidi and Janice Gillispie Mazidi, “The 8051 Microcontroller and Embedded Systems”, Prentice Hall, 1999.

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

Object oriented programming concepts – objects – classes – methods and messages – abstraction and encapsulation – inheritance – abstract classes – polymorphism. Introduction to C++ – classes – access specifiers – function and data members – default arguments – function overloading – friend functions – const and volatile functions – static members – Objects - pointers and objects – constant objects – nested classes – local classes.

UNIT II CONSTRUCTORS AND FUNCTION OVERLOADING 9

Constructors – default constructor – Parameterized constructors – Constructor with dynamic allocation – copy constructor – destructors – operator overloading – overloading through friend functions – overloading the assignment operator – type conversion – explicit constructor.

UNIT III TEMPLATES AND EXCEPTION HANDLING 9

Function and class templates – Exception handling – try-catch-throw paradigm – exception specification – terminate and unexpected functions – Uncaught exception.

UNIT IV INHERITANCE 9

Inheritance – public, private, and protected derivations – multiple inheritance – virtual base class – abstract class – composite objects Runtime polymorphism – virtual functions – pure virtual functions – RTTI – typeid – dynamic casting – RTTI and templates – cross casting – down casting .

UNIT V I/O STREAMS 9

Streams and formatted I/O – I/O manipulators – file handling – random access – object serialization – namespaces – std namespace – ANSI String Objects – standard template library.

L =45 Total = 45 Periods

TEXT BOOK:

1. Trivedi B., “Programming with ANSI C++”, Oxford University Press, 2007.

REFERENCES

1. Ira Pohl, “Object Oriented Programming using C++”, 2nd Edition, Pearson Education, Reprint 2004.
2. Lippman S. B., Josee Lajoie and Barbara E. Moo, “C++ Primer”, 4th Edition, Pearson Education, 2005.
3. Stroustrup B., “The C++ Programming language”, 3rd Edition, Pearson Education, 2004.

BEE631 MICROPROCESSORS AND MICROCONTROLLER LABORATORY **L T P C 0 0 3 2**

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:
   - Key board 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 L T P C
(Common to 3rd Sem – CSE & IT, 5th Sem – EIE, 6th Sem – EEE) 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

Typical Excitation system – Modelling – static and dynamic analysis – Stability compensation – Methods of voltage control – shunt capacitor – series capacitor – synchronous condenser – static VAR compensator – thyristor controlled series capacitor.

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

1. Olle. I. Elgerd, “Electric Energy Systems Theory – An Introduction”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2nd Edition, 2003.
2. P. Kundur, “Power System Stability & Control”, McGraw Hill Publications, USA, 1994.

REFERENCES

1. D.P. Kothari and I.J. Nagrath, "Modern Power System Analysis", 3rd Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
2. L.L. Grigsby, "The Electric Power Engineering, Hand Book", CRC Press & IEEE Press, 2001.
3. Allen.J.Wood and Bruce F.Wollenberg, "Power Generation, Operation and Control", John Wiley & Sons, Inc., 2003.

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

1. M.L. Soni, P.V. Gupta, V.S. Bhatnagar, A. Chakrabarti, “A Text Book on Power System Engineering”, Dhanpat Rai and Company, 2009.
2. R.K.Rajput, “A Text book of Power System Engineering”, Laxmi Publications, 1st Edition, Reprint, 2007.

REFERENCES

1. Sunil S. Rao, “Switchgear and Protection”, Khanna Publishers, New Delhi, 1992.
2. C.L. Wadhwa, “Electrical Power Systems”, Newage International Private Limited, 2000.
3. B. Ravindranath, and N. Chander, “Power System Protection and Switchgear”, Newage International Publishers, 2011.
4. Badri Ram, Vishwakarma, “Power System Protection and Switchgear”, Tata McGraw Hill, 2001.

BEE703 ELECTRICAL ENERGY UTILIZATION AND CONSERVATION L T P C
3 0 0 3

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 9

Energy crisis – Causes and effects of energy crisis – Need for energy conservation – Global and Indian scenario – Energy management and Audit: Definition – Energy audit – Need and Type of audit – Energy management approach – Understanding energy costs – Benchmarking – Energy performance – Matching Energy use to requirement – Maximizing system efficiencies, fuel and energy substitution, energy audit instruments.

UNIT II ECONOMIC ASPECTS OF GENERATION 9

Economic aspects of power generation –Load and load duration curves – Number and size of units – Cost of electrical energy – tariff. Economics of power factor improvement –Power capacitors – power quality. Importance of electrical energy conservation –Methods – Energy efficient equipments.

UNIT III ILLUMINATION 9

Importance of lighting – Properties of good lighting scheme –Laws of illumination – Photometry - Types of lamps – Lighting calculations – Basic design of illumination schemes for residential, Commercial, Street lighting, and Sports ground – Energy efficiency lamps.

UNIT IV INDUSTRIAL HEATING AND WELDING 9

Role electric heating for industrial applications – Resistance heating –Induction heating – Dielectric heating - Electric arc furnaces. Brief introduction to electric welding –Welding generator, Welding transformer and the characteristics.

UNIT V ELECTRIC TRACTION 9

Merits of electric traction – Requirements of electric traction system – Supply systems – Mechanics of train movement –Traction motors and control –Braking – Recent trends in electric traction.

TOTAL: 45 PERIODS

TEXT BOOKS

1. C.L.Wadhwa, “Generation, Distribution and Utilization of Electrical Energy”, New Academic Science, Turn bridge Wells, 2011.
2. B.R. Gupta, “Generation of Electrical Energy”, S. Chand & Company Limited, 14th Edition, 2011.

REFERENCES

1. H.Partab, “Art and Science of Utilisation of Electrical Energy”, Dhanpat Rai and Company, NewDelhi, 2nd Edition, 1975.
2. E. Openshaw Taylor, “Utilization of Electrical Energy in SI Units” Orient Longman Private Limited, 2003.

3. J.B. Gupta, "Utilization of Electric Power and Electric Traction", S.K.Kataria and Sons, 8th Edition, 2009.
4. Gupta, Soni and Bhatnagar, "Course in Electrical Power", Dhampat Rai and Sons, 1987.
5. Y.P. Abbi and Shashank Jain, "Handbook on Enegry Audit and Environment Management", TERI Publications, 2006.

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

Structural units in processor - selection of processor & memory devices – DMA – I/O devices : timer & counting devices – Serial communication using I^2C - CAN USB buses –Parallel communication using ISA - PCI - PCI/X buses – Device drivers

UNIT III PROGRAMMING AND SCHEDULING 9

Intel I/O instructions – Synchronization - Transfer rate, latency; interrupt driven input and output - Nonmaskable interrupts, software interrupts, Preventing interrupts overrun - Disability interrupts. Multithreaded programming –Context Switching, Preemptive and non-preemptive multitasking, semaphores. Scheduling-thread states, pending threads, context switching.

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

PIC microcontroller – M-Basic compiler and Development boards – The Basic Output and digital input – Applications – Driving LED's – Fire Alarm system – Home security system – DC motor control – Lighting control – Power management and monitoring.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Rajkamal, "Embedded system-Architecture, Programming, Design", Tata McGraw Hill, 2003.
2. Daniel W. Lewis, "Fundamentals of Embedded Software", Prentice Hall of India, 2004.

REFERENCES

1. Jack R Smith "Programming the PIC microcontroller with M-Basic" Elsevier , 2007
2. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006
3. Rajib Mall "Real-Time systems Theory and Practice", Pearson Education 2007
4. Sriram. V.Iyer & Pankaj Gupta, "Embedded Real Time Systems Programming", Tata McGraw Hill, 2004
5. N. Senthilkumar, M. Saravanan and S. Jeevananthan, "Microprocessors and Microcontollers", 2011.

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.
   b. Power flow solution of small systems using simple method, Gauss-Seidel P.F. method.
   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

1. Computation of Parameters and Modelling of Transmission Lines.
2. Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
3. Load Flow Analysis - I: Solution of Load Flow And Related Problems Using Gauss-Seidel Method.
4. Load Flow Analysis - II: Solution of Load Flow and Related Problems using Newton-Raphson and Fast-Decoupled Methods
5. Symmetrical and unsymmetrical Fault Analysis
6. Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System
7. Transient Stability Analysis of Multimachine Power Systems
8. Electromagnetic Transients in Power Systems
9. Load – Frequency Dynamics of Single- Area and Two-Area Power Systems
10. Economic Dispatch 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

BEE733 COMPREHENSION L T P C
0 0 3 1

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:

1. J. B. Gupta, "Basic Electrical and Electronics Engineering", S. K. Kataria & Sons, 2009.

REFERENCES:

1. U.A.Bakshi and A.P.Godse, "Basic Electrical and Electronics Engineering", Technical Publications, 2009.
2. R. K. Rajput, "Basic Electrical and Electronics Engineering", Laxmi Publications, 2007.

BEE801 NON CONVENTIONAL ENERGY RESOURCES L T P C
3 0 0 3

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 9

Solar Radiation – Measurements of solar radiation and sunshine – Solar thermal collectors – Flat plate and concentrating Collectors – Solar applications – Fundamentals of photo voltaic conversion – solar cells – PV Systems – PV applications.

UNIT II WIND ENERGY 9

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 9

Biomass, Biogas, Source, Composition, Technology for utilization – Biomass direct combustion – Biomass gasifier – Biogas plant – Digesters – Ethanol production – Bio diesel production and economics.

UNIT IV OTEC, TODAL, GEOTHERMAL AND HYDEL ENERGY 9

Tidal energy – Wave energy – Data, Technology options – Open and closed OTEC cycles – Small hydro, turbines – Geothermal energy sources, power plant and environmental issues.

UNIT V ENERGY MANAGEMENT 9

Hydrogen, generation, storage, transport and utilization, applications: Power generation, Transport – Fuel cells – technologies - Types – Economics and the power generation.

TOTAL: 45 PERIODS

TEXT BOOKS

1. G.D. Rai, Non Conventional Energy Sources, Khanna Publishers, New Delhi, 1999.
2. S.P. Sukhatme, Solar Energy, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

REFERENCES

1. Godfrey Boyle, Renewable Energy, Power for a Sustainable Future, Oxford University Press, U.K., 1996.
2. Twidell, J.W. & Weir, A., Renewable Energy Sources, EFN Spon Limited, UK, 1986.
3. G.N. Tiwari, solar Energy – Fundamentals Design, Modelling and applications, Narosa Publishing House, New Delhi, 2002.
4. L.L. Freris, Wind Energy Conversion systems, Prentice Hall, UK, 1990.
5. S.N. Bhadra, D. Kastha and B. Banerjee, “Wind Electrical Systems”, Oxford University Press, 2005.
6. Soteris Kalogirou, “Solar Energy Engineering”, Academic Press, 2009.
7. B.T. Nijaguna, “Biogas Technology”, New Age International Publications Private Limited, 2006.
8. R.K. Rajput, “A Text Book of Power Plant Engineering”, Laxmi Publications, 2005.

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 9

Historical developments –approaches to management– Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organization ,Meaning ,features merits and demerits.

UNIT II MANAGERS AND ENVIRONMENT 9

Social responsibility–Planning – Objectives – Setting Objectives – Process of Managing through Objectives – Strategies- Policies and Planning Premises- Forecasting – Decision-making.

UNIT III FUNCTIONAL AREA OF ORGANISATION 9

Formal and informal organization – Organization Chart – Structure and Process – Departmentation by different strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

UNIT IV MOTIVATION AND DIRECTIONS 9

Objectives– Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication.

UNIT V CONTROLLING STRATEGIES 9

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology– Computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Hellriegel, Slocum & Jackson, “Management – A Competency Based Approach”, Thomson South Western, 10th Edition, 2007.
2. Harold Koontz, Heinz Weihrich and mark V Cannice, “Management – A global and Entrepreneurial Perspective”, Tata Mcgraw Hill, 12th Edition, 2007.
3. Andrew J. Dubrin, “Essentials of Management”, Thomson Southwestern, 7th Edition, 2007.

REFERENCES

1. Stephen P. Robbins and Mary Coulter, "Management", Prentice Hall of India", 8th Edition, 2012.
2. Charles W.L Hill, Steven L McShane, "Principles of Management", Mcgraw Hill Education, Special Indian Edition, 2007.
3. Vijayaraghavan G.K & Sivakumar M. "Principles of Management", Lakshmi Publications, 1st Edition, 2011.
4. Ramachandran. S. "Principles of Management", Air Walk Publications, 1st Edition, 2007.

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**

Properties of transfer functions- Impulse response matrices- Poles and zeros of transfer function matrices- Critical frequencies, Resonance, Bandwidth- Steady state and dynamic response- Nyquist plots, Singular value analysis.

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:

1. Gopal M., "Modern Control System Theory", New Age International Publications, Revised 2nd Edition, 2005.
2. Ogatta K., "Modern Control Engineering", PHI Publications, 2002.

REFERENCES

1. Nagarath I.J. and Gopal M., "Control Systems Engineering", New Age International Publications, New Delhi, 4th Edition, 2006.
2. Bay J.S., "Linear State Space Systems", McGraw-Hill, 1999.
3. Eroni-Umez and Eroni, "System dynamics & Control", Thomson Brooks/ Cole, 1998.

BEE002 SWITCHED MODE POWER CONVERSIONS **L T P C**
3 0 0 3

OBJECTIVE

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

UNIT I INTRODUCTION **9**

Reactive elements in Power Electronic Systems-Design of Inductor-Design of transformer-Capacitors for Power electronics applications.

UNIT II BASIC SWITCHING CONVERTER TOPOLOGIES **9**

Basic concepts of SMPS - DC-DC converters – characteristics - constituent elements - operating principles.

UNIT III RESONANT CONVERTERS **9**

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 **9**

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 **9**

Unity power factor rectifier - resistor emulation principle – applications.

L =45 Total = 45 Periods

TEXT BOOKS:

1. Ramanarayanan V., “Course Material on Switched Mode Power Conversion”, IISc Bangalore, 2007
2. Umanand L., Bhat S.R., “Design of magnetic components for Switched Mode Power Converters” , Wiley Eastern Ltd.,1992
3. Rashid M.H., “Power Electronics: Circuits, Devices and Applications”, Pearson Education, PHI Third edition, New Delhi 2004.

REFERENCES

1. Ned Mohan, Tore M. Undeland, William P.Robbins, “Power Electronics: Converters, Applications and Design”, John Wiley and Sons, Third edition, 2003.
2. Philip T. Krein, “Elements of Power Electronics”, Oxford University Press, 2004.
3. Simon S. Ang, “Power Switching Converter”, Marcel Dekker Inc., 1995.

BMG701 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

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:

1. Dale H. Besterfiled, “Total Quality Management”, Pearson Education Asia Third Edition, Indian Reprint (2010).
2. James R. Evans and William M. Lindsay, “The Management and Control of Quality” 6th Edition, South-Western (Thomson Learning), 2005.

REFERENCE

1. Oakland J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.

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.

L =45 Total = 45 Periods

TEXT BOOKS:

1. Wayne Tomasi, “Electronic Communication Systems: Fundamentals through Advanced”, Pearson Education, 5th edition, 2003.
2. Simon Haykin, “Digital Communications”, John Wiley & Sons, 203.

REFERENCES

1. John G. Proakis, “Digital communications”, 5th Edition, Tata McGraw-Hill, 2008.
2. Taub and Schilling, “Principles of Communication Systems”, Tata McGraw-Hill, 2nd Edition, 2003.
3. Martin S. Roden, “Analog and Digital Communication System”, PHI, 3rd Edition, 2002.
4. Blake, “Electronic Communication Systems”, Thomson Delman, 2nd Edition, 2002.

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

Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics – Absorption losses – Scattering losses – Dispersion – Connectors and splicers – Fibre termination – Optical sources – Optical detectors.

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES 9

Fibre optic sensors – Fibre optic instrumentation system – Different types of modulators – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III LASER FUNDAMENTALS 9

Fundamental characteristics of lasers – Three level and four level lasers – Properties of laser – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers – Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

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

Holography – Basic principle - Methods – Holographic interferometry and application, Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser and tissue interactive – Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

L =45 Total = 45 Periods

TEXT BOOKS

1. Senior J.M., “Optical Fibre Communication – Principles and Practice”, Prentice Hall of India, 1985.
2. Wilson J. and Hawkes J.F.B., “Introduction to Opto Electronics”, Prentice Hall of India, 2001.

REFERENCE BOOKS

1. Keiser G., “Optical Fibre Communication”, Tata McGraw-Hill, 1995.
2. Arumugam M., “Optical Fibre Communication and Sensors”, Anuradha Agencies, 2002.
3. John F. Read, “Industrial Applications of Lasers”, Academic Press, 1978.
4. Monte Ross, “Laser Applications”, Tata McGraw-Hill, 1968.

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 9

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 9

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 9

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 9

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 9

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

1. Allan Greenwood, "Electrical Transients in Power Systems", Wiley Interscience, New York, 2nd Edition, 1991.
2. R.D.Begamudre, "Extra High Voltage AC Transmission Engineering", Wiley Eastern Limited, 1986.

REFERENCE

1. M.S.Naidu and V.Kamaraju, "High Voltage Engineering", Tata McGraw Hill, 2nd Edition, 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

Features of linear and non-linear systems - Common physical non-linearities – Methods of linearising non-linear systems - Concept of phase portraits – Singular points – Limit cycles – Construction of phase portraits – Phase plane analysis of linear and non-linear systems – Isocline method.

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 Ztransform, 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

Introduction - Decoupling - Time varying optimal control – LQR steady state optimal control – Optimal estimation – Multivariable control design.

TOTAL: 45 PERIODS

TEXT BOOKS

1. M.Gopal, "Digital Control & State Variable Methods", Tata McGraw Hill, 3rd Edition, 2009.
2. I.J. Nagrath and M.Gopal, "Control Systems Engineering", New Age International Publishers, 2003.
3. Ashish Tewari, "Modern control Design with Matlab and Simulink", John Wiley, New Delhi, 2002.

REFERENCES

1. M.Gopal , "Modern Control Theory", Wiley International 2nd Edition, 1996.
2. K.Ogate, "Discrete time control system", PHI, 2010.
3. B.C.Kuo," Digital Control Systems", SRL Publication, 1997.
4. J.E.Slotine & W.P.Li," Applied non-linear control", Prentice Hall, USA, 2012.
5. Isidari ," Nonlinear Control Systems", Springer -Verlag. , 1995.
6. George J. Thaler, "Automatic Control Systems", Jaico Publishers, 1993.
7. M.Gopal," Modern control system theory", New Age International Publishers, 2002.
8. Gene F. Franklin, J. David Powell and Abbasemami-Naeini, "Feedback Control of Dynamic Systems", 4th Edition, Pearson Education, 2002.

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

1. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, 2nd Edition, New Age International Private Limited, 1990.

REFERENCES

1. Power Engineer’s Handbook, Revised and Enlarged 6th Edition, TNEB Engineers’ Association, October 2002.
2. Microtran Power System Analysis Corporation, Microtran Reference Manual, Vancouver 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

Approaches to intelligent control. Architecture for intelligent control. Symbolic reasoning system, rule-based systems, the AI approach. Knowledge representation. Expert systems.

UNIT II ARTIFICIAL NEURAL NETWORKS 9

Basic-concepts- Biological Neuron -Types of activation functions –Concept of Artificial Neural McCulloch-Pitts neuron model, Adaline and Madaline, Application, Architecture: Feed forward and Feedback– Multilayer Perceptron– Hopfield network, Self-organizing network and Recurrent network Back Propagation Algorithm Limitations of Back Propagation Algorithm.

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

GA application to power system optimization problem, Case studies: Identification and control of linear and nonlinear dynamic systems using Neural Network. Stability analysis of Neural-Network interconnection systems. Stability analysis of fuzzy control systems.

TOTAL: 45 PERIODS

TEXT BOOK

1. J.S.R. Jang, C. –T. Sun E. Mitusani, “Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence”, Prentice Hall Engineering / Science Mathematics, 1996.

REFERENCES

1. Jacek.M.Zurada, “Introduction to Artificial Neural Systems”, Jaico Publishing House, 1999.
2. Kosko,B. “Neural Networks And Fuzzy Systems”, Prentice-Hall of India Private Limited, 1994.
3. Klir G.J. & Folger T.A. “Fuzzy sets, uncertainty and Information”, Prentice- Hall of India Pvt. Ltd., 1993.
4. Zimmerman H.J. “Fuzzy set theory-and its Applications” Kluwer Academic Publishers, 1994.
5. Driankov, Hellendroon, “Introduction to Fuzzy Control”, Narosa Publishers, 2012.

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

1. Poppovik Bhatkar, “Distributed Computer Control for Industrial Automation”, Dekkar Publications, 1990.
2. Webb and Reis, “Programmable Logic Controllers: Principles and Applications”, PHI, 1995.
3. S.K.Singh, “Computer Aided Process Control”, PHI, 2004.
4. Garry Dunning, Thomson Learning, “Introduction to Programmable Logic Controllers”, 2006.

REFERENCES

1. N.E.Battikha, "The Management of Control System”, Justification and Technical Auditing, ISA, 1992.
2. Krishna Kant, “Computer Based Process Control”, PHI, 2004.

BEE008 SPECIAL ELECTRICAL MACHINES L T P C
3 0 0 3

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 9

Constructional features – Types – Axial and Radial flux motors – Operating principles – Variable Reluctance and Hybrid Motors. SYNREL Motors – Voltage and Torque Equations - Phasor diagram - Characteristics.

UNIT II STEPPER MOTORS 9

Constructional features – Principle of operation – Variable reluctance motor – Hybrid motor – Single and multi stack configurations – Torque equations. Modes of excitations – Characteristics – Drive circuits – Microprocessor control of stepper motors – Closed loop control.

UNIT III SWITCHED RELUCTANCE MOTORS 9

Constructional features – Rotary and Linear SRMs - Principle of operation – Torque production – Steady state performance prediction- Analytical method. Power Converters and their controllers – Methods of Rotor position sensing – Sensorless operation – Closed loop control of SRM - Characteristics.

UNIT IV PERMANENT MAGNET BRUSHLESS DC MOTORS 9

Permanent Magnet materials – Magnetic Characteristics – Permeance coefficient - Principle of operation – Types – Magnetic circuit analysis. EMF and torque equations –Commutation - Power controllers – Motor characteristics and control

UNIT V PERMANENT MAGNET SYNCHRONOUS MOTORS 9

Principle of operation – Ideal PMSM – EMF and Torque equations – Armature reaction MMF – Synchronous Reactance – Sinewave motor with practical windings. Phasor diagram – Torque / speed characteristics - Power controllers - Converter Volt ampere requirements

TOTAL: 45 PERIODS

TEXT BOOKS

1. T.J.E. Miller, “Brushless Permanent Magnet and Reluctance Motor Drives”, Clarendon Press, Oxford, 1993.
2. T. Kenjo, “Stepping Motors and Their Microprocessor Controls”, Clarendon Press London, 1994.

REFERENCES

1. R.Krishnan, “Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application”, CRC Press, New York, 2001.
2. P.P. Aearnley, “Stepping Motors – A Guide to Motor Theory and Practice”, Peter Perengrinus, London, 1982.
3. T. Kenjo and S. Nagamori, “Permanent Magnet and Brushless DC Motors”, Clarendon Press, London, 1985.

BME022 SOLAR PHOTOVOLTAIC FUNDAMENTALS AND APPLICATIONS

L T P C
3 0 0 3

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 9

Solar cell – physics - Photovoltaics in Global Energy Scenario - Fundamentals of Semiconductors, Energy band, Charge carriers - Motion, PN Junction diode, Solar cells – Design characteristics, Solar radiation.

UNIT II COMMERCIAL AND DEVELOPING TECHNOLOGIES 9

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 9

Solar cells to solar array – On-Grid PV system – With and Without storage – Balance of system - DC-DC converters - Inverters – Net Metering – Design and analysis - Performance evaluation and monitoring – Field visit – Grid tied PV power plant.

UNIT IV SOLAR PV FOR OFF-GRID APPLICATIONS 9

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 9

Cost and manufacturability – Manufacturing economics – scaling – Pricing – Trends in retail pricing – energy economics – grid tied power plant –solar street lighting system

TOTAL: 45 PERIODS

TEXT BOOK

1. "Solar Photovoltaics Fundamentals, Technologies and Applications", 2nd Edition by Chetan Singh Solanki, Prentice Hall of India.

REFERENCES

1. "Photovoltaic Systems", 2nd Edition by James P. Dunlop, American Technical Publishers.
2. "Solar Electricity: Engineering of Photovoltaic Systems" by Eduardo Lorenzo, PROGENSA.
3. "SOLAR ENERGY - Renewable Energy and the Environment" Robert Foster, Majid Ghassemi, Alma Cota, CRC Press
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.

UINT 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.

UINT 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

UINT V CASE STUDIES **9**

Mutiple robots, Machine interface, Robots in manufacturing and non manufacturing applications, Robot cell design, Selection of robot.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Mikell P Groover, "Industrial Robotics - Technology, Programming and Applications", McGraw Hill, 2008.
2. Saeed B. Niku, "Introduction to Robotics Analysis, Systems, Applications", Prentice Hall of India/Pearson Education, Asia, second edition 2010.

REFERENCE BOOKS

1. J. J. Craig, "Introduction to Robotics, Mechanics and Control", Addison Wesley, MA. Digitized Dec 4, 2007
2. R. J. Schilling, "Fundamentals of Robotics Analysis and Control", Prentice Hall, NJ, Digitized Dec 5, 2007
3. Richaerd D Klafter, Thomas Achmielewski and Mickael Negin, "Robotic Engineering - An Integrated Approach", Prentice Hall India, New Delhi, 2001.

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

Cell and its structure - Resting and Action Potential - Propagation of action potential - Nervous system: Nerve cell - synapse - CNS- PNS-Electro physiology of heart and lungs- Introduction to biosensor and types.

UNIT II ELECTRO-PHYSIOLOGICAL MEASUREMENT 9

General block diagram of Biomedical Instrumentation system – Electrodes: Micro, needle and surface electrodes – Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier. ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms. Electrical safety in medical environment: shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipments

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENT 9

Measurement of blood pressure –blood flow- Cardiac output – Heart rate – phonocardiography - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – pH of blood –measurement of blood pCO2, pO2, - Introduction to ESR, GSR measurements .

UNIT IV MEDICAL IMAGING AND TELEMETRY 9

Radio graphic and fluoroscopic techniques – Instrumentation in Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems, telemedicine and patient monitoring.

UNIT V ASSISTING AND THERAPEUTIC DEVICES 9

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Prosthetic devices – Dialysers – Lithotripsy

TOTAL: 45 PERIODS

TEXT BOOKS

1. R.S.Khandpur, “Hand Book of Bio-Medical instrumentation”, Tata McGraw Hill Publishing Company Limited, 2003.
2. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, “Bio-Medical Instrumentation and Measurements”, 2nd Edition, Pearson Education, PHI 2002.

REFERENCES

1. M.Arumugam, “Bio-Medical Instrumentation”, Anuradha Agencies, 2003.
2. L.A. Geddes and L.E.Baker, “Principles of Applied Bio-Medical Instrumentation”, John Wiley and Sons, 1989.
3. J.Webster, “Medical Instrumentation application and design”, 4th Edition, Wiley, 2009.
4. C.Rajarao and S.K.Guha, “Principles of Medical Electronics and Bio-medical Instrumentation”, Universities press (India) Limited, Orient Longman Limited, 2000.

BCS404 OPERATING SYSTEMS L T P C
3 0 0 3

UNIT I PROCESSES AND THREADS 9

Introduction to operating systems – review of computer organization – operating system structures – system calls – system programs – system structure – virtual machines. Processes: Process concept – Process scheduling – Operations on processes – Cooperating processes – Interprocess communication – Communication in client-server systems. Case study: IPC in Linux. Threads: Multi-threading models – Threading issues. Case Study: Pthreads library.

UNIT II PROCESS SCHEDULING AND SYNCHRONIZATION 10

CPU Scheduling: Scheduling criteria – Scheduling algorithms – Multiple-processor scheduling – Real time scheduling – Algorithm Evaluation. Case study: Process scheduling in Linux. Process Synchronization: The critical-section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – critical regions – Monitors. Deadlock: System model – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance – Deadlock detection – Recovery from deadlock.

UNIT III STORAGE MANAGEMENT 9

Memory Management: Background – Swapping – Contiguous memory allocation –Paging – Segmentation – Segmentation with paging. Virtual Memory: Background – Demand paging – Process creation – Page replacement – Allocation of frames –Thrashing. Case Study: Memory management in Linux.

UNIT IV FILE SYSTEMS 9

File-System Interface: File concept – Access methods – Directory structure – File system mounting – Protection. File-System Implementation: Directory implementation –Allocation methods – Free-space management – efficiency and performance – recovery– log-structured file systems. Case studies: File system in Linux – File system in Windows XP.

UNIT V I/O SYSTEMS 8

I/O Systems – I/O Hardware – Application I/O interface – kernel I/O subsystem –streams – performance. Mass-Storage Structure: Disk scheduling – Disk management –Swap-space management – RAID – disk attachment – stable storage – tertiary storage. Case study: I/O in Linux.

TOTAL: 45 PERIODS

TEXT BOOK

1. Silberschatz, Galvin, and Gagne, “Operating System Concepts”, 6th Edition, Wiley India Pvt Private Limited, 2003.

REFERENCES

1. Andrew S. Tanenbaum, “Modern Operating Systems”, 2nd Edition, Pearson Education, 2004.
2. Gary Nutt, “Operating Systems”, 3rd Edition, Pearson Education, 2004.
3. Harvey M. Deital, “Operating Systems”, 3rd Edition, Pearson Education, 2004.

BCS030 DATA COMMUNICATION AND COMPUTER NETWORKS L T P C
3 0 0 3

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 9

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

UNIT II NETWORK FUNDAMENTALS 9

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

UNIT III DATA LINK LAYER 9

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

UNIT IV NETWORK LAYER 9

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

UNIT V TRANSPORT AND APPLICATION LAYER 9

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

TOTAL: 45 PERIODS

TEXT BOOKS

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, 4th Edition, Morgan Kauffmann Publishers Inc., 2007.
2. William Stallings, “Data and Computer Communications”, 8th Edition, Pearson Education, 2007.

REFERENCES

1. James F. Kuross, Keith W. Ross, “Computer Networking, a Top-Down Approach Featuring the Internet”, 3rd Edition, Addison Wesley, 2004.
2. Nader F. Mir, “Computer and Communication Networks”, Pearson Education, 2007.
3. Comer, “Computer Networks and Internets with Internet Applications”, 4th Edition, Pearson Education, 2003.
4. Andrew S. Tanenbaum, “Computer Networks”, 4th Edition, Prentice Hall PTR, 2003.

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 NMOSAND 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 / Demltiplexers

TOTAL: 45 PERIODS

TEXT BOOKS

1. D.A.Pucknell, K.Eshraghian, “Basic VLSI Design”, 3rd Edition, Prentice Hall of India, New Delhi, 2003.
2. Eugene D.Fabricius, “Introduction to VLSI Design”, Tata McGraw Hill, 1990.
3. J.Bhasker, “VHDL Primer”, 3rd Edition, Prentice Hall, 1998.
4. Charles H.Roth, “Fundamentals of Logic Design”, Jaico Publishing House, 1992.

REFERENCES

1. Douglas Perry, “VHDL Programming By Example”, Tata McGraw Hill, 4th Edition, 2008,
2. N.H.Weste, “Principles of CMOS VLSI Design”, Pearson Education, India, 2002.
3. Zainalatsedin Navabi, “VHDL Analysis and Modelling of Digital Systems”, 2nd Edition, Tata Mc Graw Hill, 1998.

BEE010 ELECTRICAL POWER SYSTEM QUALITY L T P C
3 0 0 3

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 9

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 9

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 9

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 9

Harmonic sources from commercial and industrial loads - Locating harmonic sources – Power system response characteristics - Harmonics Vs transients. Effect of harmonics – Harmonic distortion - Voltage and current distortion - Harmonic indices - Inter harmonics – Resonance - Harmonic distortion evaluation - Devices for controlling harmonic distortion - Passive and active filters - IEEE and IEC standards.

UNIT V POWER QUALITY MONITORING 9

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

1. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.Wayne Beaty, "Electrical Power Systems Quality", McGraw Hill, 2012.
2. J. Arrillaga, N.R. Watson, S. Chen, "Power System Quality Assessment", New York: Wiley, 1999.

REFERENCES

1. G.T. Heydt, "Electric Power Quality", 2nd Edition, West Lafayette, IN, Stars in Circle Publications, 1994.
2. M.H.J Bollen, "Understanding Power Quality Problems: Voltage Sags and Interruptions", New York: IEEE Press, 1999.
3. C. Sankaran, "Power Quality", CRC Press, 2001.

4. Alexander Kusko and Marc. T. Thompson, “Power Quality in Electrical Systems”, Tata McGraw Hill, 2007.
5. Angelo Baggini, “Handbook of Power Quality”, John Wiley & Sons, 2008.
6. Surajit Chattopadhyay, Madhuchanda Mitra and Samarjit Senguptha, “Electrical Power Quality”, Springer, 2011.
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 9

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 9

Pulse number – Choice of converter configuration – Simplified analysis of Graetz circuit – Converter bridge characteristics – Characteristics of a twelve pulse converter – Detailed analysis of converters.

UNIT III COMPOUNDING AND REGULATIONS 9

General – Required regulation – Inverter compounding – Uncompounded inverter – Rectifier compounding – Transmission characteristics with the rectifier and inverter compounding – Communication link – Current regulation from the inverter side – Transformer tap changing

UNIT IV HARMONICS AND FILTERS 9

Introduction – Generation of harmonics – Design of AC filters and DC filters – Interference with neighbouring communication lines.

UNIT V HVDC CABLES AND SIMULATION OF HVDC SYSTEMS 9

Introduction of DC cables – Basic physical phenomenon arising in DC insulation – Practical dielectrics – Dielectric stress consideration – Economics of DC cables compared with AC cables. Introduction to system simulation – Philosophy and tools – HVDC system simulation – Modeling of HVDC systems for digital dynamic simulation.

TOTAL: 45 PERIODS

TEXT BOOKS

1. K.R.Padiyar, “HVDC Power Transmission Systems: Technology and system Interactions”, New Age International (P) Limited, and Publishers, 1990.
2. Edward Wilson Kimbark, “Direct Current Transmission”, Vol. I, Wiley Interscience, New York, London, Sydney, 1971.

REFERENCES

1. Colin Adamson and Hingorani N G, “High Voltage Direct Current Power Transmission”, Garraway Limited, London, 1960.
2. Arrillaga, J., “High Voltage Direct Current Transmission”, Peter Pregrinus, London, 1983.
3. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, New Age International Private Limited, New Delhi, 1990.

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 actutators
- 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

1. Chang Liu, ‘Foundations of MEMS’, Pearson Education Inc., 2006.

REFERENCES

1. Nadim Maluf, “An Introduction to Micro Electro Mechanical System Design”, Artech House, 2000.
2. Mohamed Gad-el-Hak, editor, “The MEMS Handbook”, CRC press Baco Raton, 2000
3. Julian W. Gardner, Vijay K. Varadan, Osama O.Awadelkarim, micro sensors mems and smart devices, John Wiley and son Limited,2002
4. James J.Allen, “Micro Electro Mechanical System Design”, CRC Press published in 2005.

5. Tai Ran Hsu, “MEMS & Micro systems Design and Manufacture”, Tata McGraw Hill, New Delhi, 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

Electromagnetic Field Equations – Magnetic Vector/Scalar potential – Electrical vector /Scalar potential – Stored energy in Electric and Magnetic fields – Capacitance - Inductance- Laplace and Poisson's Equations – Energy functions.

UNIT III PHILOSOPHY OF FEM 9

Mathematical models – Differential/Integral equations – Finite Difference method – Finite element method – Energy minimization – Variational method- 2D field problems – Discretisation – Shape functions – Stiffness matrix – Solution techniques – FDM - CSM.

UNIT IV CAD PACKAGES 9

Elements of a CAD System –Pre-processing – Modelling – Meshing – Material properties- Boundary Conditions – Setting up solution – Post processing.

UNIT V DESIGN APPLICATIONS 9

Voltage Stress in Insulators – Capacitance calculation - Design of Solenoid Actuator – Inductance and force calculation – Torque calculation in Switched Reluctance Motor.

TOTAL: 45 PERIODS

TEXT BOOKS

1. S.J Salon, "Finite Element Analysis of Electrical Machines", Kluwer Academic Publishers, London, 1995.
2. Nicola Bianchi, "Electrical Machine Analysis using Finite Elements", CRC Taylor & Francis, 2005.

REFERENCES

1. Joao Pedro, A. Bastos and Nelson Sadowski, "Electromagnetic Modeling by Finite Element Methods", Marcell Dekker Inc., 2003.
2. P.P.Silvester and Ferrari, "Finite Elements for Electrical Engineers", Cambridge University Press, 1983.
3. D.A.Lowther and P.P Silvester, "Computer Aided Design in Magnetics", Springer Verlag, New York, 1986.
4. S.R.H.Hoole, "Computer Aided Analysis and Design of Electromagnetic Devices", Elsevier, New York, 1989.
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 9

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 9

Voltage control by SVC – advantages of slope in dynamic characteristics – influence of SVC on system voltage. Applications - enhancement of transient stability – steady state power transfer – enhancement of power system damping – prevention of voltage instability.

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS 9

Operation of the TCSC – different modes of operation – modelling of TCSC – variable reactance model – modelling for stability studies. Applications -improvement of the system stability limit – enhancement of system damping – voltage collapse prevention.

UNIT IV EMERGING FACTS CONTROLLERS 9

Static Synchronous Compensator (STATCOM) – operating principle – V-I characteristics – Unified Power Flow Controller (UPFC) – Principle of operation - modes of operation – applications – modeling of UPFC for power flow studies – Principles and operation of SSSC.

UNIT V CO-ORDINATION OF FACTS CONTROLLERS 9

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

1. Mohan Mathur, R., Rajiv. K. Varma, “Thyristor – Based Facts Controllers for Electrical Transmission Systems”, IEEE press and John Wiley and Sons, Inc., 2002.

REFERENCES

1. A.T.John, “Flexible AC Transmission System”, Institution of Electrical and Electronic Engineers (IEEE), 1999.
2. Narain G.Hingorani, Laszio. Gyugyl, “Understanding FACTS Concepts and Technology of Flexible AC Transmission System”, Standard Publishers, Delhi, 2001.

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 9

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 9

Review of reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

UNIT III POWER CONVERTERS 9

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 9

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 9

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

1. Rashid.M. H., “Power Electronics Hand book”, Academic Press, 2001.
2. Rai. G.D, “Non Conventional Energy Sources”, Khanna Publishes, 1993.

REFERENCES

1. Rai. G.D,” Solar Energy Utilization”, Khanna publishes, 1993.
2. Gray, L. Johnson, “Wind Energy System”, Prentice Hall Inc., 1995.
3. B.H.Khan, “Non-conventional Energy Sources”, Tata McGraw-hill Publishing Company, New Delhi, 2006.

BEE016 ELECTROMAGNETIC INTERFERENCE AND ELECTROMAGNETIC COMPATIBILITY **L T P C**
3 0 0 3

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 **9**

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 **9**

Cabling – capacitive coupling - inductive coupling - shielding to prevent magnetic radiation - shield transfer impedance - Grounding – safety grounds – signal grounds - single point and multipoint ground systems- hybrid grounds - functional ground layout – grounding of cable shields- ground loops - guard shields.

UNIT III BALANCING, FILTERING AND SHIELDING **9**

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 **9**

Frequency versus time domain - analog versus digital circuits - digital logic noise- internal noise sources - digital circuit ground noise – power distribution - noise voltage objectives measuring noise voltages - unused inputs - logic families.

UNIT V ELECTROSTATIC DISCHARGE, STANDARDS AND LABORATORY TECHNIQUES **9**

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

1. Henry W.Ott, “Noise Reduction Techniques in Electronic Systems”, John Wiley and Sons, 2011.
2. Bernhard Keiser, “Principles of Electro-Magnetic Compatibility”, Artech House, Inc., 1987.

REFERENCES

1. Bridges J.E., Milleta J. and Ricketts L.W., “EMP Radiation and Protective Techniques”, John Wiley and sons, 1976.
2. IEEE National Symposium on “Electromagnetic Compatibility”, IEEE, 445, Hoes Lane, Piscataway, 2007.

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

System response to small disturbances - linear model of the unregulated synchronous machine and its modes of oscillation – regulated synchronous machine - Distribution of power impact - linearization of the load equation for the one machine problem –Simplified linear model - effect of excitation on dynamic stability - approximate system representation - supplementary stabilizing signals - dynamic performance measure -small signal performance measures

TOTAL: 45 PERIODS

TEXT BOOKS

1. P.M. Anderson and A.A.Fouad, "Power System Control and Stability", Galgotia Publications, New Delhi, 2003.
2. P. Kundur, "Power System Stability and Control", McGraw Hill Inc., USA, 1994.

REFERENCES

1. M.A.Pai and W.Sauer, "Power System Dynamics and Stability", Pearson Education Asia, India, 2002.
2. James A.Momoh, Mohamed.E. EI-Hawary. "Electric Systems, Dynamics and stability with Artificial Intelligence applications", Marcel Dekker, USA, 1st Edition, 2000.

BEE018 FPGA BASED DESIGN L T P C
3 0 0 3

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 9

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 9

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 9

Actel ACT - Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Altera MAX 9000 Altera FLEX - Design systems - Logic Synthesis - Half Gate ASIC - Schematic entry - Low level design language - PLA tools - EDIF - CFI design representation.

UNIT IV LOGIC SYNTHESIS, SIMULATION AND TESTING 9

Verilog and logic synthesis - VHDL and logic synthesis - Types of simulation - Boundary scan test - Fault simulation - Automatic test pattern generation. Built-in self test.

UNIT V FLOOR PLANNING, PLACEMENT AND ROUTING 9

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

1. M.J.S. Smith, “Application Specific Integrated Circuits”, Addison Wesley Longman Inc., 1997.
2. Wolf Wayne, “FPGA Based System Design”, Pearson Education, 2004.

REFERENCES

1. Mohammed Ismail and Terri Fiez, “Analog VLSI Signal and Information Processing”, McGraw Hill, 1994
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

Energy Scenario - Energy monitoring, auditing and targeting – Economics of various Energy Conservation schemes. Total Energy Systems - Energy auditing – Types, methodologies, barriers, role of energy manager – Energy audit questionnaire – Energy conservation act.

UNIT II ELECTRICAL ENERGY SYSTEMS 9

Captive power generation systems – Biomass, wind and diesel power generation – KVA demand estimation– EB bill detailing - Basics of monitoring and targeting – Elements of monitoring and targeting, data and information analysis techniques – Energy consumption, production.

UNIT III ENERGY CONSERVATION 9

Refrigeration and Air conditioning - Energy conservation in cooling towers & spray ponds – Case studies of Electrical Energy -Energy Efficiency in Lighting – Case studies.

UNIT IV PERFORMANCE EVALUTION 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

1. Hamies, Energy Auditing and Conservation; Methods, Measurements, Management and Case Study, Hemisphere, Washington, 1980.

REFERENCES

1. CB Smith, “Energy Management Principles”, Pergamon Press, New York, 1981
2. Trivedi, P. R. and Jolka, K. R., Energy Management, Common Wealth Publication, New Delhi, 1997.
3. Steve Doty and Wayne C. Turner, “Energy Management Handbook”, 7th Edition, The Fairmont Press, Inc., 2009.
4. Y.P. Abbi and Shashank Jain, “Handbook on Energy Audit and Environment Management”, TERI Publications, 2006.
5. F. Kerith, D.Y. Goswami, “Energy Management and Conservation Handbook”, CRC Press, 2008.

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

Introduction – Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation – Multiplexing – Modulations – Spread spectrum – MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks

UNIT II TELECOMMUNICATION SYSTEMS 9

GSM – GPRS – DECT – TETRA- UMTS – IMT-2000

Satellite Networks Basics – Parameters and Configurations – Capacity Allocation – FAMA and DAMA – Broadcast Systems – DAB - DVB.

UNIT III WIRELESS LAN 9

IEEE 802.11 - Architecture – services – MAC – Physical layer – IEEE 802.11a - 802.11b standards – Infrared vs Radio Transmission, Infrastructure and Ad hoc networks-HIPERLAN – Blue Tooth.

UNIT IV NETWORK AND TRANSPORT LAYER 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.

Support for Mobility: File systems, World Wide Web, Wireless Application Protocol

TOTAL: 45 PERIODS

TEXT BOOKS

1. Jochen.H.Schiller “Mobile Communications” Pearson Education Limited , 2nd Edition, 2007
2. Raj Kamal, “Mobile Computing”, Oxford University Press, New Delhi, 2007.

REFERENCES

1. S.Rappapart Wireless Communication; Prentice Hall, NJ 2002
2. Steele Lee and Gluis, “GSM, CDMA and 3G systems”, JW,2001
3. K.Feher, Wireless Digital Communication PH 1995.
4. Richards, “Mobile Satellite Communication Engineering”, 2nd Edition, Addision- Wesley 2002.
5. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2007.
6. Fundamentals of Wireless Communication (Hardcover) by David Tse, Pramod Viswanath Reprinting 2011, University Press Edition.
7. Jon W. Mark, Weihua Zhuang, “Wireless Communications and Networking”, Prentice Hall, New Delhi, 2007.

BIT014 COMPUTER ARCHITECTURE L T P C
3 0 0 3

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 9

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 9

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 9

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

UNIT IV MEMORY SYSTEM 9

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

UNIT V I/O AND INTERFACES 9

I/O devices – I/O programming – polling – interrupts – DMA – buses – links – interfacing – context switching – threads and multithreading

TOTAL: 45 PERIODS

TEXT BOOKS

1. B. Parhami, “Computer Architecture”, Oxford University Press, 2005.
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, 5th Edition, Tata McGraw Hill, 2002.

REFERENCES

1. David A. Patterson and John L. Hennessy, “Computer Organization and Design: Hardware / Software interface”, 5th Edition, Elsevier, 2004.
2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, 7th Edition, Pearson Education, 2006.
3. Miles Murdocca “Computers Architecture and Organization An Integrated approach”, India Private Limited, 2007.
4. John D. Carpinelli, “Computer systems organization and Architecture”, Pearson Education, 2001.

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

Introduction to ergonomics and its area of application in the work system. Anatomy, Posture and body mechanics - low back pain, risk factors for musculoskeletal disorders in the work place - behavioural aspects of posture - effectiveness.

Individual differences, Factors contributing to personality, fitting the man to the job. Motivation - job satisfaction - Frustration and conflicts, reaction to frustration, emotion and frustration. Attitudes - determination of attitudes - changing attitudes.

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 - CO_2 system, foam system and DCP system.

UNIT V SAFETY MANAGEMENT TECHNIQUES, EDUCATION AND TRAINING 9

Incident recall technique (IRT), disaster control, Job safety Analysis, Safety survey, safety inspection. Safety training programs, seminars, conferences, competitions- method of promoting safe practice – motivation - creating awareness, awards, celebrations, safety posters, safety displays, safety incentive scheme- domestic safety and training.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Heinrich.H.W. "Industrial Accident Prevention", McGraw Hill Company, New York, 1980.
2. John V. Grimaldi and Rollin H. Simonds, "Safety Management", All India Travellers Book Seller, New Delhi, 1989.
3. E.J.McCormick and M.S. Sanders "Human Factors in Engineering and Design", TMH New Delhi, 1982.
4. Hand Book of "Occupational Safety and Health", National Safety Council, Chicago, 1982.
5. Derek, James, "Fire Prevention Hand Book", Butter Worths and Company, London, 1986.

REFERENCES

1. Krishnan.N.V. "Safety Management in Industry" Jaico Publishing House, Bombay, 1997.
2. Lees, F. P. "Loss Prevention in Process Industries", Butter Worth publications, London, 2nd Edition, 1990.
3. Dan Peterson, "Techniques of Safety Management", McGraw Hill Company, Tokyo, 1981.

4. "Accident Prevention Manual for Industrial Operations", N.S.C. Chicago, 1982.
5. Hunter, Gomos, "Engineering Design for Safety", McGraw Hill Inc., 1992.
6. Encyclopedia of "Occupational Health and Safety" Vol I and II, Published by International Labour Office, Geneva 1985.
7. Gupta. R.S., "Hand Book Of Fire Technology", Orient Longman, Bombay, 1977.

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-thinfilms-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.

UNITIII 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 CHARECTERISATION 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 Applications”, Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, “Nanoscalecharecterisation of surfaces & Interfaces”, 2nd Edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES

1. G Timp (Editor), “Nanotechnology”, AIP press/Springer, 1999.
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.