K. S. R. M. COLLEGE OF ENGINEERING (AUTONOMOUS) KADAPA

Course Structure for B. Tech (Regular) (2014-15)

ELECTRICAL AND ELECTRONICS ENGINEERING (E.E.E)

Annexure – 1: Curriculum

I Year B. Tech

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	14211001	Mathematics-I	BS	3	1	0	30	70	5
2	14211002	Mathematics-II	BS	3	1	0	30	70	5
3	14221003	Engineering Physics	BS	2	0	0	30	70	3
4	14231004	Engineering Chemistry	BS	2	0	0	30	70	3
5	14241005	English	HS	2	0	0	30	70	3
6	14031006	Engineering Drawing	ED	1	0	3	30	70	5
7	14051007	Problem Solving and Programming in C	ED	3	0	0	30	70	5
8	14991008	Engineering Workshop	ED	0	0	3	50	50	4
9	14051009	Programming in C Lab	ED	0	0	3	50	50	4
10	14991010	Engineering Sciences Lab	BS	0	0	3	50	50	4
11	14241011	English Language and Communication Skills Lab	HS	0	0	3	50	50	4
Total				16	02	15	410	690	45

II Year B. Tech – I Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	14212101	Mathematics-III	BS	3	1	0	30	70	3
2	14012102	Environmental Studies	HS	4	0	0	30	70	3
3	14112103	Fluid Mechanics & Hydraulic Machinery	PN	4	0	0	30	70	3
4	14042104	Electronic Devices and Circuits	PJ	3	1	0	30	70	3
5	14022105	Circuit Theory	PJ	3	1	0	30	70	3
6	14022106	Electrical Machines - I	PJ	3	1	0	30	70	3
7	14112107	Fluid Mechanics & Hydraulic Machinery Lab	PN	0	0	3	50	50	2
8	14042108	Electronic Devices and Circuits Lab	PJ	0	0	3	50	50	2
Total				20	04	06	280	520	22

II Year B. Tech – II Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	14042201	Switching Theory & Logic Design	PJ	3	1	0	30	70	3
2	14042202	Analog Electronic Circuits	PJ	3	1	0	30	70	3
3	14022203	Generation of Electrical Power	PJ	3	1	0	30	70	3
4	14022204	Electromagnetic Fields	PJ	3	1	0	30	70	3
5	14022205	Network Theory	PJ	3	1	0	30	70	3
6	14022206	Electrical Machines - II	PJ	3	1	0	30	70	3
7	14022207	Electrical Circuits and Simulation Lab	PJ	0	0	3	50	50	2
8	14022208	Electrical Machines – I Lab	PJ	0	0	3	50	50	2
Total				18	06	06	280	520	22

III Year B. Tech – I Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	14253101	Managerial Economics And Financial Analysis	HS	3	1	0	30	70	3
2	14143102	Linear& Digital Integrated Circuit Applications	PJ	3	1	0	30	70	3
3	14023103	Control Systems	PJ	3	1	0	30	70	3
4	14023104	Power Electronics	PJ	3	1	0	30	70	3
5	14023105	Power Systems - I	PJ	3	1	0	30	70	3
6	14023106	Electrical Machines - III	PJ	3	1	0	30	70	3
7	14023107	Power Electronics Lab	PJ	0	0	3	50	50	2
8	14023108	Electrical Machines – II Lab	PJ	0	0	3	50	50	2
Total				18	06	06	280	520	22

III Year B. Tech – II Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	14143201	Micro Processors & Microcontrollers	PJ	3	1	0	30	70	3
2	14023202	Electrical & Electronic Measurements	PJ	3	1	0	30	70	3
3	14023203	Advanced Control Systems	PJ	3	1	0	30	70	3
4	14023204	Power Semiconductor Drives	PJ	3	1	0	30	70	3
5	14023205	Power Systems - II	PJ	4	0	0	30	70	3
6		**Elective - I**							
	14143206	Digital Signal Processing	PJ	3	1	0	30	70	3
	14023207	High Voltage DC Transmission	PJ	3	1	0	30	70	3
	14153208	Object Oriented Programming through JAVA	PJ	3	1	0	30	70	3
7	14243209	Advanced English communication Lab(Audit Course)	HS	0	0	3	50*	--	--
8	14023210	Control Systems Lab	PJ	0	0	3	50	50	2
9	14023211	Electrical Measurements Lab	PJ	0	0	3	50	50	2
Total				19	05	09	280	520	22

IV Year B. Tech – I Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	14254101	Management Science	HS	3	1	0	30	70	3
2	14024102	Power Systems - III	PJ	3	1	0	30	70	3
3	14024103	Switch Gear & Protection	PJ	3	1	0	30	70	3
4	14024104	Flexible AC Transmission Systems	PJ	3	1	0	30	70	3
5		**Elective - II**							
	14024105	Soft Computing Techniques	PJ	3	1	0	30	70	3
	14024106	High Voltage Engineering	PJ	3	1	0	30	70	3
	14024107	Special Electrical Machines	PJ	3	1	0	30	70	3
6		**Elective - III**							
	14134108	Optimization Techniques	PJ	3	1	0	30	70	3
	14144109	VLSI Design	PJ	3	1	0	30	70	3
	14024110	Reliability Engineering & Applications to Power Systems	PJ	3	1	0	30	70	3
7	14254111	Professional Ethics (Audit Course)	HS	2	-	-	30*	-	-
8	14144112	Micro Processors & Micro Controllers Lab	PJ	0	0	3	50	50	2
9	14024113	Power Systems Simulation Lab	PJ	0	0	3	50	50	2
Total				20	06	06	280	520	22

IV Year B. Tech – II Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	14024201	Utilization of Electrical Power	PJ	3	1	0	30	70	3
2	14024202	Power System Operation & Control	PJ	3	1	0	30	70	3
3	14024203	Electrical Distribution Systems	PJ	3	1	0	30	70	3
4		**Elective-IV**							
	14024204	Energy Auditing and Demand Side Management	PJ	3	1	0	30	70	3
	14024205	Switch Mode Power Converters	PJ	3	1	0	30	70	3
	14024206	Electrical Machine Design	PJ	3	1	0	30	70	3
5	14024207	Seminar	PJ	0	0	-	100	-	3
6	14024208	Project Work	PJ	0	0	-	50	50	10
Total				12	4	0	270	330	25

Annexure – 2: Syllabus

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14211001	BS	Mathematics - I	3	1	0	30	70	5

Objectives: This course aims at providing the students with the concepts of Matrices, Differential, Integral and Vector calculus and Laplace Transforms.

Unit I

Matrices: Rank – Echelon form – Normal form – Solution of linear system of homogeneous and non-homogeneous equations – Eigen values, Eigen vectors for real matrices – Cayley- Hamilton theorem – Inverse and powers of a matrix. Linear transformations – Orthogonal transformations. Hermitian, skew-Hermitian and unitary matrices.Diagonalization of a matrix. Quadratic forms – Reduction of quadratic form to canonical form by orthogonal reduction and their nature.

Unit II

Taylor's series – Maclaurin's series – Functions of two or more variables Jacobians – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers. Radius of curvature, centre of curvature, Involutes, Evolutes and envelopes. Curve tracing – Cartesian, polar and parametric curves.

Unit III

Multiple Integrals: Evaluation of double integrals in Cartesian coordinates, and polar coordinates - Change of variables in double integrals - Change the order of integration in double integrals - Evaluation of triple integrals in Cartesian and polar coordinates - Change of variables in triple integrals –Areas by double integration- Volumes by triple integrals. Beta and Gamma functions.

Unit IV

Laplace transforms of standard functions – Properties of Laplace Transformations - Transforms of derivatives and integrals- Evaluation of integrals by Laplace transforms – Unit step function – Second shifting theorem – Dirac's delta function . Laplace transform of periodic functions – Convolution theorem. Inverse Laplace Transforms – Applications of Laplace transforms to ordinary differential equations.

Unit V

Vector calculus - Vector differentiation: Scalar point function - Vector point function - Vector operator Del – Gradient – Divergence - Curl and their related properties - Laplacian and Second order operators. Vector integration: Line, Surface and Volume integrals-Green's theorem in a plane, Stoke's theorem and Gauss-divergence theorems (statement only). Application of Green's Strokes and Gauss divergence theorems.

Textbook:

1. Higher Engineering Mathematics, Dr.B.SGrewal, Khanna Publishers-42 edition.

Reference Books:

1. Higher Engineering Mathematics, B.VRamana, Mc. Graw Hill Education(India) Private Limited.

2. Engineering Mathematics Volume -1, Dr.D.S Chandra Sekharaiah, Prism Books Pvt. Limited.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14211002	**BS**	**Mathematics - II**	**3**	**1**	**0**	**30**	**70**	**5**

Objectives:

* This course aims at providing the students with the concepts of Differential equations, Fourier series, Fourier Transforms and Partial Differential equations.
* Our emphasis will be more on logical and problem solving development in Numerical methods and their applications in solving Engineering problems when analytical methods fails.

Unit I

Differential equations of first order and first degree: Exact, Non exact, Linear and Bernoulli equations. Applications: Orthogonal trajectories, Newton's law of cooling, Law of natural growth and decay.

Linear differential equations of second and higher order with constant coefficients with R.H.S term of the type eax, sin ax, cosax, polynomials in x , eax V(x), xV(x) - Method of variation of parameters – Cauchy's linear equation –Legendre's linear equation.

Unit II

Solution of algebraic and transcendental equations - False - position method - Newton - Raphson method.

Solution of System of equations: Gauss Elimination method- Gauss seidel iteration method. Interpolation – Introduction - Finite differences - Forward differences - Backward differences - Newton's forward and backward difference formulae for interpolation - Lagrange's formula for unequal intervals- Inverse interpolation.

Numerical differentiation: Finding first and second order derivatives using Newton's formulae. Numerical integration – Newton - Cote's quadrature formula - Trapezoidal rule – Simpson's 1/3 rule – Simpson's 3/8 rule.

Unit III

Numerical solution of ordinary differential equations - Solution by Taylor's series – Picard's method of successive approximations –Runge - Kutta methods of second and fourth order – Milne's predictor - corrector method.

Curve fitting - Principle of least squares - Fitting a straight line, second degree curve, exponential curve, power curve by the method of least squares. Simple correlation & regression.

Unit IV

Fourier series: Determination of Fourier coefficients - Fourier series - Even and odd functions - Fourier series in an arbitrary interval - Functions having points of discontinuity- Half range Fourier sine and cosine expansions.

Fourier integral theorem(only statement) – Fourier integrals- Fourier sine and cosine integrals. Fourier transform, Fourier sine and cosine transforms – Properties - Inverse transforms.

Unit V

Partial Differential Equations: Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions - Method of separation of variables. Solution of one dimensional wave equation - Solution of one dimensional heat equation -Solution of Laplace's equation.

Text Books:

1. Higher Engineering Mathematics, Dr.B.SGrewal, Khanna Publishers-42 edition.
2. Introductory methods of Numerical Analysis, S.SSastry, 5th edition.

References:

1. Engineering Mathematics – III B, Dr.M.KVenkata Raman, 13th edition.
2. Higher Engineering Mathematics, B.VRamana, Mc. Graw Hill Education(India) Pvt. Limited.
3. Numerical Methods, S. Arumugam, A.Thangapandi Isaac, A. Soma Sundaram, Second edition, Scitech Publications (India) Pvt. Limited.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14221003	**BS**	**Engineering Physics**	**2**	**0**	**0**	**30**	**70**	**3**

UNIT – 1

Physical Optics, Lasers and Fibre Optics: Introduction: Interference in thin films by reflection – Newton's Rings-Fraunhofer diffraction due to single slit, double slit and diffraction grating.

Lasers: Introduction –characteristics of laser-Spontaneous and simulated demission of radiation- Einstein's coefficients-population inversion – Excitation mechanisms and optical resonator-Ruby laser – Hene laser- Application of lasers.

Fiber Optics:- Introduction-Construction and working principle of optical fiber- Numerical aperture and acceptance angle- Types of optical fibers- Attenuation and loses in fivers- Optical fiber communication system- Applications of optical fibers in communications sensors and medicine.

UNIT – 2

Crystallography and Ultrasonics: CRYSTALLOGRAPHY:- Introduction –Space lattice – unit Cell lattice parameters- Bravis lattice – Crystal systems- Packing fractions of SC, BCC and FCC – Structures of NAcl and diamond –Directions and planes in Crystals – Miller indices – InterPlanar spacing in cubic crystals – X-ray diffraction – Bragg's law-Laue and powder methods- Defects in solide: point defects, line defects(Qualitative) – Screw and edge dislocation, Burgers Vector.

Ultrasonics: Introduction- production of ultrasonic's by piezoelectric method-properties and detection- applications in non –destructive testing.

UNIT-3

Elements of Thermodynamics, Special Theory of Relativity: Elements of Thermodynamics: Introduction- concept of temperature- heat- thermodynamic-terminology –work-heat exchange-internal energy- law of conservation of energy- first law of thermodynamic- carnot-cysle- second law of thermodynamic –third law of thermodynamic.

Special Theory of Relativity: Introduction-space time and motion – frame of reference –Galileo's principle of relativity- Galilean transformation – Einstein's principle of relativity-Lorentz transformation –consequences of special relativity.

UNIT- 4

Semiconductors and Magnetic Materials: Semiconductor Physics: Introduction-Intrinsic and extrinsic semiconductors- Drift and diffusion currents and Einstein's equation- Hall effect- Direct and Indirect band gasp semiconductors- working principle of p-n junction diode, LED, Laser diode and photo diode.

Magnetic Materials:- Introduction and basic definitions- Origin of Magnetic moments-Bohr magneton- Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials- Hysteresis- Soft and hard magnetic materials and applications.

UNIT- 5

Super Conductivity and Physics of Nano-Materials: Superconductivity: Introduction-Meissonier effect- Properties of Superconductors- Type I and Type II Superconductors-Flux quantization- London penetration depth- ac and dc Josephson effects- BCS theory(Qualitative)- Higher T superconductors- Applications of superconductors.

Physics of Nano-Materials: Introduction- Significance of Nano-scale- surface area and quantum confinement- physical properties: optical, thermal, mechanical and magnetic properties- Synthesis of nano-materials: ball mill, chemical vapour deposition , sol-gel, plasma arcing and thermal evaporation –Properties of carbon nanotubes- High strength applications- properties of grapheme- Graphenen-based field effect transistor-Applications of nano-materials.

Text Books:

1. Engineering Physics by K. Thyagarajan, Tata Mac Graw Hill Publishing Co., New Delhi.
2. Engineering Physics by P. K. Palaniswamy, Scitech Publications.
3. Engineering Physics by S. Mani Naidu, Pearson Edition.
4. Classical Mechanics by J. C. Upadhaya.

Reference Books:

1. Solid State Physics by S. O. Pillai.
2. Engineering Physics by R. K. Gaur, S. L. Gupta.
3. Physics Volume – 2 by Resnick, Halliday and Krane, John Wiley India.
4. Introduction to Nano Science & Nano Technology by K. K. Chattapadhyay & A. N. Banarjee – Prentice Hall of India Pvt. Ltd.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14231004	BS	Engineering Chemistry	2	0	0	30	70	3

Objectives:

- Knowledge in Chemistry serves as basic nutrient for the understanding and thereby design of materials of importance in life. Thus the advancement in Engineering depend on the outcome of basic sciences.
- The Engineering Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.
- The course main aim is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
- An attempt has been made to logically correlate the topic with its application.
- After the completion of the course, the student would understand about the concepts of chemistry in respect of water, Polymers with their applications, Energy sources, material chemistry and advanced chemistry.

UNIT – I

Water: Introduction, Hardness: Causes, expression of hardness – units – Types of hardness, estimation of temporary & permanent hardness of water, analysis of water, numerical problems. Boiler troubles – Scale & Sludge formation, caustic embrittlement, corrosion, priming & foaming, Softening of water (Internal & External treatment – Lime soda, Zeolite, Ion exchange process) Reverse osmosis, electro dialysis

UNIT – II

Polymers: Types of Polymerization, Mechanism (chain growth & Step growth). Plastics: Thermoplastic resins & Thermo set resins. Compounding of plastics, preparation, properties, engineering applications of polyethylene, PVC, Bakelite, Nylon. Conducting polymers: Poly acetylene, Polyaniline, conduction, doping, Applications. Rubber – Natural rubber, vulcanization. Elastomers – Buna-s, Butyl rubber, Thiokol Rubbers, Fibres – Polyester fiber, Inorganic polymers – Silicones.

UNIT – III

Energy sources: Batteries, fuels, classification – conventional fuels (solid, liquid, gaseous) Solid fuels – coal and their significance, Liquid fuels – primary – petroleum – refining of petroleum – cracking, knocking, synthetic petrol – Bergius and Fischer Tropsech's process; Gaseous fuels – natural gas, analysis of flue gas by Orsat's method, combustion – problems, Calorific value of fuel – HCV, LCV, determination of calorific value by Junker's gas calorie meter. Nuclear energy, Solar cells.

UNIT – IV

Material Chemistry: Cement: composition of Portland cement, manufacture of port land Cement, setting & hardening of cement (reactions). Refractories: Classification, Characteristics of a good refractory. Lubricants: Criteria of a good lubricant,

mechanism, properties of lubricants: Cloud, point, pour point, flash & fire point, Viscocity. Rocket Propellents – Classification and Characteristics of good propellents.

UNIT – V

Advance Chemistry: Green Chemistry: Introduction, Goals and Significance of green chemistry, basic components of green chemistry, industrial applications – products from natural materials, Green solvents, Green fuels and e-green propellents, Bio-catalysis.

Photo Chemistry: Introduction Fluorescence, Phosphorescence, Luminescent compounds, Photo and light responsive compounds.

Catalysis: Introduction, action of catalyst (Catalytic promoters and catalytic poisons) Types of Catalysis.

Instrumental Techniques: Chromatography, UV-visible spectroscopy, IR Spectrophotometry, AAS.

Textbooks

1. A Text Book of Engineering Chemistry, Jain and Jain, DhanapathRai Publishing Company, New Delhi, 15th Edition, 2010.
2. Text Book of Engineering Chemistry, Shashichawla, DhanapathRai Publications, New Delhi, 4th Edition, 2011.

References

1. Text Book of Engineering Chemistry – C. Parameswara Murthy, C.V. Agarwal and Andra Naidu, BS Publications, Hyderabad, 3rd Edition, 2008.
2. Engineering Chemistry by K.B. Chandra Sekhar, UN. Das and Sujatha Mishra, SCITECH, Publications India Pvt. Limited, Chennai, 2nd Edition, 2012.
3. Text Book of Engineering Chemistry by S.S. Dara&Mukkati S. Chand & Co Publishers, New Delhi, 2006.
4. Chemistry of Engineering Materials by C. V. Agarwal, C.P. Murthy, A. Naidu, BS Publications.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14241005	**HS**	**English**	**2**	**0**	**0**	**30**	**70**	**3**

Objectives:

a) To improve the language proficiency of the students in English with an emphasis on LSRW skills.
b) To develop an awareness in the students about the significance of silent reading and comprehension.
c) To equip the students to study academic subjects with greater facility through theoretical and practical components of the syllabus.
d) To develop study skills as well as communication skills in formal and informal situations.
e) To enable students to express themselves fluently and appropriately in social and professional contexts.

f) To develop an awareness in the students about writing as an exact and formal skill.

PART-1: DETAILED STUDY

1) A dissertation upon Roast pig – Charles Lamb
2) The post master – Rabindranath Tagore
3) Spoken English and Broken English – George Bernard Shaw
4) Building a New state - A. P. J Abdul Kalam
5) The wood Rose – AbburiChaya Devi

PART-II NON-DETAILED STUDY

1) My struggle for an education – Booker T. Washington
2) A city Night-piece – Oliver Goldsmith
3) Indian crowds – Nirad C. Chowdari
4) The worship of the wealthy – G. K. Chesterston
5) Mokshagundam Visveswaraya – An Autobiography

Grammar & Vocabulary

1. Exercises on Comprehension, Letter Writing, Technical Report writing, E-mail Writing, Curriculum Vitae
2. Exercises on Remedial grammar covering common errors in English, Transformation covering interchange of parts of speech Active/Passive voice, Direct & Indirect Speech, Simple, Compound & Complex.

Vocabulary development covering: Synonyms & Antonyms, One word substitutes, Prefixes and suffixes, Idioms & phrases, Words often confused and paragraph writing.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14031006	**ED**	**Engineering Drawing**	**1**	**0**	**3**	**30**	**70**	**5**

Objectives:

- By studying the engineering drawing, a student becomes aware of how industry communicates technical information. Engineering drawing teaches the principles of accuracy and clarity in presenting the information necessary about objects.
- This course develops the engineering imagination i.e., so essential to a successful design. Learning techniques of engineering drawing changes the way one thinks about technical images.
- It is ideal to master the fundamentals of engineering drawing first and to later use these fundamentals for a particular application, such as computer aided drafting. Engineering Drawing is the language of engineers and by studying this course, engineering students will eventually be able to prepare drawings of various objects being used in technology.

UNIT-I

Introduction: Principles of Engineering Graphics and their significance- Drawing instruments and their use- Conventions in Drawing- Lettering- BIS Conventions.

Curves: (a) Conic sections –General method only (b) Cycloid, Epicycloids and Hypocycloid and (c) Involutes

UNIT- II

Projection of Points and Lines: Principles of orthographic projection- conventions- First and Third angle projections. Projections of points, Lines inclined to one or both planes, Problems on projections, Finding True lengths & traces.

Projection of Planes: Projections of regular plane surfaces/figures, Projection of planes using auxiliary planes.

UNIT-III

Projections of Solids: Projections of regular solids inclined to one or both planes.

Sections of Solids: Section planes and sectional views of right regular solids- Prism, Cylinder, Pyramid and Cone. True shape of sections.

UNIT- IV

Development of Surfaces: Development of surfaces of Right regular solids- Prisms, Cylinder, Pyramid, Cone and their sectional parts.

Introduction to AutoCAD: Co-ordinate systems, Setting of Drawing space, Preparatory commands-limits, Snap, Grid and Orho, Viewing commands -Zoom, Pan &Osnap; Geometry commands (Only Line, Circle and Arc) and editing commands.

UNIT- V

Isometric Projections: Principles of isometric projection -isometric views-Conventions-isometric views of Lines, Plane figures, Simple and Compound Solids- Isometric projection of objects having non isometric lines.

Orthographic Projections: Conversion of isometric projections/views to Orthographic Views- Conventions.

Text Books

1. Engineering Drawing, N. D. Bhat, Charotar Publishers.
2. Engineering Drawing, K. L. Narayana, P. Khanniah, SCITECH Pub.
3. Engineering Drawing, Basant Agrawal, C. M. Agrawal, Tata McGraw-Hill.

References:

1. Engineering Drawing, Shah and Rana, 2/e, Pearson Education.
2. Engineering Drawing, B. V. R. Guptha, J. K. Publishers.
3. Engineering Drawing and Graphics, Venugopal, New age Publishers.
4. Engineering Drawing, Johle, Tata McGraw-Hill.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14051007	**ED**	**Problem Solving & Programming in C**	**3**	**0**	**0**	**30**	**70**	**5**

Objectives:

- Students will be able to understand the syntax and semantics of C programming language and other features of the language.
- To make the student solve problems, implement them using C language.

UNIT-I

Introduction to Computers: Introduction, Computer Hardware, Computer Software, Algorithms, Flowcharts.

Introduction to C: Introduction, Basic structure of 'C' program, Character set, Tokens, Keywords and Identifiers, Constants, Variables, Data types, Declaration of variables.

UNIT-II

Managing of Input/output operations, Reading a character, writing a character, Formatted input, Formatted output, Operators and Expressions.

Decision Making & Branching: If, Switch, Go To statements. Decision making and looping: While, Do, For, Break, Continue, Exit statements.

UNIT-III

Functions: Introduction, Need for user define functions, Definition of function, Return values and their types, Function declaration, Category of functions, Recursion, Passing parameters to the function, Storage classes.

Arrays: Introduction, One dimensional arrays, Declaration of one dimensional arrays, Initialization of one-dimensional arrays, Two dimensional arrays, Initializing two-dimensional arrays, Multi dimensional arrays, Math function.

UNIT-IV

Strings: Introduction, Declaration and initializing string variables, Reading strings and writing strings, Arithmetic operations on characters, String handling functions.

Pointers: Introduction, Understanding pointers, Accessing the address of a variable, Declaration and initialization of pointer variables, Accessing a variable through its pointers.

UNIT-V

Structures and Unions: Introduction, Defining a structure, Declaring structure variables, Accessing structure members, Structure initialization, Arrays of structures, User defined data types, Unions.

File Management in C: Introduction, Defining and opening a file, Closing a file, I/O operations on files, Random access to files.

Text Books:

1. Programming in C & Data Structures, E. Balaguruswamy, 4th Edition, TMH.
2. Programming in C, Reema Thareja, Oxford University Press.

Reference Books:

1. Programming with C, Ron S Gottfried, 3rd Edition, TMH – Schuam Outline Series.
2. The C Programming Language, B. W. Kernignan & Dennis M. Ritchie, 2nd Edition 2003, PHI.
3. Let Us C, Yashavanth P. Kenetkar, 7th Edition, BPB Publications, 2007.
4. Programming in C, Ajay Mittal, Pearson Education, 2010.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14991008	ED	Engineering Workshop	0	0	3	50	50	4

Part A - Engineering Workshop

Objectives: The budding Engineer may turn out to be a technologist, scientist, entrepreneur, practitioner, consultant etc. There is a need to equip the engineer with the knowledge of common and newer engineering materials as well as shop practices to fabricate, manufacture or work with materials. Essentially he should know the labour involved, machinery or equipment necessary, time required to fabricate and also shouldbe able to estimate the cost of the product or job work. Hence engineering work shop practice is included to introduce some common shop practices and on hand experience to appreciate the use of skill, tools, equipment and general practices to all the engineering students.

1. Trades for Exercises:

1. Carpentry shop– Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, cross lap joint, mortise and tenon T joint, Bridle T joint from out of 300 x 40 x 25 mm soft wood stock.
2. Fitting shop– Two joints (exercises) from: square joint, V joint, half round joint or dove tail joint out of 100 x 50 x 5 mm M.S. stock.
3. Sheet metal shop– Two jobs (exercises) from: Tray, cylinder, hopper or funnel from out of 22 or 20 guage G. I. sheet.
4. House-wiring– Two jobs (exercises) from: wiring for ceiling rose and two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.
5. Foundry– Preparation of two moulds (exercises): for a single pattern and a double pattern.
6. Welding – Preparation of two welds (exercises): single V butt joint, lap joint, double V butt joint or T fillet joint.

2. Trades for Demonstration:

a. Plumbing
b. Machine Shop
c. Metal Cutting

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.

Reference Books:

1. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
2. Engineering Practices Lab Manual, Jeyapoovan, SaravanaPandian, 4/e Vikas.

3. Dictionary of Mechanical Engineering, GHFNayler, Jaico Publishing House.

Part B – Information Technology (I.T.)Workshop

Objectives:

- To make the students know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system
- To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations

Task 1: Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

Task 2: Assembling a Computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

Task 3: Install Operating system: Student should install Windows on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

Task 4: Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.

Task 5: Spread sheet: Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spread sheet application considered.

Task 6: Presentations: creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colours, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyper linking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

Task 7: Browsing Internet: Students should access the internet browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Face Book, Skype etc.

References:

1. Introduction to Computers, Peter Norton, McGraw Hill
2. MOS study guide for word, Excel, Powerpoint & Outlook Exams", Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Trouble shooting, Maintaining & Repairing PCs", Bigelows, TMH

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14051009	**ED**	**Programming in C Lab**	**0**	**0**	**3**	**50**	**50**	**4**

Objectives:

- To make the student learn C Programming language.
- To make the students solve problems, implement them using C language.

LIST OF EXPERIMENTS:

1. Practice DOS and LINUX commands necessary for design of C programs.
2. Write, edit, debug, compile and execute sample C programs to understand the programming environment.
3. a) Write a C program to find the sum of the individual digits of a given number.
   b) Write a C program to check whether a given number is a palindrome or not.
4. a) Write a C program to generate & print first n terms of the Fibonacci sequence.
   b) Write a C program to find the roots of a quadratic equation.
5. a) Write a C program to compute the factorial of a given number.
   b) Write a C program to generate all the prime numbers within a given range
6. a) Write a C program to generate PASCAL triangle.
   b) Write a C program to find the GCD of two integers.
7. a) Write a C program to evaluate the function Sin(x) as defined by the infinite series expression

   $\text{Sin(x)} = \frac{x}{1!} - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots$.

   b) Write a C program to find the square root of a given number.
8. a) Write a C program to find both smallest and largest number in a list of integers.
   b) Write a C program to perform multiplication of two matrices.
9. Write a C program to read a matrix and perform the following operations.
   i) Print transpose of a matrix.
   ii) Removal of duplicates from an ordered array.
10. a) Write a C program to perform arithmetic operations using functions.

b) Write a C program to find the factorial of a given number using recursive function.

11. a) Write a C program to count the number of vowels, constants, blank spaces, digits and special characters in a given string.
    b) Write a C program to check whether a given string is palindrome or not.
12. Write a C program to read two strings and perform the following operations without using built-in string library functions.
    a. String length determination.
    b. Comparison of two strings.
    c. Concentration of two strings.
    d. String reversing.
13. a) Write a C program to swap the contents of two variables using pointers.
    b) Write a C program to understand the usage of pointer to pointer.
14. Write a C program to define a structure with the following members.
    Roll No., Name, and marks in Sub1, Sub2, and Sub3. Read the n students records and find the total marks of each student and print the result in the following format.

Roll No.	Name	Sub1	Sub2	Sub3	Total Marks	Result
1234	XXX	40	50	90	180	Distinction

15. Write a C program to copy the contents of one file into another file.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14991010	**BS**	**Engineering Sciences Lab**	**0**	**0**	**3**	**50**	**50**	**4**

PART A - Engineering Physics Lab

List of Experiments

1. Determination of radius of curvature of a plano-convex lens by forming newton's rings.
2. Determination of thickness of a thin object using parallel fringes
3. Determination of rigidity modulus of a material in the form of a wire using torsional pendulum.
4. Determination of magnetic field along the axis of a current carrying coil using Stewart-Gee's method
5. Determination fo wavelengths of the prominent lines of mercury by a plane transmission diffraction grating using spectrometer
6. Determination of dispersive power of the material of a prism using spectrometer
7. Determination of energy gap of a material of p-n junction
8. Melde's experiment – transverse and longitudinal modes

PART B - Engineering Chemistry Lab

Objectives

- This course on Chemistry Lab is designed with 12 experiments in an academic year. It is common to all branches of Engineering in B.Tech 1st Year.
- The objective of the course is that the student will have exposure to various experimental skills which is very essential for an Engineering student.
- The experiments are selected from various areas of Chemistry like Conductometry, Polymers, Energy sources and water.
- Also the student is exposed to various tools like Analytical Balance, pH meter, Viscometer, conductometer, Bomb calorimeter, etc.

List of Experiments

I. **Introduction to Lab** – Analytical Balance, Molarity, Normality, Calculations, Glass ware.

II. **Water Analysis**:
   1. Determination of total hardiness of water by EDTA method.
   2. Estimation of Dissolved Oxygen present in given water sample by Winkler's method.
   3. Determination of Acidity of water.
   4. Estimation of chloride ions using Potassium Chromate Indicator.

III. **Conductometry**
   1. Conductometric titrations of strong acid Vs strong base (Neutralization titration)
   2. Conductometric titrations of Barium Chloride Vs Sodium Sulphate (Precipitation titration)

IV. **Physical Properties**
   1. Determination of viscosity of oils by Redwood viscometer I & II.
   2. Determination of calorific value of fuel sample using Bomb Calorimetry

V. **Titrimetry**
   1. Estimation of Iron by Diphenyl amine indicator
   2. Determination of Copper by EDTA method
   3. Determination of Copper by Iodometry

VI. **Preparation of Phenol Formaldehyde resin** (Bakelite)

References

1. Vogel's Text book of Quantitative Chemical Analysis, J. Mendham et.al., Pearson Education, Sixth Edition, 2012.
2. Laboratory manual on Engineering Chemistry, Anupama Rajput, DhanpatRai& Co Publications.
3. Essentials of Experimental Engineering Chemistry, Shashichawla, DhanpatRai& Co Publications.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14241011	**HS**	**English Language & Communication Skills Lab**	**0**	**0**	**3**	**50**	**50**	**4**

1. **Listening skills**

   Low level

   a) Fun in the sun
   b) Home and family
   c) Snake in the house
   d) A horse is a horse of course
   e) The wonder of Wales.

   High level

   a) Winter wonderland
   b) Great trip, Great country
   c) Keeping in shape
   d) Asia tour
   e) I like to use my hands.

2. **Situational dialogues**
   a) Group discussion
   b) Interviewing
   c) Making acquaintances
   d) Sight seeing
   e) Arguing
3. **Phonetics**
   a) Vowel sounds
   b) Consonant sounds
   c) Phonetic Transcription
4. **Text to speech**
5. **Dictionary**
6. **Idioms**
7. **Telephone skills**
8. **Debate**
9. **Describing objects, situations, people**
10. **Information transfer**
11. **Accent, Stress, Intonation**
12. **JUST A MINUTE (JAM)**

Software: GLOBARENA & K-VAN SOLUTIONS.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14212101	**BS**	**Mathematics – III** (Common to EEE & ECE Branches)	**3**	**1**	**0**	**30**	**70**	**3**

UNIT- I

Special Functions: Beta function - Gamma Function - Relation between Beta and Gamma Function and their properties. – Evaluation of improper integrals- Series solutions of Differential Equations – Power series method and Frobenius method.

UNIT- II

Bessel functions – Solution of Bessel equation - Recurrence formulae for $J_n(x)$ - Generating function for $J_n(x)$ - Jacobi series – Orthogonality of Bessel functions - Legendre polynomials – Solution of Legendre's equation – Legendre Polynomials - Rodrigue's formula -Generating function for $P_n(x)$ - Recurrence formulae for $P_n(x)$ - Orthogonality of Legendre polynomials.

UNIT- III

Functions of a complex variable – Limit – Continuity -Differentiability - Analytic function – Properties – Cauchy – Riemann equations in cartesian and polar coordinates - Harmonic and Conjugate harmonic functions. - Construction of analytic function using Milne - Thomson method. Applications to flow problems. Conformal Transformation: Some standard transforms – translation, rotation, magnification, inversion and reflection. Bilinear transformation – invariant points. Special conformal transformations $w = e^z$, z^2, sinz , cosz.

UNIT- IV

Complex integration: Line integral - Evaluation along a path and by indefinite integration - Cauchy's theorem - Cauchy's integral formula - Generalized integral formula. Complex power series - Taylor's series and Laurent series with problems. Singular point – Isolated singular point – Simple pole, Pole of order *m* - Essential singularity.

UNIT- V

Residues: Evaluation of residues by formula. Cauchy's residue theorem - Evaluation of the real definite integrals of the type (i) Integration around the unit circle $\int_0^{2\pi} f(cos\theta, sin\theta)d\theta$ (ii) integration around a small semi circle $\int_{-\infty}^{\infty} f(x)dx$ (iii) Integration around the rectangular contour $\int_{-\infty}^{\infty} e^{imx} f(x)dx$ and (iv) Integration around the indenting contour having the poles on real axis.

Text Books

1. Higher Engineering Mathematics, Dr. B.S Grewal, Khanna Publishers-42 edition.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Willey Publications, 9th edition-2013.

Reference Books

1. Higher Engineering Mathematics, B.VRamana, Mc. Graw Hill Education(India) Private Limited.
2. Advanced Engineering Mathematics by N. Bali, M Goyal, Firewall Media 7th edition.

3. Engineering Mathematics, Volume – III , E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14012102	**HS**	**Environmental Studies**	**4**	**0**	**0**	**30**	**70**	**3**

UNIT- I

Multidisciplinary nature of environmental studies: Definition, scope and importance – Need for public awareness.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems; (a) Forest resources – Use and over-exploitation, deforestation, case studies – Timber extraction, mining, dams and their effects on forest and tribal people; (b) Water resources – Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems; (c) Mineral resources – Use and exploitation, environmental effects of extracting and using mineral resources, case studies; (d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies; (e) Energy resources –Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies; (f) 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.

UNIT- II

Ecosystems: 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 following ecosystems (a) Forest ecosystem, (b) Grassland ecosystem, (c) Desert ecosystem, (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT- III

Biodiversity and its conservation: Introduction – Definition : genetic, species and ecosystem diversity; Bio-geographical 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-sports 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.

UNIT- IV

Environmental Pollution: Definition – Cause, 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; Solid waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of

pollution – Pollution case studies; Disaster management: floods, earthquake, cyclone and landslides.

UNIT- V

Social Issues and the Environment: 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; • 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 Protection Act; Air (Prevention and Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness.

Human Population and the Environment: 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;

Field work: Visit to a local area to document environmental assets river/forest/grassland/hill/mountain-Visit to a local polluted site - Urban/Rural/Industrial/Agricultural; Study of common plants, insects, birds; Study of simple ecosystems-pond, river, hill slopes, etc.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14112103	**PN**	**Fluid Mechanics & Hydraulic Machinery**	**3**	**1**	**0**	**30**	**70**	**3**

UNIT-I

Introduction : Dimensions and units – physical properties of fluids, specific gravity, viscosity, surface and capillarity, vapor pressure and their influence on fluid motion. Newtonian and Non-Newtonian fluids. Fluid Pressure at a Point; Pascal's law, Hydrostatic law, Atmospheric, Absolute and gauge pressure; Hydrostatic paradox, Pressure measurement manometers; Simple, differential and Micro Manometers

Kinematics Of fluid Motion: Methods of describing fluid motion; Classification of flow; Steady, unsteady, uniform and non – uniform flows: Laminar and turbulent flows: Three, two and one dimensional flows; Irrotational and rotational flows; Streamline; Pathline; Streakline; Equation for acceleration; Convective acceleration; Local acceleration; Continuity equation; Velocity potential and stream function; Flownet.

UNIT-II

Dynamics Of Fluid Flow: Forces acting on a Fluid in Motion; Euler's equation of motion; Bernoulli's equation; energy correction factor; Momentum Principle; force exerted on a pipe bend. Discharge through Venturi Meter; Discharge through Orifice Meter; Discharge through flow nozzle; Measurement of velocity by Pitot tube, pitot – static tube.

Closed Conduit Flow: Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent

length; Hydraulic power transmission through a pipe; Siphon; Pipes in series, parallel ?& branched pipes.

UNIT-III

Basics of turbo Machinery: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency – Angular momentum principle, Torque and head transferred in roto dynamic machines.

Hydraulic Turbines – I: Introduction, head and efficiencies of hydraulic turbines, Classification of turbines; pelton wheel: parts, Velocity triangles, work done and efficiency, working proportions, design of pelton wheel. Radial flow reaction turbines: velocity triangles and work done for inward radial flow turbine, degree of reaction, discharge, speed ratio, flow ratio.

UNIT- IV

Hydraulic Turbines –II: Francis turbine: main components and working, work done and efficiencies, design proportions; design of Francis turbine runner. Kaplan turbine: main components and working, working proportions. Draft tube: theory and efficiency; specific speed, unit quantities, characteristic curves of hydraulic turbines. Cavitation: causes, effects.

Centrifugal Pumps: Introduction, component parts and working of a centrifugal pump, work done by the impeller; heads, losses and efficiencies; minimum starting speed; Priming; specific speed; limitation of suction lift, net positive suction head (NPSH); Performance and characteristic curves; Cavitation effects; Multistage centrifugal pumps; troubles and remedies.

UNIT- V

Hydro Electric Power Station: Development of hydro power in Andhra Pradesh and India; Classification of hydel plants – runoff river plants, storage plants and pumped storage plants; low, medium and high head schemes; Investigation and planning; components of hydel schemes – fore bay, intake structure, surge tanks, penstocks, power house, turbines – selection of suitable type of turbine, Scroll casing, draft tube and tail race; assessment of available power; definition of gross head, operating head, effective head;, hydrographs, Flow duration curve; Power; installed capacity, dependable capacity; firm power, secondary power; power factor; load factor, capacity factor, utilization factor and Diversity factor.

Text Books

1. P.N. Modi & S.M. Seth, Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Book House, New Delhi.

2. R. K. Bansal, A Textbook of Fluid Mechanics and Hydraulic Machinery, Laxmi Publications(P) Ltd.

Reference Books:

1 Streeter & Wylie, Fluid Mechanics, McGraw Hills Publications.

2. C.M. White, Fluid Mechanics, McGraw Hills Publications.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14042104	**PJ**	**Electronic Devices & Circuits (Common to EEE & ECE)**	**3**	**1**	**0**	**30**	**70**	**3**

Course Objectives

- To understand electronic devices, including diodes, bipolar junction transistors and FET.
- To understand basic circuits of the electronic devices.

UNIT-I

Semiconductors: Intrinsic and extrinsic semiconductors, mobility and conductivity, Fermi level and carrier concentration of semi conductors, Drift and diffusion currents, continuity equation, Hall Effect.

PN Junction diode: Band structure of PN Junction, Quantitative Theory of PN Diode, Volt –Amp. Characteristics, Temperature Dependence, Transition and Diffusion Capacitance of PN Junction.

UNIT-II

Special Diodes: Zener and Avalanche Breakdowns, Tunnel Diode, LED, Schottky Barrier Diode, Varactor Diode, Photo Diode, SCR.

Rectifiers: Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics.

UNIT-III

Bipolar Junction Transistors: NPN and PNP junction Transistor, Characteristics of Current Flow across the Base Regions, Minority and Majority Carriers CB, CE and CC Configurations and their Input and Output Characteristics. Comparison of CE, CB and CC Configurations. Junction Biasing for Saturation, Cutoff and Active Region, α and β Parameters and the relation between them.

UNIT- IV

JFET: JFET and its characteristics, Pinch off Voltage, Drain Saturation Current, MOSFET – Enhancement and Depletion Modes, Small signal models of FET.

UNIT- V

Transistor Biasing Circuits: Various Biasing Circuits and Stabilization, Thermal Runaway, Thermal Stability, Biasing of FETs. Transistor as an Amplifier, h – parameter model, Analysis of Transistor Amplifier Circuits using h-parameters. CB, CE and CC Amplifier configurations and performance factors.

Text Books

1. Electronic devices and circuits, Jacob Millman and D. Halkias, Mc Graw Hill.
2. Integrated Electronics Analog Digital Circuits, Jacob Millman and D. Halkias, TMH.
3. Electronic Devices and Circuits Theory, Boylsted, Prentice Hall Publications.
4. Electronic devices and circuits by S. Salivahanan.

Subject	Subject	Subject Title	L	T	P	IM	EM	CR

Code	Category							
14022105	PJ	Circuit Theory	3	1	0	30	70	3

Objectives

This course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basis analysis of circuits which includes single phase circuits, magnetic circuits, theorems, transient analysis and network topology.

UNIT – I

Introduction to Electrical Circuits: circuit concepts, classification of network elements, voltage & current sources; independent & dependent sources, source transformation techniques, R-L-C Parameters, Voltage - Current relationship for passive elements. Kirchhoff's laws, network reduction techniques – series, parallel, series parallel, Y/Δ-Transformations, Mesh and Nodal analysis for D.C excitation.

UNIT – II

Single Phase AC Circuits: RMS, Average values, form factor, peak factor for different periodic waveforms, phase, phase difference, phasor notation, J-notation. Concept of Reactance, Impedance, Susceptance, and Admittance, Active & Reactive power, Power factor, power triangle. Response of R, L & C elements for Sinusoidal excitation, steady state analysis of RL, RC and R-L-C (Series, parallel, series parallel) Circuits for sinusoidal excitations, phasor diagram. Steady state analysis of A.C Circuits using mesh and nodal analysis.

UNIT – III

Series and Parallel resonance: Resonant frequency, Half Power frequency, Band width, Q– Factor, Relation between them, problems.

Locus Diagrams: Impedance & admittance locus diagrams of RL & RC Series circuits and two branch parallel circuits.

UNIT – IV

Magnetic Circuits: Concept of self & mutual inductances, Dot Convention, Problems, Coefficient of coupling, Composite Magnetic circuit, analysis of Series and Parallel Magnetic Circuits, Duality and dual Circuits, problems.

Unit – V

Network Topology: Definition – Graph, tree, Co-tree, Incidence Matrix, Tie-Set & Cut – Set Matrices for Planar networks, Formulation of equilibriurn equations based on graph theory, problems.

Text Books

1. Network Analysis – Van Valkenburg - 3rd edition, PHI.
2. Engineering Circuit Analysis – William H. Hayt –Jack E. Kimmerly – TMH
3. Fundamentals of Electric Circuits – Charles's, Alexander & Mathew N.O. Sadiku, TMH 3rd Edition.
4. Electrical Circuits – N. Sreenivasulu – Reem Publications

References

1. Circuits & Networks – A. Sudhakar , Shayammohan.S. Pillai, 4th Edition – TMH.
2. Theory and Problems of Electrical Circuits – Joseph A. Edminister – Schaum Series, 1st Edition – TMH.

3. Network Analysis – N C Jagan & C. Lakshmi Narayana, BSP.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14022106	PJ	Electrical Machines - I	3	1	0	30	70	3

Objective

Electrical machines course is one of the important course of the Electrical discipline. In these course different types of DC generators, motors which are widely used in industries are covered and their performance aspects will be studied.

UNIT – I

DC Generators: Introduction- Construction – Principle of Operation, Armature windings – Lap and Wave windings - Simplex & Multiplex windings – EMF equation – Problems.

Armature Reaction – Cross Magnetizing & demagnetizing AT/Pole – Compensating winding - commutation – reactance voltage – Methods of improving Commutation – Problems.

UNIT – II

Types of DC Generators: Methods of Excitation – Open Circuit Characteristics - build up of EMF- Critical Field Resistance & Critical Speed – Causes for Failure to self excitation & Remedial Measures – Problems.

UNIT - III

Load Characteristics of DC Generators: Load Characteristics of shunt, series & compound generators – parallel operation of DC Generators – use of equalizer bar and cross connection of field windings – load sharing - problems.

UNIT – IV

D.C Motor: DC Motors – Principle of operation – Back EMF – Torque Equation – Characteristics & application of shunt, Series & Compound Motors – Armature reaction & Commutation.

Speed Control of D.C Motors: Speed control of DC Motor – Armature, Flux and Voltage control methods – Ward Leonard system. Starters – problems.

Unit – V

Testing of D.C Machines: Losses and Efficiency, Condition for maximum efficiency. Methods of Testing – Direct, Indirect & Regenerative testing - Brake test – Swinburne's test – Hopkinson's test – Field's test – Retardation test – Separation of stray losses in a DC Motor.

Text Books

1. Electrical Machines P.S. Bimbra, Khanna Publishers
2. Electrical Machinery – A. E. Fitzgerald, C. Kingsley and S. Umlauts, Mc Graw – Hill Companies, 5th Edition
3. Electrical machines-1: DC machines- by J. B. Gupta, Kataria publications

Reference Books:

1. Electric Machines – by I.J Nagrath & D.P. Kothari , Tata Mc Graw – Hiss Companies Publishers 3rd & 7th Editions.
2. Performance and design of DC machines – by Clayton and Hancock-BPB Publishers-2004.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14112107	PN	Fluid Mechanics & Hydraulic Machinery Lab	0	0	3	50	50	2

Course Objective: The object of the course to make the students understand the fluid flow concepts and get familiarity with flow measuring devices.

LIST OF EXPERIMENTS:

1. Calibration of Venturimeter
2. Calibration of Orifice meter
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Calibration of contracted Rectangular Notch and / or Triangular Notch.
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Verification of Bernoulli's equation.
8. Impact of jet on vanes.
9. Study of Hydraulic jump.
10. Performance test on Pelton wheel turbine.
11. Performance test on Francis turbine.
12. Efficiency test on centrifugal pump.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14042108	PJ	Electronic Devices & Circuits Lab(Common to EEE & ECE)	0	0	3	50	50	2

Course Objectives:

- To know the different devices- their characteristics and applications
- To study the design and analysis of amplifier circuits

ELECTRONIC WORKSHOP PRACTICE (in 3 lab sessions)

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB s
2. Identification, Specifications and Testing of Active Devices, Diodes, BJTs, Lowpower JFETs, MOSFETs, Power Transistors, LEDs, LCDs, SCR, UJT.
3. Study and operation of Multimeters (Analog and Digital), Function Generator, Regulated Power Supplies, Study and Operation of CRO.

List of Experiments

1. Forward and Reverse bias characteristics of PN Junction diode
2. Zener diode characteristics and Zener diode as Voltage Regulator.
3. Input and Output characteristics of Transistor in CB Configuration.
4. Input and Output characteristics of Transistor in CE Configuration.

5. Half Wave Rectifier with and without filter.
6. Full wave Rectifier with and without filter.
7. Bridge rectifier with and without filter.
8. FET characteristics
9. VI characteristics of LED
10. Characteristics of Photo transistor
11. Characteristics of Photo diode
12. SCR Characteristics.
13. UJT Characteristics.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14042201	**PJ**	**Switching Theory & Logic Design (Common to EEE & ECE Branches)**	**3**	**1**	**0**	**30**	**70**	**3**

Course Objectives

- To provide the students with an introduction to the fundamentals of Number systems, logic gates, Combinational and sequential circuits.

UNIT- I

Number Systems & Codes: Philosophy of number systems –complement representation of negative numbers-binary arithmetic, binary codes-error detecting & error correcting codes –hamming codes.

UNIT- II

Boolean Algebra and Minimization of Switching Functions: Fundamental postulates of Boolean Algebra - Basic theorems and properties –Canonical and Standard forms-Minimal SOP and POS forms, Algebraic simplification digital logic gates –universal gates-Multilevel NAND/NOR realizations. The map method, tabulation method

UNIT- III

Combinational Logic Design: Design using conventional logic gates, Encoder, Decoder, Multiplexer, De-Multiplexer, MUX Realization of switching functions, Parity bit generator, Code-converters, Hazards and hazard free realizations.

UNIT- IV

Programmable Logic Devices: Basic PLD's-ROM, PROM, PLA, and PLD, Realization of Switching functions using PLD's. .

UNIT- V

Sequential Circuits: Classification of sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples) Basic flip-flops-Triggering and excitation tables. Steps in synchronous sequential circuit design. Design of modulo-N Ring & Shift counters, Serial binary adder, sequence detector.

Text Books

1. Switching & Finite Automata theory – Zvi Kohavi, TMH, 2nd Edition.
2. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.
3. Switching Theory & Logic Design – A.Anand Kumar, 2008, PHI.

Reference Books

1. An Engineering Approach To Digital Design – Fletcher, PHI. Digital Logic – Application and Design – John M. Yarbrough, Thomson.
2. Fundamentals of Logic Design – Charles H. Roth, Thomson Publications, 5th Edition, 2004.
3. Digital Logic Applications and Design – John M. Yarbrough, Thomson Publications, 2006.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14042202	PJ	Analog Electronic Circuits	3	1	0	30	70	3

UNIT- I

SMALL SIGNAL ANALYSIS OF AMPLIFIERS (BJT & FET): BJT Modeling using h-parameters, Determination of h-Parameters from Transistor Characteristics, Measurement of h-Parameters, Analysis of CE, CB and CC configurations using h-Parameters, Comparison of CB, CE and CC configurations, Simplified Hybrid Model, Millers Theorem, Dual of Millers Theorem. Small Signal Model of JFET & MOSFET , Small signal analysis of Common Source, and Common Drain Amplifiers using FET, Illustrative problems.

UNIT- II

MULTISTAGE AMPLIFIERS: BJT and FET RC Coupled Amplifiers – Frequency Response. Cascaded Amplifiers. Calculation of Band Width of Single and Multistage Amplifiers. Concept of Gain Bandwidth Product.

UNIT- III

FEEDBACK AMPLIFIERS: Concept of Feedback Amplifiers – Effect of Negative feedback on the amplifier Characteristics. Four Feedback Amplifier Topologies.

SINUSOIDAL OSCILLATORS: Condition for oscillations –LC Oscillators – Hartley, Colpitts, – Frequency and amplitude Stability of Oscillators – Crystal Oscillators – RC Oscillators -- RC Phase Shift and Weinbridge Oscillators.

UNIT- IV

LARGE SIGNAL AMPLIFIERS: Class A power Amplifier, Maximum Value of Efficiency of Class A Amplifier, Transformer coupled amplifier – Push-Pull Amplifier – Complimentary Symmetry Circuits (Transformer Less Class B Power Amplifier) – Phase Inverters, Transistor Power Dissipation, Thermal Runaway, Heat Sinks.

UNIT- V

LINEAR WAVE SHAPING: High pass, Low pass RC circuits-response for sinusoidal, Step, Pulse, Square and Ramp inputs, Clippers and Clampers.

MULTI-VIBRATORS: Analysis of Diode and transistor switching times, Analysis and Design of Bistable, Monosatable and Astable Multi-vibrators, Schmitt trigger Using Transistors.

Text Books

1. Integrated Electronics – Millman and Halkias.

2. Pulse, Digital & Switching Waveforms by Jacob Milliman, Harbert Taub and Mothiki S Prakash Rao, 2nd edition 2008, TMH.

Reference Books

1. K. Lal Kishore, "Electronic Circuit Analysis", Second Edition, BSP
2. Electronic Devices and Circuits, G.S.N. Raju, IK International Publications, New Delhi, 2006
3. Electronic Devices and Circuits – Mottershead
4. A. Anand Kumar, "Pulse and Digital Circuits", PHI, 2005.
5. David A. Bell, "Solid State Pulse Circuits", 4th edition, 2002 PHI.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14022203	PJ	Generation of Electrical Power	3	1	0	30	70	3

The objective of this course is to learn various power plants in brief such as Thermal, Hydro and Nuclear Power Plants. With respect to the environmental aspects the Distributed Generations such as Solar, Wind, Bio-Gas, Geo- Thermal and Ocean Energy are also discussed in this subject.

UNIT – 1

Thermal Power Station:

Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash, and flue gases – brief description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney, and cooling towers.

UNIT – II

Hydro and Nuclear Power Stations

Hydro Power Stations (HPS): Selection of site, Classification, Layout, Description of main components.

Nuclear Power Stations (NPS): Nuclear fission and chain reaction – Nuclear fuels, Principle of operation of Nuclear reactor, Reactor components: Moderators, Control rods, reflectors and Coolants. Radiation hazards: Shielding and safety precautions. Types of Nuclear Reactors and brief description of PWR, BWR and FBR.

UNIT – III

Basics of Solar Energy & Geo-Thermal Energy Generation:

Role and Potential of solar energy options, Principles of Solar radiation, Flat plate and concentrating solar energy collectors, different methods of solar energy storage – Solar applications: heating energy, cooling, distillation and drying - Principles of Geo thermal energy – Methods of Harnessing.

UNIT – IV

Basics of Wind energy Generation

Role and potential of wind energy option, horizontal and vertical axis wind mills, performance characteristics – Betz criterion – application – Economic aspects.

UNIT – V

Basics of Bio gas Energy Generation & Basics of Ocean Energy Generation

Principles of Bioconversion, types of Biogas digesters – Characteristics of Bio-gas, Utilization – Economic and environmental aspects.

Principle of Ocean Energy – Tidal and Wave energy – Economic aspects.

Text Books:

1. A Text Book of Power Plant Engineering by R. K. Rajput, 4th edition, Laxmi Publications, 2007.
2. Power Plant Engineering by P. C. Sharma, S. K. Kataria Publications
3. Non-conventional energy sources by G. D. Rai, Khanna Publishers.

Reference Books:

1. Power Plant Engineering by P. K. Nag, 2th edition, TMH.
2. Power Plant Engineering by Ramalingam, Scitech Publications.
3. A Course in Power Plant Engineering by Arora and S. Domkundwar.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14022204	**PJ**	**Electromagnetic Fields**	**3**	**1**	**0**	**30**	**70**	**3**

Objective:

The objective of this course is to introduce the concepts of electric fields and magnetic fields and their applications which will be utilized in the development of the theory of power transmission lines and electrical machines.

UNIT - I

Electrostatic Fields: Coulomb's law, Electric Field Intensity (EFI), EFI due to a line charge, surface charge and volume charge. Work done in moving a point charge in an electric field. Gauss's Law, Gauss law using Infinite line charge and co-axial cable, Gauss Law in point form (Maxwell First Law, div(D) = ρ_v), Electric potential, potential gradient Electric Dipole, Dipole Moment – Potential & EFI due to an electric dipole.

UNIT- II

Conductors & Dielectrics: Current and current density, Conduction and Convection Current Densities, Continuity Equation, Behavior of conductors in electric fields, Ohm's Law in point form, Dielectric, Polarization, Boundary Conditions – Dielectric -conductor, Dielectric - Dielectric. Capacitance – Capacitance of parallel plate, Spherical and Co-axial Capacitors.

UNIT - III

Magneto static Fields: Biot-Savarat's law, MFI due to a straight current carrying filament, circular, square and solenoid current carrying wire. Maxwell's second equation ($\nabla.B=0$), Ampere's circuital law and its applications, Ampere's circuital law in point form, Maxwell third equation $\nabla x H=J$, Scalar and Vector magnetic potential.

UNIT - IV

Magnetic Field in Materials: Lorentz force equation, Force on a current element in a magnetic field, Force on a straight and long current carrying conductor in magnetic fields, Force between two straight parallel current carrying conductors, Torque on a current loop placed in a magnetic dipole. Concept of Self inductance – Determination of self inductance of Solenoid and Toroid.

UNIT - V

Time varying Fields: Faraday's laws of Electromagnetic Induction, its integral and point forms, Maxwell's fourth equation ($\text{Curl}\ (E)=\frac{\partial B}{\partial t}$). Statically and dynamically induced EMFs, Modification of Maxwell's equation for time varying fields, displacement current, and Maxwell's equation in differential and integral form.

Text Books

1. "Engineering Electromagnetics" by William H. Hayt and John A. Buck, TMH, 7th edition 2006.
2. "Principles of Electromagnetics" by Mathew N. O. Sadiku, Oxford International student edition (4th)
3. "Electromagnetic Fields" by Dr. S. Kamakshaiah, Right Publishers, 2007.

References

1. "Electromagnetics" by J. D. Kraus, TMH, 4th edition 1992.
2. "Electromagnetic Fields" by TVS Arun Murthy, S. Chand & Company Ltd., 1st edition 2008.
3. "Field Theory" by K. A. Gangadhar, P. M. Ramanathan, Khanna Publishers, 15th edition, 2003.
4. "Electromagnetics" by J. P. Tewari, Khanna Publishers.
5. "Electromagnetic Waves & Radiating Systems" by Edward C. Jordan and Keith G. Balmain, Prentice Hall of India Pvt. Ltd.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14022205	**PJ**	**Network Theory**	**3**	**1**	**0**	**30**	**70**	**3**

Objective:

This course introduces the concepts of circuit analysis which includes three phase circuits, transient analysis of D.C. and A.C excitations, various Network functions and synthesis.

UNIT – I

Network Theorems: Superposition Theorem, Thevinin's Theorem, Norton's Theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millmen's theorem, Tellegen's theorems for D.C and Sinusoidal Excitations.

UNIT – II

Three Phase Circuits: Advantages of Three phase system, Phase sequence, balanced and unbalanced systems – magnitude & phasor relationship between line and phase voltages and currents in balanced Y and Δ circuits. Analysis of balanced three phase circuits with Y and Δ connected loads –Analysis of unbalanced loads- Neutral displacement method, Y-Δ conversion and loop current method.

Measurement of Three phase power by two wattmeter method, Measurement of Three phase reactive power by single wattmeter method.

UNIT – III

DC Transient Analysis: Transient response of R-L, R-C and R-L-C circuits for DC– Determination of Initial Conditions – Solution method using differential equation and Laplace transforms. Response of R – L and R – C Networks to Pulse Excitation.

UNIT – IV

AC Transient Analysis: Transient response of R-L, R-C and R-L-C series circuits for sinusoidal excitations – Determination of Initial Conditions – Solution method using differential equation and Laplace transforms. Analysis of Electrical Circuits with non-sinusoidal periodic waveforms using Fourier series.

Unit – V

Two Port Parameters: One port and two port networks, driving point and transfer functions of Networks. Open circuit impedance & short circuit admittance parameters, hybrid & inverse hybrid parameters, transmission & inverse transmission parameters, Inter-relationships between parameter sets – Series, parallel & cascade connection of two ports – condition for symmetry & reciprocity of two port Networks in terms of different parameters – Terminated two port Networks , Image parameters.

Text Books

1. Theory and Problems of Electrical Circuits – Joseph A. Edminister – Schaum Series, 1st Edition – TMH.
2. Network Analysis & Synthesis - C.L Wadhwa, New age International Pvt Ltd, 4th e/d.
3. Network Analysis with applications – Stanely - Pearson education 4th edition.

References

1. Circuits & Networks – A. Sudhakar, Shayammohan. S. Pillai, 4th Edition – TMH.
2. Network Analysis – Van Valkenburg - 3rd edition, PHI.
3. Networks and Systems – D. Roy Chowdari – New Age International

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14022206	**PJ**	**Electrical Machines - II**	**3**	**1**	**0**	**30**	**70**	**3**

Objective:

This subject facilitates to study the performance of Transformers which play a major role in transmission and distribution of electrical power and induction motors which are the major part of industrial drives and agricultural pump sets.

UNIT – I

Single phase transformer: Construction & principle of operation– types– EMF equation –operation on no-load & on-load– Phasor diagrams. Equivalent Circuit – losses, efficiency and regulation. All - day efficiency – effect of variations of frequency & supply voltage on iron losses.

UNIT – II

Testing of Transformers: O.C and S.C Tests, Sumpner's test – pre-determination of efficiency & regulation, Separation of Losses Test.

Parallel Operation with Equal & Unequal voltage ratio's, Auto-transformers- Equivalent circuit - comparison with two winding transformers.

UNIT-III

Poly phase Transformers: Types of connections – Y-Y, Y-Δ, Δ-Y, Δ-Δ, Open Delta, Scott connection, 3-winding transformers, tertiary windings, operation of three phase transformer on unbalanced input supply.

3-ø Induction Motors: Constructional Details – types- production of Rotating Magnetic Field – Principle of operation – slip, rotor parameters at standstill and running condition, Phasor Diagram – Equivalent Circuit.

UNIT IV

Characteristics of Induction Motor – Rotor Power input, Rotor copper loss and mechanical power developed and their internal relations**.** Torque Equation – Maximum Torque and Starting Torque – Maximum Output – Slip for Maximum Output – Torque-Slip/speed characteristics and efficiency.

Testing of 3-ø Induction Motors: Brake Test – Predetermination of performance from no-load and blocked rotor tests, Determination of Equivalent Circuit Parameter, Circle Diagram.

UNIT- V

Methods of Starting – DOL starter, Auto Transformer starter, Y/Δ starter and Rotor Resistance method.

Speed control of 3-ø Induction Motor: Stator side control: Pole changing – voltage control, frequency control of 3-ø Induction Motor. Rotor side control: cascade connection, injection of emf into rotor circuit –Double cage Induction Motor, Induction generator & applications, crawling & cogging.

Text Books:

1. Electrical Machines – I. J. Nagrath, D. P. Kothari, TMH, 7th Edition 2005.
2. Electric Machines – P. S. Bimbra, Khanna Publications.
3. The performance and design of AC machines – by MG Say, ELBS and Pitman and Sons
4. Electric machinery – A.E. Fitzgerald, C. Kingsley and S. Umans, McGraw Hill company 5th Edition.

Reference books:

1. Electrical machines –II (AC machines) J. B. Gupta.
2. Theory of alternating machinery by Langsdorf, TMH 2nd Edition.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14022207	**PJ**	**Electrical Circuits and Simulation Lab**	**0**	**0**	**3**	**50**	**50**	**2**

PART-A: ELECTRICAL CIRCUITS

1. Verification of Thevenin's and Norton's Theorem
2. Verification of Superposition theorem an Maximum power Transfer theorem
3. Verification of Compensation Theorem
4. Verification of Reciprocity, Milliman's Theorems
5. Locus Diagrams of RL RC series circuits
6. Series and Parallel Resonance
7. Determination of Self, Mutual Inductances and Coefficient of coupling
8. Z and Y parameters
9. Transmission and hybrid parameters
10. Measurement of Active Power for Star and Delta connected balanced loads
11. Measurement of Reactive Power for Star and Delta connected balanced loads
12. Measurement of 3-Phase Power by two Wattmeter Method for Unbalanced loads

PART-B: P SPICE SIMULATION

1. Simulation of DC circuits
2. DC transient response

3. Mesh Analysis
4. Nodal Analysis

Note: PSPICE software package is necessary, Eight Experiments are to be conducted from Part –A and any two from Part –B.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14022208	**PJ**	**Electrical Machines - I Lab**	**0**	**0**	**3**	**50**	**50**	**2**

The following experiments are required to be conducted as compulsory experiments.

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics
3. Brake test on DC shunt motor. Determination of performance curves.
4. Load test on DC compound generator. Determination of characteristics
5. Hopkinson's test on DC shunt machines. Predetermination of efficiency.
6. Fields test on DC series machines. Determination of efficiency.
7. Swinburne's test and speed control of DC shunt motor. Predetermination of efficiencies.
8. Brake test on DC compound motor. Determination of performance curves

In addition to the above eight experiments, at least any tow of the experiments from the following list are required to be conducted.

9. Load test on DC series generator. Determination of characteristics.
10. Retardation test on DC shunt motor. Determination of losses at rated speed.
11. Separation of losses in DC shunt motor.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14253101	**HS**	**Managerial Economics & Financial Analysis**	**3**	**1**	**0**	**30**	**70**	**3**

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Objectives

- To equip the budding engineering student with an understanding of concepts and tools of economic analysis.
- Provide knowledge of managerial economics through differential economics concepts, accounting concepts are necessary to analyze and solve complex problems relating financial related matters in big industries.
- An understanding of professional and ethical responsibility and ability to communicate effectively.
- The broad education necessary to understand the impact of engineering solutions in a global and societal context.
- Recognition of the need for, and an ability to engage in life-long learning and to meet contemporary issues.

UNIT – I

Managerial Economics & Demand Analysis: Definition, Nature and Scope of Managerial Economics- relation with other disciplines. Demand analysis – Determinants, Law of Demand and its exceptions – Elasticity of Demand – Types and Measurement of Elasticity of Demand – Methods of Demand Forecasting.

UNIT – II

Theory of Production & Cost Analysis: Production Function – Isoquants and Isocost, MRTS, least cost combination of inputs, Cobb- Douglas production function, laws of returns, internal and external economies of scale.

Cost Analysis: Cost concepts and classification. Break-Even Analysis (BEA), determination of Break Even Point – Managerial significance and limitation of BEA.

UNIT – III

Introduction to Market & Pricing Policies: Markets Structures: Types of competition, features of perfect competition, Monopoly, Monopolistic competition. Price- Output determination under perfect competition and monopoly – Methods of pricing – cost plus pricing, marginal cost, limit pricing, skimming pricing, bundling pricing, sealed bid pricing and peak load pricing.

UNIT – IV

Business Organizations & Capital Budgeting: Characteristic features of business, features of Sole Proprietorship, Partnership, Joint Stock Company and Public Enterprises. Changing business environment in post- liberalization scenario.

Capital: Significance, Types, Method and Sources and raising finance – Capital Budgeting Methods – Pay back Method, Accounting Rate of return (ARR) and Net Present Value Method (simple problems).

UNIT – V

Financial Accounting & Analysis: Double Entry Book keeping, Journal, Ledger, Trail Balance – Final Accounts (Trading, Profit and loss Account and Balance sheet with simple adjustments) – Analysis and interpretation of financial statements through Liquidity, Profitability and Capital structure Ratios.

Text Books

1. Aryasri: Managerial Economics and Financial Analysis, 4/e, TMH, 2009.
2. Varshney & Maheswari: Managerial Economics, sultan chand, 2009.

References

1. Premchand babu, Madan Mohan : Financial Accounting and Analysis, Himalaya,2009
2. Joseph G. Nellis and David parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
3. M.Sugunatha Reddy: Managerial Economics and Financial Analysis, Research India Publication, New Delhi, 2013.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14143102	PJ	Linear and Digital IC Applications	3	1	0	30	70	3

UNIT-I

Differential Amplifier & Op-Amp Applications: Differential amplifier – Characteristics of OP-Amps, integrated circuits -types, classification, package types and temperature ranges, power supplies, OP-Amp Block diagram, ideal and practical OP-Amp specifications, DC and AC characteristics, 741 OP-Amp and its features, Inverting and non-inverting amplifier, integrator and differentiator, difference amplifier, instrumentation amplifier, AC amplifier, V-I, I-V converters. comparators, Multivibrators, Triangular and square wave generators, Log and antilog amplifiers, precision rectifiers.

UNIT-II

Timers & Phase Locked Loops: Introduction to 555 Timer, functional diagram, Monostable and Astable operations , Schmitt Trigger, PLL-Introduction, Block schematic, principles and description of individual blocks,565 PLL, applications.

UNIT–III

Unipolar & Bipolar Logic Families: Introduction to logic families, CMOS logic, CMOS steady state electrical behavior, CMOS dynamic state electrical behavior, CMOS logic families,Bipolar logic, transistor logic, TTL families, CMOS/TTL interfacing, ECL, Comparison of logic families.

UNIT–IV

VHDL: Design flow.program structure.data types and constants,functios andprocedures, libraries and packages.Structural design elements ,data design elements,behavioral design elements.

UNIT–V

Combinational & Sequential Logic: Decoders, encoders, multiplexers and demultiplexers code converters, comparators adders & subtractors, Latches and flip-flops, shift registers, counters .VHDL modes for the above ICs.

Text Books

1. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, 4th edition, PHI, 1987.
2. Digital Design Principles&Practices-john F.Wakerly,PHI/Pearson Education 3rd,2005
3. Digital System Design using VHDL-Charles H.Roth jr Cengage Publications,1st edition

References

1. Operational Amplifiers & Linear integrated circuits & applications,James M.Fiore Cengage 2009.
2. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition, 2003.
3. VHDL primer- J. Bhaskar, pearson Education/PHI, 3rd Edition.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14023103	PJ	Control Systems	3	1	0	30	70	3

Objective:

In this course it is aimed to introduce to the students the principles and applications of control systems in everyday life. The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.

UNIT – I

Control System Concepts: Classification, Historical development. Transfer function, Effect of feedback, mathematical modeling of Physical Systems, block diagram, reduction techniques – signal flow graphs and mason's gain formula. Transfer function of DC servo motor - AC servo motor – Synchro transmitter and receiver.

UNIT – II

Time Domain Analysis: Standard test signals, Time response of first and second order systems- Time response specifications – Steady state error and error Constants – Effects of proportional, derivative and integral control.

UNIT – III

Concept of Stability and Root Locus: The Concept of Stability, necessary Conditions for stability – Routh Hurwitz's Criterion – Limitations of Routh's stability, Relative stability analysis – Root Locus Concept – Construction of Root Loci.

UNIT – IV

Frequency Domain Analysis: Correlation between time and frequency response, Frequency domain Specifications. Bode Plots, Polar plots, Nyquist stability Criterion - Gain and Phase margin.

UNIT – V

Compensation Techniques for Linear Control Systems: System Design and Compensation – Realization of basic lead, lag and lead – lag cascade Compensations in frequency domain.

Text Books:

1. "Control Systems Engineering" by I. J. Nagrath and M. Gopal, New age International (P) Limited, Publishers, 5th edition, 2007.
2. "Automatic Control Systems" by B. C. Kuo and Farid Goinaraghi – John Wiley and Son's, 8th edition, 2003.
3. "Control Systems" by A. Anand Kumar, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. "Modern Control Engineering" by Katsuhiko Ogata,Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. "Control Systems Engineering" by NISE, 5th edition, John Wiley.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14023104	PJ	Power Electronics	3	1	0	30	70	3

Objective:

With the advent of semiconductor devices, revolution is taking place in the power transmission distribution and utilization. This course introduces the basic concepts of power semiconductor devices, converters and choppers and their analysis.

UNIT – I

SCR – Static Characteristics – Turn ON Methods-Turn ON and OFF mechanism – Gate Characteristics – Dynamic Characteristics – series and parallel operation of SCR's – Static and dynamic equalization circuits – Design of snubber circuit – ratings – Line Commutation and Forced Commutation circuits.

UNIT – II

Phase controlled Rectifiers – Single Phase half and fully Controlled converters – Midpoint and Bridge Connections with R and RL Loads – Effect of Source Inductance- Single phase and three phase dual Converters with R and RL loads- Numerical Problems.

UNIT – III

AC Voltage Controllers- Single Phase AC voltage controllers with SCR and TRIAC for R and RL Load – Cyclo Converters – Single Phase Cyclo Converters (mid-point and bridge configuration) with R and RL Loads.

UNIT – IV

Choppers – Principle of Operation – Control Strategies- Types of chopper Circuits – Type A, Type B, Type C, Type D and Type E Chopper Circuits - Morgan Chopper – Jones Chopper – Multiphase Chopper Circuits – Problems.

UNIT – V

Inverters – Single Phase Inverter – Basic Series Inverter – Basic Parallel Capacitor Inverter – Bridge Inverter – Current Source Inverter - Forced commutation Circuits for Bridge inverters – Mc. Murray inverters – Output Voltage control Techniques - Harmonic reduction techniques.

Text Books:

1. Power Electronics – By M.D Singh & K.B. Kanchandhani, Tata McGrawHill Publishing Company, 1998.
2. Power Electronics - Circuits, Devices and Applications – by M.H. Rashid, Prentice Hall of India, 2nd Edition 1998.
3. Power Electronics – By V.R. Murthy, Oxford University Press, 1st Edition – 2005
4. Power Electronics – By P.C Sen, Tata Mc Graw Hill Publishing.
5. Power Electronics- by PS Bimbhra, Khanna Publications.

Reference Books:

1. Power Electronics – By Vedam Subramanyam, New Age Information Limited, 3rd Edition.
2. Thyristorised Power Controllers – By G.K. Dubey, S. R. Doradla, A. Joshi and R. M. K. Sinha, New Age Informational(p) Limited Publishing 1996.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14023105	PJ	Power Systems - I	3	1	0	30	70	3

Objective:

This course is an extension of Generation of Electric Power course. It deals with economic aspects of generation, mechanical design of transmission lines, cables and insulators, electrical design of transmission lines and distribution system.

UNIT – I

Economic Aspects of Power Generation: Load Curve, Load Duration Curve, Integral Load Duration Curves, Load Factor, Demand Factor, Diversity Factor, Capacity Factor, Utilization Factor and Plant Use Factors-Numerical Problems.

Choice of Size and Number of Generating Units, Cost of Electrical Energy, Problems, Types of Tariff Charges on Consumers – Numerical Problems.

UNIT – II

Mechanical Design of Transmission Lines: Line Supports, Sag and Tension Calculations for Equal and Unequal Heights of Towers, Effect of Wind and Ice on Weight of Conductors – Numerical Problems, Stringing Chart and Sag Template.

Insulators, Types of Insulators, String Efficiency, Methods of Improving String Efficiency.

UNIT – III

Transmission Line Parameters: Types of Conductors, Calculation of resistance for solid conductor, concept of GMR and GMD, Calculation of inductance and Capacitance for 1-Ø and 3-Ø single and double circuit lines, symmetrical and asymmetrical conductor configuration with and without transportation –Effect of Earth on Capacitance - Numerical Problems.

UNIT – IV

AC Distribution: Comparison of AC single phase, Three Phase, Three wire and Three Phase Four wire systems, types of primary distribution systems, types of secondary distribution systems, AC distribution fed at one end and at both ends. Kelvin's law, limitation of Kelvin's law, selection of voltage of primary distribution, choice of scheme and size of feeders.

UNIT – V

Underground Cables: Construction, Types of Cables, Insulation in Cables, Calculation of Insulation Resistance and Stress in Insulation, Problems. Capacitance of Single and 3 Core Belted Cables, Numerical Problems. Grading of Cables, Capacitance Grading, Problems, Description of Intersheath Grading.

Corona: Description of Corona Phenomenon, Factors Affecting Corona, Critical Disruptive Voltage, Visual Disruptive Voltage and Power Loss, Radio Interference.

Text Books

1. Electrical power systems - by C. L. Wadhwa, New Age International (P) Limited, Publishers, 4th Edition, 2005.
2. Power system Analysis-by John J Grainger, William D Stevenson, TMC Companies, 4th edition, 1994.

Reference Books

1. Power System Analysis and Design by B. R. Gupta, S. Chand & Co, 6th Revised Edition, 2010.
2. Modern Power System Analysis by I. J. Nagrath and D. P. Kothari, Tata McGraw Hill, 3rd Edition, 2008.
3. Electric Power Transmission System Engineering: Analysis and Design, by Turan Gonen, 2nd Edition, CRC Press, 2009.

4. Electric Power Systems by S. A. Nasar, Schaum Outline Series, TMH, 3rd Edition, 2008.
5. A Text Book on Power System Engineering by M. L. Soni, P. V. Gupta, U. S. Bhatnagar, A. Chakrabarti, Dhanpat Rai & Co Pvt. Ltd., 2003.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14023106	PJ	Electrical Machines - III	3	1	0	30	70	3

Objective:

This subject is an extension of previous machines courses. It deals with the detailed analysis of Synchronous generators and motors which are the prime source of electrical power generation and its utilities. Also concerns about the different types of single phase motors which are having significant applications in house hold appliances and control systems.

UNIT-I

Synchronous Generators: Constructional details of synchronous machines, armature windings, distribution, pitch and winding factors - EMF equation, effect of harmonics-suppression of harmonics; armature reaction, concept of leakage flux, synchronous reactance, equivalent circuit, phasor diagram, voltage regulation, determination of regulation by synchronous impedance method, MMF method, ZPF method.

UNIT-II

Theory of salient pole machines, phasor diagrams, and determination of X_d and X_q from slip test, expression for power output of salient pole and cylindrical pole synchronous generators, power angle characteristics, Synchronizing power and torque.

UNIT-III

Parallel Operation of Synchronous Generators: conditions for parallel operations, synchronizing, load sharing, operation of alternator with infinite bus bars- effect of change of mechanical input, effect of change of excitation. Analysis of short circuit current waveform- determination of transient and sub-transient reactances.

UNIT-IV

Synchronous Motors: Principle of operation, methods of starting, Phasor diagram of synchronous motor, variation of current and power factor with excitation, Hunting and use of damper bars. Synchronous condenser and power factor correction. Excitation and power circles. Predetermination of V and inverted V curves.

UNIT-V

1-ø Induction Motor: Principle of operation – double field revolving theory – cross field theory – equivalent circuit – determination of equivalent parameters. Starting Methods – Split phase and shaded Pole

Principle and operation of A.C. Series Motor, Universal Motor, Reluctance Motor, Hysteresis Motor and Stepper Motor.

Text books:

1. Electric Machines by I. J. Nagrath and D. P. Kothari, TMH Publishers, 4th Edition 2010.
2. Electrical Machines by P. S. Bimbhra, Khanna Publishers.
3. The Performance and Design of AC Machines, M. G. Say, ELBS and Pitman & Sons.

Reference Books:

1. Theory of Alternating Current Machinery by Langsdorf, TMH Publishers, 2nd Edition
2. Electromechanics – III (Synchronous and Single Phase Machines) by S. Kamakashiah, Overseas Publishers Private Ltd.
3. Electrical Machines by M. S. Sarma and M. K. Pathak, CENGAGE Learning.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14023107	**PJ**	**Power Electronics Lab**	**0**	**0**	**3**	**50**	**50**	**2**

Any eight of the experiments in Power Electronics Lab

1. Study of characteristics of SCR, MOSFET & IGBT
2. Gate firing circuits for SCR's
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase fully controlled bridge converter with R and RL loads
5. Forced Commutation circuits (Class A, Class B, Class C, and Class D & Class E)
6. DC Jones chopper with R and RL Loads
7. Single Phase Parallel, inverter with R and RL loads
8. Single Phase Cyclo converter with R and RL loads
9. Single Phase Half controlled converter with R load
10. Three Phase Half controlled bridge converter with R-load
11. Single Phase series inverter with R and RL loads
12. Single Phase Bridge converter with R and RL loads
13. Single Phase Dual converter with RL loads

Any two simulation experiments with PSPICE/PSIM

1. PSPICE simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE Loads
2. PSPICE simulation of resonant pulse commutation circuit and BUCK chopper
3. PSPICE simulation of single phase inverter with PWM control

REFERENCE BOOKS:

1. Simulation of Electric and Electronic Circuits using PSPICE – by M. H. Rashid, PHI.
2. PSPICE A/D user's manual – Microsim, USA
3. PSPICE reference guide – Microsim, USA.
4. MATLAB and its Tool Book's user's manual and –Mathworks, USA.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14023108	**PJ**	**Electrical Machines – II Lab**	**0**	**0**	**3**	**50**	**50**	**2**

The following experiments are required to be conducted as compulsory experiments:

1. O.C. & S.C. Tests on Single phase Transformer
2. Sumpner's test on a pair of single phase transformers
3. Scott connection of transformers
4. No-load & Blocked rotor tests on three phase Induction motor
5. Regulation of a three –phase alternator by synchronous impedance & m.m.f. methods
6. V and Inverted V curves of a 3 phase synchronous motor.

7. Equivalent Circuit of a single phase induction motor
8. Determination of X_d and X_q of a salient pole synchronous machine

In addition to the above eight experiments, atleast any two of the following experiments are required to be conducted from the following list:

1. Parallel operation of Single phase Transformers
2. Separation of core losses of a single phase transformer
3. Brake test on three phase Induction Motor
4. Regulation of three-phase alternator by Z.P.F. and A.S.A methods

TEXT BOOKS:

1. Electrical Machines Lab manual with MATLAB Programs by Dr. D. K. Chaturvedi, Univ. Science Press.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14143201	PJ	Microprocessor & Microcontrollers	3	1	0	30	70	3

Course Objectives

- To become familiar with 8085 & 8086 Microprocessor Architecture, Instructions, Operating Modes, Programming.
- To use 8086 microprocessor for various applications.
- To study various peripherals for microprocessor based systems.

UNIT I

INTRODUCTION: Development of microprocessors, Brief introduction to 8085,8086 microprocessor - Architecture, Instruction set, Addressing modes, Interrupt system. Minimum mode 8086 system and timings, Maximum mode 8086 system and timings.

UNIT II

ASSEMBLY LANGUAGE PROGRAMMING: Assembler directives, Assembly language programs (8086) with Assembler directives for addition, subtraction, multiplication, division etc., sorting and searching, bit manipulation, Programs using look-up tables, Delay subroutines. Stages of software development.

UNIT III

Data transfer schemes : Synchronous, Asynchronous, Interrupt driven and DMA type schemes, Programmable interrupt controller (8259) and its interfacing, Programmable DMA controller(8257) and its interfacing, Programmable Interval Timer (8253) and its interfacing, Programmable Communication Interface(8251 USART) and its interfacing.

UNIT IV

Memory interfacing to 8086 : Interfacing various types of RAM and ROM chips, 8255 PPI and its interfacing, ADC and DAC Interfacing, Data acquisition, Waveform generation, Traffic light controller, Stepper motor control, temperature measurement and control.

UNIT V

8051 Microcontroller : Architecture, Register set, Instruction set, Interrupt structure, timer and serial port operations, Memory and I/O interfacing, Simple Assembly language programs.

Text Books:

1. A.K. Ray and K.M. Bhurchandi, "Advanced Microprocessors and Peripherals", TMH.
2. Douglas V. Hall, "Microprocessors and interfacing: Programming and hardware", 2nd edition, Tata McGraw-Hill.
3. Kenneth J Ayala, "The 8051 Micro Controller Architecture, Programming and Applications", 2nd Edition, Pernam International / Thomson Publishers, 2005.
4. Ajay V. Deshmukh, "Microcontrollers - theory applications", Tata McGraw-Hill.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14023202	PJ	Electrical and Electronic Measurements	3	1	0	30	70	3

Objective:

Electrical measurements course introduces the basic principles of all measuring instruments. It also deals with the measurement of RLC parameters voltage, current Power factor, power, energy and magnetic measurements and Digital Meters.

UNIT – I

Measuring Instruments: Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron, dynamometer type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunt and multipliers- problems.

UNIT – II

Measurement of Power and Energy: Single phase dynamometer wattmeter, expression for deflecting and control torques, Single phase induction type energy meter – driving and braking torques – errors and compensations. Three phase energy meter. Types of P.F. Meters – dynamometer and moving iron type – 1-phase and 3-phase meters.

UNIT – III

D.C. & A.C Bridges: Method of measuring low, medium and high resistance – sensitivity of Wheatstone's bridge – Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method. Measurement of inductance – Maxwell's bridge, Anderson's bridge. Measurement of capacitance and loss angle – Desauty's Bridge, Schering Bridge- Frequency measurement- Wien's bridge.

UNIT – IV

Instrument Transformers and Potentiometers: CT and PT – Ratio and phase angle errors–design considerations. Principle and operation of D.C. Crompton's potentiometer–standardization – Measurement of unknown resistance, current and voltage. A.C. potentiometers: polar and coordinate type's - standardization – applications.

UNIT – V

Electronic Measurements: Cathode Ray Oscilloscope – Cathode Ray tube – Time base generator – Horizontal and Vertical amplifiers – application of CRO – Measurement of phase, frequency, current & voltage – Lissajous pattern – digital meters - Digital Voltmeter – Successive approximation, ramp and integrating type.

Text Books

1. Electrical measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition, Reem Publications.
2. Electrical & Electronic Measurement & Instruments by A. K. Sawhney, Dhanpat Rai & Co. Publications.
3. Electronic Instrumentation and measurement techniques by William D Cooper- Prentice Hall Publishers
4. Electronic Instrumentation by H. S. Kalsi, Tata Grawhill Mc, 3rd Edition.

Reference Books

1. Electrical Measurements – by Buckungham and Price, Prentice – Hall
2. Electrical Measurements: Fundamentals, Concepts, Appliations – by Ressland, M.U, New Age International (P) Limited, Publish.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14023203	**PJ**	**Advanced Control Systems**	**3**	**1**	**0**	**30**	**70**	**3**

Objective:

This subject deals with state space, describing function, phase plane and stability analysis including controllability and observability. It also deals with modern control and optimal control systems.

UNIT – I

Linear System Design: Introduction of compensating networks – Lead, Lag, lead – lag cascade compensation – Feedback compensation – P, PI and PID controllers design using Bode plot and root locus techniques.

UNIT – II

State variable descriptions: Concepts of State, State variables, State vector, State space model, representation in state variable form, phase variable representation – Diagonalization – Canonical variable representation.

Controllability and Observability: Definition of controllability – Controllability tests for continuous time systems – Definition of Observability – Observability tests for continuous time systems.

UNIT – III

Time Response of Linear System: Introduction – Solution of state equations – State Transition matrix – Sylvester's expansion theorem – Pole placement by state feedback – Full order and reduced order observers.

UNIT – IV

Non-Linear Systems: Introduction – common physical non-linearities, Singular points, Basic concepts of phase plane method, construction of phase trajectories by phase plane method. Basic concepts and derivation of describing functions. Stability analysis by describing function method.

UNIT – V

Stability: Introduction – Equilibrium points – Stability concepts and definitions – Stability in the sense of Liapunov stability of linear system – Methods of constructing Liapunov functions for Non – linear system – Krasovskii's method – Variable gradient method.

Text Books:

1. Modern Control System Theory by M. Gopal, New Age International Publishers, 2nd edition, 1996.
2. Systems and Control by Stainslaw, H. Zak, Oxford Press, 2003.

Reference Books:

1. Modern Control Engineering by K. Ogata, Prentice Hall of India, 3rd Edition, 1998.
2. Control System Engineering by I. J. Nagarath and M. Gopal, New Age International (P) Ltd.
3. Digital Control and State Variable Methods by M. Gopal, TMH, 1997.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14023204	PJ	Power Semiconductor Drives	3	1	0	30	70	3

Objective:

This course is an extension of Power Electronics applications to AC and DC drives. Control of DC motor drives with single phase and three phase converters and choppers are given in detail. The control of AC motor drives with variable frequency converters and variable voltage are presented.

UNIT – I

Electrical Drives: Introduction – Electrical Drives, Advantages of Electrical Drives, Parts of Electrical drives – Electrical motor, Power Modulators, Sources, Control Unit, choice of Electrical Drives, status of dc and ac drives.

Dynamics of Electrical Drives: Fundamental Torque Equation, Speed-Torque Convention and multi quadrant operation, Equivalent values of drive parameters – Loads with rotational motion, loads with translational motion, measurement of moment of inertia, components of load torques, Nature and classification of load torques. Calculation of time and energy loss in transient operation, steady state stability, load equalization.

UNIT – II

Control of Electrical Drives –Modes of operation, speed control and drive classifications, closed loop control of drives.

D.C. Motor Drives speed control Armature voltage control, Ward Leonard drives, and Controlled rectifier fed DC drives 1-Φ and 3-Φ fully controlled and half controlled converter fed separately Excited D.C. Motor (discontinuous and continuous mode), chopper controlled DC drives (separately Excited motor)- Braking Methods.

UNIT – III

Induction Motor Drives – Speed control – pole changing, stator voltage control – A.C. Voltage controllers, Variable frequency and variable voltage control from inverter-Braking Methods.

UNIT – IV

Synchronous Motor Drives – Torque Expression – open loop VSI fed drive – self control Brushless DC motor Drives – applications.

UNIT – V

Energy Conservation in Electrical Drives – Losses in Electrical Drive System, Measures of energy conservation in Electrical drives, use of efficient Converters, Energy Efficient

operation of drives, improvement of P.F.- improvement of quality of supply-maintenance of motors.

TEXT BOOKS:

1. Fundamentals of Electrical Drives by G. K. Dubey, Narosa Publications
2. Power Electronic Circuits, Devices and Applications by M. H. Rashid, PHI

Reference Books:

1. Power Electronics by M.D. Singh and K. B. Khanchandani, TMH, 1998.
2. Modern Power Electronics and AC Drives by B. K. Bose, PHI.
3. Thyristor Control of Electric Drives by Vedam Subramanyam, TMH
4. Analysis of Thyristor Power Conditioned Motors by S. K. Pillai, Universities Press, 1st edition.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14023205	PJ	Power Systems - II	3	1	0	30	70	3

Objective:

This course is an extension of Power systems – I. It deals with performance of transmission lines and its modeling, Short Circuit Analysis and Earthing.

UNIT I

Performance of Transmission Lines - Classification of Transmission lines – Short, Medium and Long Line and their model representation – Estimation of regulation and efficiency by Nominal T, Nominal Π and Rigorous Methods - Problems. Equivalent T and Π, Surge Impedance Loading, Ferranti Effect.

UNIT II

System Modeling – Representation of Transmission Lines – Circuit Representation of Synchronous Machine – Two Winding and Three Winding Transformers – Per Unit Representations and Advantages – Single Line Diagram Representation – Impedance and Reactance Diagram – Changing the Base of Per Unit Quantities.

UNIT III

Symmetrical Fault Studies - Introduction to symmetrical fault analysis – Short circuit capacity of a bus – The short circuit currents and the reactance of synchronous machines – Internal voltages of loaded machines under transient conditions – Expressions for fault MVA in terms of per unit and percentage quantities – Need for current limiting reactors and their location – The selection of circuit breakers.

UNIT – IV

Unsymmetrical Fault Studies - Symmetrical components – phase shift of symmetrical components in Star-Delta transformer banks – Power in terms of symmetrical components – Unsymmetrical series impedances – Sequence impedances and Sequence Networks of Synchronous Machines, Transmission Lines, Transformers – Zero Sequence Networks of 3 Phase Loads and 3 Phase Transformer Banks – Unsymmetrical Fault Analysis on unloaded generator and on power systems with and without fault impedance.

UNIT V

Power System Earthing – Objectives, Definitions, Tolerable Limits of Body Currents – Soil Resistivity – Earth Resistance- Tolerable Step and Touch Potential – Design of Earthing Grid – Tower Footing Resistance – Neutral Earthing – Ungrounded and Effectively Earthed System – Types of Earthing, Grounding through an Earthing Transformer.

Text Books:

1. Modern power System analysis – by I. J. Nagarth and D. P. Kothari, TMH, 2nd Edition.
2. Elements of power system analysis, William. D. Stevenson, 4th Edition Jr., MGH

Reference Books:

1. Electrical power systems by C. L. Wadhwa, New Age International publications.
2. Power system analysis by Hadi Saadat, MGH International.
3. Power system analysis by AR Bergen and Vijay Vittal, Pearson education Asia, 2001.
4. A course in Power Systems by J. B. Gupta, S. K. Kataria & Sons, 11th Edition, 2013.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14143206	PJ	Digital Signal Processing	3	1	0	30	70	3

(Elective – I)

Course Objectives

- To become familiar with Digital Filter design and transform domain Processing.
- To understand the concepts of representation, transformation of the signals and the information they contain.

UNIT-I

Introduction: Review of Discrete signals & systems, linear constant coefficient difference equations.

Z–Transforms: Derivation and definition ,ROC, Properties – Linearity, time shifting, change of scale, Z-domain differentiation differencing, accumulation, convolution in discrete time, initial and final value theorems , Poles and zeros in Z plane-the inverse Z-transform , system analysis , Transfer function , BIBO stability , system response to standard signals ,Solution of difference equations with initial conditions.

UNIT-II

Discrete Fourier Series: Properties of discrete Fourier series, DFS representation of periodic sequences, discrete Fourier transforms: properties of DFT, linear convolution of sequences using DFT, computation of DFT.

Fast Fourier Transforms: Fast Fourier transforms (FFT)-Radix2 decimation in time and decimation in frequency FFT algorithms, inverse FFT and FFT for composite N.

UNIT-III

Realization of Digital Filters: Block diagram representation of linear constant-coefficient difference equations, basic structures of IIR filters- direct form I, direct form II, transposed form, cascade form, parallel forms, lattice ladder, basic structures of FIR filters.

UNIT-IV

IIR Digital Filters: Analog filter approximations-Butterworth and chebyshev, design of IIR digital filters from analog filters, design examples: analog-digital transformations, Illustrative Problems.

UNIT-V

FIR Digital Filters

Characteristics of FIR digital filters, frequency response. Design of FIR digital filters using window techniques, frequency sampling technique, comparison of IIR and FIR filters, Illustrative Problems, applications of DSP

Text Books

1. Digital signal processing, principles, Algorithms and applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 4th ed., 2007.
2. Digital signal processing , A computer base approach- Sanjit K Mitra, Tata Mcgraw Hill, 3rd edition, 2009.
3. Discrete Time Signal Processing-A.V. Oppenheim and R.W. Schaffer, 2nd ed., PHI.

References

1. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.
2. A Text book on Digital Signal processing – R S Kaler, M Kulkarni,, Umesh Gupta, I K International Publisthing House Pvt. Ltd.
3. Digital signal processing: M H Hayes, Schaum's outlines, TATA Mc-Graw Hill, 2007.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14023207	**PJ**	**High Voltage DC Transmission**	**3**	**1**	**0**	**30**	**70**	**3**

(Elective – I)

Objective: This subject gives the fundamental concepts of High voltage direct current. It mainly concentrates on converter configuration and analysis for the application of high voltage transmission system.

UNIT-I

D. C. Power Transmission Technology: Introduction- Comparison of AC & DC transmission, Converter station, Description of DC Transmission systems, Choice of voltage level, Modern trends in DC transmission.

UNIT-II

Analysis of HVDC Converters: Pulse number, Choice of converter configuration, valve rating, Transformer, Simplified analysis of graetz circuit with and without overlap, Rectifier and Inverter waveforms, Converter bridge characteristics.

UNIT – III

Converter and HVDC System Control: Principle of DC link control, Converter control characteristics, System and control hierarchy, Firing angle control, Converter and excitation angle control, Starting and stopping of DC Link , Power Control, Higher level Controllers.

UNIT – IV

Converter Faults: Protection against over currents, over voltages in a converter station, Surge arresters, Protection against over voltages. Smoothing reactor, DC Line, Transient over voltages in DC line, Protection of DC Line, DC breakers.

UNIT – V

Reactive Power Requirements in Steady State: Sources of reactive power, Static var systems, generation of Harmonies, Design of AC filters, DC filters, Carrier frequency and RI Noise.

Text Books:

1. High Voltage Direct Current Transmission by J. Arilliga 2nd edition, IEE Power and Energy Series.
2. High Voltage Direct Current Transmission by K. R. Padiyar, Wiley Eastern Ltd., 1993.
3. Direct current transmission by E. W. Kimbark, Wiley Inter Science New York 1971.

Reference Books:

1. EHVAC, HVDC Transmission and Distribution Engineering by S. Rao, Khanna Publishers, 2001.
2. Power Transmission by Direct Current by E. Uhlamann, Springer – Verlag, Berlin, 1975.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14053208	**PJ**	**Object-Oriented Programming Through Java**	**3**	**1**	**0**	**30**	**70**	**3**

Elective – I

UNIT I

Overview of programming, Programming paradigms, Basics of object oriented programming, brief history of java, Structure of a java program-token comments, identifiers, keywords, literals, input& output mechanisms, Java development and runtime environment setup.

UNIT II

Statements: Labeled, Expression, Null and Compound Statements, Control statements-Conditional, Unconditional Control Transfers, Loops.

Arrays: Declaration, and Creation, Accessing array elements, Initialization and assigning values, Assigning array to another array, Library methods for arrays, Multidimensional arrays, Characters array, passing array to functions.

UNIT III

Methods or functions: Declaration, definition and a call of method or function, Main method arguments, Reference variables. Method overloading, parameter passing, Recursion, Scope of variables. Return from methods.

Data abstraction through classes: class, class and Member modifiers, Constructors, Dynamic memory management, The this keyword, Static members, Scope of variables, interfaces, implementing and Extending, packages, Exception handling.

UNIT IV

Class relationships: Inheritance, Polymorphism, Object class, controlling access to members of class, Direct and indirect super-classes- Access rights in subclasses and packages, Constructor calling sequence, Multiple inheritance, per class protection, Dynamic binding of methods, Operator instance of Abstract class, Over ridding, Shadowing and Hiding, Finalize, aggregation and composition.

Multi threading: processes and threads, Life cycle of a thread. Thread methods, Creating and naming a thread, priority threads, Sleep and joining a thread, Thread synchronization, Thread groups.

UNIT V

Java standard packages and classes: Java standard packages-java.lang, java.util, java.math; Java classes-String Buffer, StringTokenizer classes, Wrapper classes for primitive types-Date, Calendar, Random classes, Exception class, Assert Statement, Formatter class, Interface collection and collection framework with Vector, ArrayList, LinkedList, Stack, Arrays, Hashtable classes.

Applets: Basics, skeleton, Initialization and termination, Repainting, Status window, Passing parameters.

Text Books

1. Jana D, Java and Object-Oriented Programming paradigm, PHI, 2005.
2. Java Fundamentals - A Comprehensive Introduction, Herbert Schildt and Dale Skrien, Special Indian Edition, Mc Graw Hill, 2013.
3. Java the Complete Reference, Herbert Schildt, 8th Edition, 2011, Oracle press, TMH.

Reference Books

1. Programming with Java, T.V. Suresh Kumar, B. Eswara Reddy, P. Raghavan Pearson Edition.
2. Java – How to Program, Paul Deitel, Harvey Deitel, PHI.
3. Core Java, Nageswar Rao, Wiley Publishers.
4. Thinking in Java, Bruce Eckel, Pearson Education.
5. A Programmers Guide to Java SCJP, Third Edition, Mughal, Rasmussen, Pearson.
6. Head First Java, Kathy Sierra, Bert Bates, O. Reilly.
7. SCJP – Sun Certified Programmer for Java Study guide – Kathy Sierra, Bert Bates, Mc Graw Hill.
8. Java in Nutshell, David Flanagan, O. Reilly
9. Core Java: Volume I – Fundamentals, Cay S. Horstmann, Gary Cornell, the Sun Micro Systems Press.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14243209	**HS**	**Advanced English Communication Skills Lab**	**0**	**0**	**3**	**50**	**0**	**0**

AUDIT COURSE

Introduction

The Advanced English Language Skills Lab introduced at the 3rd year B.Tech level is considered essential for the student for focusing on his/her career. At this stage it is imperative for the student to start preparing for the ever growing competition in the job market. In this scenario, in order to be on par with the best, he/she needs to improve his/her Communication and soft skills

This course focuses on the practical aspects of English incorporating all the four (LRSW) skills relevant to the requirements of the prospective employers in view of globalization. The proposed course will enable the students to perform the following:

- Intensive reading to improve comprehension and communication
- Attentive listening for better understanding
- Write project/research/technical reports

- Write Resume' to attract attention
- Discuss ideas / opinions for better solutions
- Face interviews confidently
- Gather information, organize ideas, and present them effectively before an audience
- To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required ability to face computer-based competitive exams such GRE, TOEFL, CAT, GMAT etc.

Objectives:

Keeping in mind the previous exposure of the student to English, this lab focuses on improving the student's proficiency in English at all levels. The lab intends t**o** train students to use language effectively, to participate in group discussions, to help them face interviews, and sharpen public speaking skills and enhance the confidence of the student by exposing him/her to various situations and contexts which he/she would face in his/her career.

Syllabus

The following course content is prescribed for the Advanced Communication Skills Lab:

Reading Comprehension -- Reading for facts, guessing meanings from context, speed reading, scanning, skimming for building vocabulary(synonyms and antonyms, one word substitutes, prefixes and suffixes, idioms and phrases.)

Listening Comprehension-- Listening for understanding, so as to respond relevantly and appropriately to people of different backgrounds and dialects in various personal and professional situations.

Technical Report Writing—Types of formats and styles, subject matter, organization, clarity, coherence and style, data-collection, tools, analysis

Resume' Writing—Structure, format and style, planning, defining the career objective, projecting one's strengths, and skills, creative self marketing, cover letter

Group Discussion-- Communicating views and opinions, discussing, intervening. Providing solutions on any given topic across a cross-section of individuals,(keeping an eye on modulation of voice, clarity, body language, relevance, fluency and coherence) in personal and professional lives.

Interview Skills—Concept and process, pre-interview planning, mannerisms, body language, organizing, answering strategies, interview through tele and video-conferencing

Technical Presentations (Oral)— Collection of data, planning, preparation, type, style and format ,use of props, attracting audience, voice modulation, clarity, body language, asking queries.

Minimum Requirements: The English Language Lab shall have two parts:

The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

The Communication Skills Lab with movable chairs and audio-visual aids with a P. A System, a TV, A digital stereo-audio and video system, Camcorder etc

System Requirement (Hardware Component):

Computer network with LAN with a minimum of 60 multimedia systems with the following specifications:

P-IV Processor, Speed-2.8 GHz, RAM_512 MB minimum, Hard Disk-80 GB, Headphones

Prescribed Software: Walden and K-van Solutions.

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. **Technical writing and professional communication, Huckin and Olsen** Tata Mc Graw-Hil 2009.
2. **Speaking about Science**, A Manual for Creating Clear Presentations **by Scott Morgan and Barrett Whitener, Cambridge University press, 2006**
3. **Books on** TOEFL/GRE/GMAT/CAT/ IELTS **by Barron's/DELTA/Cambridge University Press.**
4. **Handbook for Technical Writing** by David A Mc Murrey & Joanne Buckely CENGAGE Learning 2008
5. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
6. **The ACE of Soft Skills** by Gopal Ramesh and Mahadevan Ramesh, Pearson Education, 2010
7. **Cambridge English for Job-Hunting** by Colm Downes, Cambridge University Press, 2008
8. **Resume's and Interviews** by M.Ashraf Rizvi, Tata Mc Graw-Hill, 2008.
9. **From Campus To Corporate** by KK Ramachandran and KK Karthick, Macmillan Publishers India Ltd, 2010
10. **English Language Communication: A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr.G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
11. **Managing Soft Skills** by K R Lakshminarayan and T.Muruguvel, Sci-Tech Publications, 2010

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14023210	**PJ**	**Control Systems and Simulation Lab**	**0**	**0**	**3**	**50**	**50**	**2**

Any Eight of the following experiments are to be conducted

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servo motor
5. Transfer function of DC Machine
6. Effect of P, PD, PI, PID Controller on a second order systems
7. Lag and lead compensation – Magnitude and phase plot
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor

Any two simulation experiments are to be conducted

1. PSPICE simulation of Op-Amp based Integrator and Differentiator circuits.

2. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
3. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB
4. State space model for classical transfer function using MATLAB – Verification.

REFERENCE BOOKS:

1. Simulation of Electrical and electronics Circuits using PSPICE – by M.H. Rashid, M/s PHI Publications.
2. PSPICE A/D user's manual – Microsim, USA.
3. PSPICE reference guide – Microsim, USA.
4. MATLAB and its Tool Books user's manual and – Mathworks, USA.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14023211	**PJ**	**Electrical Measurements Lab**	**0**	**0**	**3**	**50**	**50**	**2**

The following experiments are required to be conducted as compulsory experiments:

1. Calibration and Testing of single phase energy Meter.
2. Calibration of dynamometer power factor meter.
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
5. Measurement of % ratio error and phase angle of given C. T. by comparison.
6. Schering bridge & Anderson bridge.
7. Measurement of 3 phase reactive power with single-phase wattmeter.
8. Measurement of parameters of a choke using 3 voltmeter and 3 ammeter methods.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted.

9. Optical bench – Determination of polar curve measurement of MHCP of filament lamps.
10. Calibration LPF wattmeter – by Phantom testing.
11. Measurement of 3 phases power with Two watt meter method (Balanced & Unbalanced).
12. Dielectric oil testing using H. T. testing kit.
13. LVDT and capacitance pickup – characteristics and Calibration.
14. Resistance Strain Guage – Strain Measurements and Calibration.
15. Transformer turns ratio measurement using A.C. Bridge.
16. A. C. Potentiometer – Calibration of AC Voltmeter, Parameters of Choke.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14254101	**HS**	**Management Science**	**3**	**1**	**0**	**30**	**70**	**3**

Objectives

1. Provide a basic understanding of management science including analytical problem solving and communications skills.
2. Prepare for practice in a field that sees rapid changes in tools, problems and opportunities.
3. Prepare for graduate study and self-development over an entire career.

4. Provide ability to use the techniques, skills and modern engineering tools necessary for engineering practices.
5. The broad education necessary to understand the impact of engineering solutions in a global and societal context.
6. Background necessary for admission to top professional graduate engineering or business programs.

UNIT- I

Introduction to Management: Concept of Management-Administration, Organization-Functions of Management, Evolution of Management Thought, managerial objectives and social responsibilities of Management. Organization: Principles of Organization-Types of mechanistic and organic structures of organizations.

UNIT – II

Strategic Management: Mission, Goals, Objectives and Programmes, Elements of Corporate Planning Process- SWOT Analysis-Strategy Formulation and Implementation. Plant location and Plant Layout concepts-Production control.

UNIT – III

HRM and Inventory Management: Human Resource Management - Personnel Management and Industrial Relations (PMIR)-Basic functions of Personnel Management, Job Evaluation and Merit Rating-Incentive plans.

Inventory Management: Need for Inventory Control; EOQ, ABC Analysis, Purchase Procedure, Maintaining Store Records.

UNIT-IV

Operations Management: Productivity- Job, Batch and Mass Production-Work Study-Basic procedure involved in Method Study and Work Measurement- Statistical Quality Control: *c* chart, *p* chart, R chart, Acceptance sampling, Deming's contribution to Quality.

UNIT-V

Project Management: Network Analysis to project management- PERT/CPM- Application of network techniques to engineering problems- Cost Analysis-Project Crashing.

Text Books

1. Aryasri: Management Science, TMH, 2008.

Reference Books

1. Koontz& Weihrich: Essentials of Management,6/e,TMH,2005
2. Kanishka Bedi: Production and Operations Management, Oxford University Press, 2004
3. Parnell: Strategic Management, Biztantra, 2003.
4. LS Srinath: PERT/CPM, Affiliated East-West Press, 2005

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14024102	**PJ**	**Power Systems - III**	**3**	**1**	**0**	**30**	**70**	**3**

Objective:

This course introduces formation of Y bus and Z bus of a Power System, power flow studies by various methods. It also deals with the analysis of power system for steady state and transient stability.

UNIT I

Load Flow Studies – I: Need for load flow studies in a power system – Formation of Bus admittance matrix – Classification of types of buses in a power system – Formulation of

load flow equations – Gauss-Seidel iterative method for load flow studies – Treatment of PV bus – Acceleration factors – Problems(Sample One Iteration Only).

UNIT II

Load Flow Studies –II: Newton - Raphson Method in Rectangular and Polar Coordinates – Formulation of Load Flow Solution with or Without PV Buses – Derivation of Jacobian Elements, Algorithm and Flow Chart. Decoupled and Fast decoupled Methods – Representation of transformer in load flow studies.

UNIT III

Stability Studies - Classification of stability studies – The power flow equations of wound rotor and salient pole synchronous machine connected to infinite bus through a transmission system under steady state and transient state – Power flow equations of a two machine system with and without losses – Power flow equations in terms of ABCD constants – Power angle diagrams – Steady State Stability and Limits, Methods of Improvement of Steady State Stability.

UNIT IV

Transient Stability Analysis - General considerations and assumptions – Transient stability and stability limits – Inertia Constant, Derivation of Swing Equations, Equal area criterion – Limitations of equal area criterion – Application of equal area criterion to a) Sudden increase in input b) Sudden three phase fault on one of the lines of a transmission system – Determination of critical clearing angle – Clearing Time. Solution of swing equation of one machine system by point by point method – Methods for improving power system stability.

UNIT V

Power System Transients – Types of System Transients – Travelling or Propagation of Surges – Attenuation, Distortion, Reflection and Refraction Coefficients – Termination of Lines with Different Types of Conditions – Open Circuited Line, Short Circuited Line, T – Junction, Lumped Reactive Junctions – Problems.

Text Books

1. Computer Methods in Power Systems by Stagg EI – Abiad & Stags, TMH
2. Modern Power System Analysis by I. J. Nagarath & D. P. Kothari, TMH, 2nd Edition.
3. Power System Analysis by Nagsarkar and Sukhija, OXFORD University Press.

Reference Books

1. Power System Analysis by Grainger and Stevenson, TMH.
2. Computer Techniques in Power System Analysis by M. A. Pai, TMH, 2nd Edition.
3. Power System Analysis and Design by B. R. Gupta, S. Chand & Company, 6th Revised Edition, 2010.
4. Computer Modeling of Electric Power Systems by J. Arrillaga and N. R. Watson, John Wiley Student Edition, 2nd Edition.
5. Computer Techniques and Models in Power Systems by K. Uma Rao, I. K. International.
6. Electric Power Systems by S. A. Nasar, Schaum's Outline Series, Revised 1st Edition, TMH.
7. Power System Analysis by Glovar and Sarma, Thomson Publishers.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14024103	PJ	Switchgear and Protection	3	1	0	30	70	3

UNIT-I

Over Voltages in Power Systems: Cause of over voltages, protection against lightning over voltages, ground wires, counter poises, surge absorbers and surge diverters, lightning arrestors(valve type), ratings of Lightning arrestors, insulation co-ordination, neutral earthing-types.

UNIT-II

Circuit Breakers: Elementary principles of arc interruption, restriking and recovery voltages, average and maximum RRRV, numerical problems. Current chopping and resistance switching-circuit breaker ratings, auto re-closure and problems. Description and operation of minimum oil circuit breakers, air blast circuit breakers, vaccum circuit breakers and sulphur hexafluoride circuit breakers.

UNIT-III

Protective Relays: Basic requirements of a relays, relay terminology, types of relays, electromagnetic relays (attraction type and induction type). Construction and operation of non-directional and directional over current relays, universal torque equation, operating characteristics of impedance, reactance and admittance relays. Principle and operation of differential and percentage differential relays.

Static Relays: Advantages and dis-advantages, amplitude comparators and phase comparators. Microprocessor based relays: introduction, advantages and dis-advantages

UNIT-IV

Protection of Generators: protection of generators against stator faults, rotor faults and abnormal running conditions, restricted earth fault protection and inter turn fault protection, numerical problems on percentage winding unprotected.

Protection of transformers: percentage differential protection of transformers, numerical problems on design of CT's ratio, Buchholtz relay.

UNIT-V

Protection of Feeders and Lines: Protection of feeders (radial and ring main) using over current relays, protection of transmission lines by three zone protection using distance relays, carrier current protection and protection of bus-bars.

Text Books:

1. Power System Protection and Switch Gear by Badriram & D. N. Vishwakarma, TMH publishing Company Ltd., 1995.
2. Electrical Power Systems by C. L. Wadhwa, New Age International (P) Limited, 3rd Edition.
3. Power System Protection & Switch Gear by B. Ravindranath & M. Chander, Wiley Eastern Ltd.
4. Switch Gear and Protection by Sunil. S. Rao, Khanna Publishers.

Reference Books:

1. Fundamentals of Power System Protection by Y. G. Paithanakar and S. R. Bhide, PHI, 2nd Edition.
2. Transmission Network Protection by Y. G. Paithankar, Taylor and Francis, 2009.
3. Power System Protection and Switch Gear by Bhuvanesh Ozq, TMH, 2010.

4. Electrical Power System Protection by C. Christopoulos and A. Wright, Springer International Edition, 2nd Edition.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14024104	PJ	Flexible AC Transmission Systems	3	1	0	30	70	3

Objective:

This subject is an extension of previous power system courses. It deals with the detailed analysis of FACTS controllers which are the prime source of enhancement of electrical power generation and its utilities. Also concerns about the different types of FACTS controllers which are having significant applications in utility appliances and control systems.

UNIT I

FACTS Concepts: Transmission interconnections power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters basic types of FACTS controllers, benefits from FACTS controllers.

UNIT II

Voltage Source Converters: Single & three phase full wave bridge Converters - transformer connections for 12 pulse 24 and 48 pulse operation. Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, and comparison of current source converters with voltage source converters.

UNIT III

Static Shunt Compensation: Objectives of shunt compensation, midpoint voltage regulation voltage instability prevention, improvement of transient stability, Power oscillation damping. Methods of controllable VAR generation, variable impedance type static VAR generators, switching converter type VAR generators, hybrid VAR generators.

UNIT IV

SVC and STATCOM: The regulation and slope transfer function and dynamic performance, transient stability enhancement and power oscillation damping operating point control and summary of compensator control.

UNIT V

Static Series Compensators: concept of series capacitive compensation, improvement of transient stability, power oscillation damping.

Functional requirements, GTO thyristor controlled Series Capacitors (GSC), Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC) control schemes for GSC, TSSC and TCSC.

Text Book:

1. Concepts and Technology of Flexible AC Transmission Systems-Understanding FACTS by Narain G. Hingorani and Laszlo Gyuygyi, Standard Publishers Distributors, IEEE Press Publications, 1st Edition, 2001.

Reference Text Books:

1. Thyristor Based FACTS Controllers for Electrical Transmission Systems by R. Mohan Mathur, Rajiv K. Varma, IEEE Press Series on Power Engineering, 2002.

2. Flexible AC Transmission Systems by Yong Hua Song and Allen T Johns, The Institute of Electrical Engineers, London, UK, 1999.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14024105	**PJ**	**Soft Computing Techniques**	**3**	**1**	**0**	**30**	**70**	**3**

(ELECTIVE-II)

Objective:

This course deals with various Artificial Intelligent Techniques, i.e., Artificial Neural Networks, Fuzzy Logic and its basic concepts. It also deals with role of ANN and Fuzzy Logic in various Electrical Engineering Applications.

UNIT I

Introduction to Artificial Intelligence: Introduction and motivation – Approaches to AI – Architectures of AI – Symbolic Reasoning System –Rule based Systems – Knowledge Representation – Expert Systems.

UNIT II

Artificial Neural Networks: Basics of ANN - Comparison between Artificial and Biological Neural Networks – Basic Building Blocks of ANN – Artificial Neural Network Terminologies – McCulloch Pitts Neuron Model – Learning Rules – ADALINE and MADALINE Models – Perceptron Networks – Back Propagation Neural Networks – Associative Memories.

UNIT III

ANN Applications to Electrical Systems: ANN approach to: Electrical Load Forecasting Problem – System Identification – Control Systems – Pattern Recognition.

UNIT IV

Fuzzy Logic: Classical Sets – Fuzzy Sets – Fuzzy Properties and Operations – Fuzzy Logic System – Fuzzification –Defuzzification – Membership Functions – Fuzzy Rule base – Fuzzy Logic Controller Design.

UNIT V

Fuzzy Logic Applications to Electrical Systems: Fuzzy Logic Implementation for Induction Motor Control – Power System Control – Automatic Generation Control – Switched Reluctance Motor Control – Modeling and Control of DC Drive – Fuzzy Excitation Control Systems in Power System Stability Analysis - Transient Stability Analysis – Automatic Voltage Regulator - Fuzzy Logic Controller in an 18 Bus Bar System.

Text Books:

1. Introduction to Neural Networks using MATLAB by S. N. Sivanandam, S. Sumathi and S. N. Deepa, Tata McGraw Hill Edition, 2006.
2. Fuzzy Logic with Engineering Applications by Timothy J. Ross, WILEY India Edition, 3rd Edition, 2012.

Reference Books:

1. Introduction to Fuzzy Logic using MATLAB by S. N. Sivanandam, S. Sumathi and S. N. Deepa, Springer International Edition, 2013.
2. Intelligent System – Modeling, Optimization & Control by Yung C. Shin and Chengying Xu, CRC Press, 2009.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14024106	PJ	High Voltage Engineering	3	1	0	30	70	3

(ELECTIVE-II)

Objective:

This subject deals with the detailed analysis of Breakdown occur in gaseous, liquids and solid dielectrics. Information about generation and measurement of High voltage and current. In addition the High voltage testing methods are also discussed.

UNIT – I

Break down mechanism of gases, Liquid and solid insulating materials: Introduction to HV technology, industrial applications of high voltage, electrostatic precipitation, gases as insulating media, collision process, ionization process, Towsend's creteria of breakdown in gases, Paschen's law -Principles of breakdown in solids and liquid dielectrics

UNIT – II

Generation of H.V.D.C. and H.V.A.C voltages: Introduction, need for cascade connection and working of transformer units connected in cascade. Series resonant circuit, principle of operation-Tesla coil-Voltage Double circuit-Cockcroft- Walton type High voltage DC set

UNIT-III

Generation of impulse voltages: introduction to standard lightning and switching impulse voltages-analysis of single impulse generator-expression for output impulse voltage-rating of impulse generator-components of multistage generator – Multistage impulse generator working of Marx Impulse generator-triggering of impulse generator by three electrode gap arrangement-generation of high impulse current.

UNIT-IV

Measurement of high voltages: Electrostatic voltmeter-principle and construction-chubb and fortesue method for HVAC measurement-generating voltmeter-principle and construction-series resistance micro ammeter for HVDC measurements-standard sphere gap measurements of HVAC and HVDC voltages- potential dividers-resistance dividers-capacitance dividers-measurement of high impulse currents-Rogowsky coil.

UNIT – V

High voltage testing of electrical equipment: Dielectric loss and loss angle measurement using Schering bridge-need for discharge detection and PD measurements-Factors affecting discharge detection-discharge detection methods-Testing of insulators, Testing of cables, Testing of bushings, Testing of power capacitor, Testing of power transformers, Testing of circuit breakers.

Text Books:

1. High Voltage Engineering by M. S. Naidu and V. Kamaraju, TMH Publications, 4th Edition, 2004.
2. High voltage Engineering by C. L. Wadhwa, New Age International (P) Limited, 1997.

Reference Books:

1. High Voltage Engineering: Fundamentals by E. Kuffel, W. S. Zaengl, J. Kuffel by Elsevier, 2nd Edition, 2000.

2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited, 1995.
3. High Voltage Technology by L. L. Alston, OXFORD University Press, Second Edition, 2009.
4. High Voltage Engineering Problems & Solutions, R. D. Begamudre, New Age International Publishers, First Edition, 2010.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14024107	**PJ**	**Special Electrical Machines**	**3**	**1**	**0**	**30**	**70**	**3**

(ELECTIVE-II)

Objective:

This subject deals with the basic principle of operation, working, drive circuits, control circuits and characteristics applications of special electric machines like Linear Induction Motors, Stepper Motors, BLDC motors and Switched Reluctance motors.

UNIT – I

Stepper motors: Construction and operation of Stepper Motors: variables reluctance, permanent magnet, hybrid stepper motors, characteristics of stepper motors.

Drive circuits for Stepper motors: Block diagram of stepper motor controller, logic sequence generator, power drivers, current suppression circuits, and acceleration and deceleration circuits.

UNIT – II

Microprocessor control of stepper motors: Microprocessor based stepper motor controller, PC based stepper motor controller**.**

Micro-stepping Control of Stepper motors: The micro-stepping principle, advantages of micro stepping, design of basic micro-stepping controller. Applications of stepper motors.

UNIT – III

Switched Reluctance Motor Drives: Types of SR motor, principle of operation, static torque production, energy conversion loop, dynamic torque production.

Converter Circuits, Control of SR motors: Current regulation commutation, torque speed characteristics, shaft position sensing.

UNIT –IV

Brushless DC motor: Principle of operation of BLDC motor, square wave permanent magnet brushless motor drives, sine wave permanent magnet brushless DC motor drives, Phasor diagram, torque speed characteristics, controllers for BLDC motors

UNIT –V

Linear motors: Basic principle of operation and types. End effects and transverse edge effects. Fields analysis & Propulsion force; equivalent circuit.

Text Books:

1. Stepper Motors: Fundamentals, Applications, and Design by V. V. Athani, New Age International Publications, 1997.
2. Brushless Permanent-Magnet and Reluctance Motor Drives by TJE Miller Clarendon Press, Oxford.
3. Special Electrical Machines by K. Venkataratnam, University Press, 2009.

Reference Books:

1. Electrical Machines by R. K. Rajput, Laxmi Publications, 4th Edition.
2. Power Electronics – Converters, Applications & Design by N. Mohan, Undeland & Robbins, Wiley India, Student Edition, 2002.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14134108	**PJ**	**Optimization Techniques**	**3**	**1**	**0**	**30**	**70**	**3**

(Elective – III)

Course Objective:

The main objective of the course is to enlighten the students with various optimization methods such as Linear Programming Technique, Constrained and Un-constrained Non-Linear Programming Technique and Transportation algorithm to understand and apply in industrial operations.

UNIT - I

Introduction to Classical Optimization Techniques: Statement of an optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of optimization problems.

Single variable optimization – multi variable optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable optimization with equality constraints, solution by method of Lagrange Multipliers – multivariable optimization with inequality constraints – Kuhn Tucker conditions.

UNIT - II

Linear Programming: Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

UNIT - III

Transportation Problem: Finding initial basic feasible solution by north-west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.

UNIT – IV

Unconstrained Non-Linear Programming: One-dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method. Univariate method, Powell's method and steepest descent method.

UNIT - V

Constrained Non-linear Programming: Characteristics of a constrained problem, Classification, Basic approach of penalty function method, Basic approaches of interior and exterior penalty function methods, Introduction to convex programming problem.

Text Books:

1. Engineering Optimization: Theory and Practice by S. S. Rao, New Age International (P) Ltd., 3rd edition, 1998.

2. Introductory Operations Research by H. S. Kasene & K. D. Kumar, Springer (India) Pvt. Ltd.
3. Operation Research by K. Rajagopal, PHI Publications.

Reference Books:

1. Optimization Methods in Operation Research and System Analysis by K. V. Mittal and C. Mohan, New Age International (P) Ltd., 3rd edition, 1996.
2. Operation Research by Dr. S. D. Sharma, Kedernath Ramnath and Company, 11th edition, Reprint 1997.
3. Operation Research: An Introduction by H. A. Taha, PHI Pvt. Ltd., 6th edition.
4. Linear Programming by G. Hadley, Narosa Publishing House, 2002.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14144109	**PJ**	**VLSI Design**	**3**	**1**	**0**	**30**	**70**	**3**

(Elective – III)

Course Objectives

- The main objective of the course is to introduce the concepts of IC fabrication technologies and their corresponding Stick Diagrams.
- The course will also introduce scaling techniques of CMOS devices and their effects.
- The course will also familiarize the students with CAD/EDA tools.

UNIT-I

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS technologies-Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation, Probe testing, Integrated Resistors and Capacitors.

UNIT-II

Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: I_{ds} Vs V_{ds} relationships, MOS transistor threshold Voltage, gm, gds, Figure of merit, Pass transistor, NMOS Inverter, Various pull ups and Pull downs, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT-III

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2μ CMOS Design rules for wires, Contacts and ransistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

UNIT-IV

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Basic circuit concepts, Sheet Resistance(RS) concept and Sheet Resistance RS in MOS, Area Capacitance Units, Calculations Delays, Driving large Capacitive Loads, Wiring Capacitances.

Subsystem Design: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Counters, High Density Memory Elements.

UNIT-V

Semiconductor Integrated Circuit Design: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic(PLA'S), Design Approach.

CMOS Testing: CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level

Test Techniques, System-level Test Techniques, and Layout Design for improved Testability.

Text Books

1. Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, Essentials of VLSI circuits and systems, PHI, 2005 Edition.
2. Weste and Eshraghian, Principles of CMOS VLSI Design, Pearson Education, 1999.

Reference Books

1. John P. Uyemura, Introduction to VLSI Circuits and Systems, John Wiley, 2003.
2. John M. Rabaey, Digital Integrated Circuits, PHI, EEE, 1997.
3. Wayne Wolf, Pearson Education, Modern VLSI Design, 3rd Edition, 1997.
4. S.M. SZE, VLSI Technology, 2nd Edition, TMH, 2003.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14024110	**PJ**	**Reliability Engineering & Applications to Power Systems**	**3**	**1**	**0**	**30**	**70**	**3**

(ELECTIVE-III)

UNIT I

Basic probability theory, Distribution & Network Modeling: Basic probability theory-rules for combining probabilities of events, Bernoulli's trials, Probability Density and Distribution Functions, Binomial Distribution- Expected Value and Standard Deviation of Binomial Distribution. Analysis of Series, Parallel, Series – Parallel Networks, Complex Networks – Decomposition Method.

UNIT II

Reliability Functions: Reliability Functions – f(t), R(t), F(t), h(t) and their relationships – Exponential Distribution – Expected Value and Standard Deviation of Exponential Distribution – Bath – tub Curve – Reliability Analysis of Series – parallel Networks using Exponential Distribution – Reliability Measures. MTTF, MTTR, MTBF.

UNIT III

Markov Modeling – Markov Chains – Concept of STPM, Evaluations of Limiting State Probabilities – Markov Processes on Components Repairable System – Time Dependent Probability Evaluation using Laplace Transform Approach – Evaluation of Limiting State Probabilities using STPM – Two Component Reliability Models.

Frequency and Duration Concept – Evaluation of Frequency of Encountering State, Mean Cycle Time for One and Two Component Repairable Models – Evaluation of Cumulative Probability and Cumulative Frequency of Encountering of Merged States.

UNIT IV

Generation System Reliability Analysis: Reliability Model of a Generation System, Recursive Relation for Unit Addition and Removal, Load Modeling, Merging of Generation

Load Model – Evaluation of Transition Rates for Merged State Model, Cumulative Probability and Cumulative Frequency of Failure Evaluation - LOLP, LOLE, LOEE.

UNIT V

Composite System Reliability Analysis: System and Load Point Reliability Indices, Weather Effects on Transmission Lines, Weighted Average Rate and Markov Model.

Distribution System Reliability Analysis: Basic Techniques, Radial Networks, Evaluation of basic Reliability Indices, Performance Indices, Load Point and System Reliability Indices, Customer Oriented, Load and Energy Oriented Indices.

Text Books:

1. Reliability Evaluation of Engg. System – R. Billinton, R. N. Allan, Plenum Press, New York, Reprinted in India by B. S. Publications, 2006
2. Reliability Evaluation of Power Systems – R. Billinton, R. N. Allan, Plenum Press, New York, Reprinted in India by B. S. Publications, 2006.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14254111	**HS**	**Human Values & Professional Ethics**	**2**	**0**	**0**	**30**	**0**	**0**

(Audit Course)

Course Objective

- This course deals with professional ethics which includes moral issues and virtues, social responsibilities of an engineer right quality of moral Leadership.

UNIT - I

Engineering Ethics: Senses of Engineering Ethics – Variety of Moral issues – Types of inquiry – Moral Dilemmas – Moral Autonomy – Kohlberg's Theory – Consensus and Controversy – Professions and Professionalism – Professional ideals and virtues.

UNIT – II

Engineering as Social Experimentation: Engineering as experimentation – Engineers as Responsible Experimenters – Research Ethics – Codes of Ethics – Industrial Standards – A Balanced Outlook on Law – The Challenger Case Study.

UNIT – III

Engineer's Responsibility for Safety: Safety and Risk – Assessment of Safety and Risk – Risk benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk – Chernobyl Case and Bhopal Case studies.

UNIT – IV

Responsibilities and Rights: Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property (IPR) – Discrimination.

UNIT – V

Global Issues: Multinational Corporations – Business Ethics – Environmental Ethics – Computer Ethics – Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Leadership – Sample Code of conduct.

Text Books

1. Mike martin and Roland Schinzinger. " Ethics in Engineering '', McGrow Hill, New York 2005.
2. Charles E Harris. Michael S Pritchard and Michael J Rabins. " Engineering Ethics – Concepts and Cases ", Thompson Learning 2000.

Reference Books

1. Charles D Fleddermann, " Engineering Ethics", Prentice Hall, New Mexico, 1999.
2. John R Baatright. "Ethics and the Conduct of Business", Pearson Education 2003.
3. Edmund G Seeabauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University press 2001.
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, 2003.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14144112	**PJ**	**Microprocessor & Microcontrollers Lab**	**0**	**0**	**3**	**50**	**50**	**2**

I. Microprocessor 8086

1. Arithmetic operation – Multi byte addition and subtraction,
2. Multiplication and Division – Signed and unsigned Arithmetic operation, ASCII – arithmetic operation.
3. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
4. By using string operation and Instruction prefix: Move Block, Reverse string, Sorting, Inserting, Deleting, Length of the string, String comparison.
5. Modular Program: Procedure, Near and Far implementation, Recursion.

II. Interfacing

6. 8259 – Interrupt Controller
7. 8279 – Keyboard Display
8. 8255 – PPI.
9. 8251 – USART

III. Micro Controller 8051

1. Reading and Writing on a parallel port
2. Timer in different modes
3. Serial communication implementation
4. Understanding three memory areas of 00 – FF (Programs using above areas)
5. Using external interrupts
6. Programs using special instructions like swap, bit/byte, set/reset etc
7. Programs based on short, page, absolute addressing

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14024113	PJ	Power Systems Simulation Lab	0	0	3	50	50	2

The following experiments are required to be conducted as compulsory experiments:

1. Power Angle Curve of a synchronous Generator
2. Determination of sequence reactances of 3-Φ Alternator
3. Determination of sequence reactances of 3-Φ Transformer
4. Operating Characteristics Of Over Current-Relay
5. Operating Characteristics Of Differential Relay
6. Simulation of 220KV Transmission Line
7. Symmetrical Fault Analysis at the Terminals of an Unloaded 3-Φ Alternator
8. Unsymmetrical Fault Analysis at the Terminals of an Unloaded 3-Φ Alternator

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted.

9. Simulation of Power Flow Using Gauss-Seidel Method for the 3-Bus System
10. Simulation of Power Flow Using Newton-Raphson Method for the 3-Bus System
11. Simulation of Power Flow Using Fast-Decoupled Method for the 3-Bus System
12. Swing Curves For Different Critical Clearing Times using SIMULINK
13. Economic Load Dispatch For Thermal Plant Simulation
14. Simulation of Z-Bus, Y-Bus Using Bus Algorithms

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14024201	PJ	Utilization of Electrical Power	3	1	0	30	70	3

Objectives:

It deals with the illumination, Electrical heating, Welding, Electrolytic Process and Electric Traction.

UNIT – I

Illumination: Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light, discharge lamps, MV and SV lamps – Comparison between tungsten filament lamps and fluorescent tubes- Basic principles of light control- Types of lighting schemes -factory lighting, street lighting and flood lighting.

UNIT-II

Electric Heating & Welding: Advantages and methods of electric heating - types and applications of electric heating equipment- Resistance ovens-induction heating – dielectric heating-Electric welding –resistance welding and arc welding techniques.

UNIT –III

Electric Drives: Types of Electric drives, Choice of motor, starting and running characteristics, Speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

UNIT –IV

Systems of Electric Traction and Track Electrification: Review of existing electric traction systems in India. Special features of traction motors, methods of electric braking – plugging, rheostatic braking and regenerative braking.

UNIT –V

Mechanism of Train Movement: Speed-time curves for different services – Trapezoidal and quadrilateral speed time curves – Calculations of tractive effort, power, specific energy consumption for a given run, effect of varying acceleration and braking retardation, adhesive weight and coefficient of adhesion.

Text Books

1. Utilization of Electric energy by E. Openshaw Taylor and V. V. L. Rao, Universities Press, 2009.
2. Art & Science of Utilization of Electrical Energy by H. Partab, Dhanpat Rai & Co, 2004.

Reference Books

1. Generation, Distribution and Utilization of Electrical energy by C. L. Wadhwa, New Age International (P) Limited, 1997.
2. Utilization of Electrical Power including Electric Drives and Electric Traction by N. V. Suryanarayana, New Age International (P) Limited, 1996.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14024202	**PJ**	**Power System Operation and Control**	**3**	**1**	**0**	**30**	**70**	**3**

Objective: This subject deals with Economic operation of Power Systems, Hydrothermal Scheduling and Modeling of Turbines, Generators and Automatic Controllers. It Emphasizes on Single Area and Two Area Load Frequency Control and Reactive Power Control.

UNIT I

Economic Operation: Optimal Operation of Thermal Power Units, - Heat Rate Curve – Cost Curve – Incremental Fuel and Production Costs, Input-Output Characteristics, Optimum Generation Allocation with Line Losses Neglected. Optimum Generation Allocation Including the Effect of Transmission Line Losses – Loss Coefficients, General Transmission Line Loss Formula.

UNIT II

Hydrothermal Scheduling: Optimal Scheduling of Hydrothermal System: Hydroelectric Power Plant Models, Scheduling Problems- Short Term Hydrothermal Scheduling Problem. Modeling of Turbine: First Order Turbine Model, Block Diagram Representation of Steam Turbines and Approximate Linear Models. Modeling of Governor: Mathematical Modeling of Speed Governing System – Derivation of Small Signal Transfer Function – Block Diagram.

UNIT III

Load Frequency Control-I: Necessity of Keeping Frequency Constant. Definitions of Control Area – Single Area Control – Block Diagram Representation of an Isolated Power System – Steady State Analysis Dynamic Response – Uncontrolled Case.

UNIT IV

Load Frequency Control-II:

Load Frequency Control of 2-Area System – Uncontrolled Case and Controlled Case, Tie-Line Bias Control. Proportional Plus Integral Control of Single Area and Its Block Diagram Representation, Steady State Response – Load Frequency Control and Economic Dispatch Control.

UNIT V

Power System Operation In Competitive Environment: Introduction – Restructuring models – Independent System Operator (ISO) – Power Exchange - Market operations – Market Power – Standard cost – Transmission Pricing – Congestion Pricing – Management of Inter zonal/Intra zonal Congestion - Electricity Price Volatility Electricity Price Indexes – Challenges to Electricity Pricing – Construction of Forward Price Curves – Short-time Price Forecasting

Text Books:

1. Power System Analysis Operation and Control by A. Chakravarthy and S. Halder, 3rd Edition, PHI, 2012.
2. Modern Power System Analysis by I. J. Nagrath & D. P. Kothari, Tata Mc Graw – Hill Publishing Company Ltd, 2nd Edition, 2003.
3. An Introduction to Reactive Power Control and Voltage Stability in Power Transmission Systems by Abhijit Chakrabarti, D. P. Kothari, A. K. Mukhopadhyay and Abhinandan De, Eastern Economy Edition, 2010.

Reference Books:

1. Power System Analysis and Design by J. Duncan Glover and M.S. Sharma., THOMSON, 3rd Edition, 2008.
2. Electric Power Systems by S. A. Nasar, Schaum Outline Series, Revised 1st Edition, TMH, 2005.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14024203	**PJ**	**Electrical Distribution Systems**	**3**	**1**	**0**	**30**	**70**	**3**

Objective: This course mainly focuses the distribution end of the power system in which the characteristics of load, classification of distribution systems, substations, automation of the distribution systems are introduced.

UNIT I

Load Modeling and Characteristics: Introduction to Distribution Systems, Load Modeling and Characteristics. Coincidence Factor, Contribution Factor Loss Factor - Relationship between the Load Factor and Loss Factor. Classification of Loads (Residential, Commercial, Agricultural and Industrial) and Their Characteristics.

UNIT II

Classification of Distribution Systems: Classification of Distribution Systems - Comparison of DC Vs AC–comparison of Under-Ground Vs Over - Head Distribution Systems- Requirements and Design Features of Distribution Systems-

Design Considerations of Distribution Feeders: Radial and Loop Types of Primary Feeders,-Voltage Levels, Feeder Loading, Basic Design Practice of the Secondary Distribution System.

Voltage Drop Calculations (Numerical Problems) In A.C. Distributors for The Following Cases: Power Factors Referred to Receiving End Voltage and With Respect to Respective Load Voltages.

UNIT III

Substations: Location of Substations: Rating of Distribution Substation, Service Area within Primary Feeders. Benefits Derived Through Optimal Location of Substations. Classification of Substations: Air Insulated Substations - Indoor & Outdoor Substations: Substations Layout Showing the Location of All the Substation Equipment. Bus Bar Arrangements in the Sub-Stations With Relevant Diagrams.

UNIT IV

Power Factor Improvement: Voltage Drop and Power-Loss Calculations: Derivation for Voltage Drop and Power Loss in Lines, Manual Methods of Solution for Radial Networks, Three Phase Balanced Primary Lines.

Causes of Low P. F -Methods of Improving P. F-Phase Advancing and Generation of Reactive KVAR Using Static Capacitors-Most Economical P.F. for Constant KW Load and Constant KVA Type Loads, Numerical Problems.

UNIT V

Distribution Automation: Distribution Automation (DA) – Project Planning – Definitions – Communication – Sensors – Supervisory Control and Data Acquisition (SCADA) – Consumer Information Service (CIS) – Geographical Information System (GIS) – Automatic Meter Reading (AMR) – Automation Systems.

Text Books:

1. Electric Power Distribution System, Engineering by Turan Gonen, Mc Graw-hill Book Company, 1986.
2. Electric Power Distribution by A. S. Pabla, Tata Mc Graw-hill Publishing Company, 4th edition, 1997.

Reference Books:

1. Electric Power Distribution Automation by Dr. M. K. Khedkar and Dr. G. M. Dhole, University Science Press, 2010.
2. Electrical Power Distribution Systems by V. Kamaraju, Jain Book Depot. 2012.
3. Electrical Power Systems for Industrial Plants by Kamalesh Das, JAICO Publishing House, 2008.
4. Hand Book of Electric Power Distribution by G. Ramamurthy, 2nd Edition, Universities Press, 2009.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14024204	PJ	Energy Auditing & Demand Side Management	3	1	0	30	70	3

(ELECTIVE-IV)

Objective

This subject is an extension of previous power systems and machines courses. It deals with the detailed analysis of energy conservation by various motors and loads. Also concerns about the different types of methods to improve system efficiency by means of power factor improvement and use of quality of conductors.

UNIT – I

Energy Auditing: Energy audit- definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes. Measurements in energy audits, presentation of energy audit results.

UNIT - II

Energy Efficient Motors: Energy efficient motors, constructional details, loss distribution, factors affecting efficiency, characteristics - variable speed, variable duty cycle systems, RMS hp- voltage variation-voltage unbalance- over motoring- motor energy audit.

UNIT – III

Power Factor Improvement: Power Factor – methods of improvement, location of capacitors, pf with non linear loads, effect of harmonics on pf, pf motor controllers.

UNIT – IV

Lighting and Energy Instruments: Good lighting system design and practice, lighting control ,lighting energy audit - Energy Instruments- watt meter, data loggers, thermocouples, pyrometers, lux meters, tongue testers ,application of PLC's.

UNIT – V

Demand Side Management: Introduction to DSM, concept of DSM, benefits of DSM, different techniques of DSM – time of day pricing, multi-utility power exchange model, time of day models for planning.

Load management:, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation, energy efficient equipment**.** Management and Organization of Energy Conservation awareness Programs.

Text Books:

1. Electrical Power distribution by A. S. Pabla, TMH, 5th edition, 2004.
2. Energy management by W.R. Murphy & G. Mckay Butter worth, Heinemann publications.
3. Energy management hand book by W. C. Turner, John Wiley and Sons.

References:

1. Energy management by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998.
2. Energy efficient electric motors by John. C. Andreas, Marcel Dekker Inc Ltd., 2nd Edition, 1995.
3. Energy management and good lighting practice: Fuel Efficiency- Booklet12 – EEO.
4. Recent Advances in Control and Management of Energy Systems by D. P. Sen, K. R. Padiyar, Indrane Sen, M. A. Pai, Interline Publisher, Bangalore, 1993.

5. Energy Demand – Analysis, Management and Conservation, Ashok V. Desai, Wiley Eastern, 2005.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14024205	PJ	SWITCH MODE POWER CONVERTERS	3	1	0	30	70	3

(Elective-IV)

UNIT I

Non-Isolated Dc-Dc Converters: Basic Types of Switching Power Supplies – Volt-Sec balance – Non-Isolated Switched-Mode DC-to-DC Converters – Buck Converter – Boost Converter – Buck-Boost Converter – Cuk Converter – SEPIC and Zeta Converters – Comparison of Non-Isolated Switched mode DC-to-DC Converters.

UNIT II

Isolated Dc-Dc Converters: Need of Transformer Isolations in high frequency Power conversion - Isolated Switched Mode DC-to-DC Converters – Single Switch Isolated DC-to-DC Converters – Forward, Fly back, Push-Pull, Flux Walking Phenomena, Half and Full Bridge Converters – Multi Switch Isolated DC-to-DC Converters –Comparison of Isolated and Non-Isolated Switched Mode DC-to-DC Converters.

UNIT III

Resonant Converters: Classification of Resonant converters-Basic resonant circuits-Series resonant circuit-parallel resonant circuits- Resonant switches, Concept of Zero voltage switching, principle of operation, analysis of M-type and L-type Resonant Buck and boost Converters.

UNIT IV

Dynamic Analysis of Dc-Dc Converters: Formulation of dynamic equations of buck and boost converters, State-Space Models, Averaged Models, linearization technique, small-signal model and converter transfer functions, Significance of Small Signal Models, Dynamical Characterization.

UNIT V

Controller Design: Review of frequency-domain analysis of linear time-invariant systems, controller specifications, Proportional (P), Proportional plus Integral (PI), Proportional, Integral plus Derivative controller (PID), selection of controller parameters for Isolated and Non-Isolated DC -DC Converters.

Text Books:

1. Introduction to Modern Power Electronics by Andrzej M. Trzynadlowski, 2nd Edition, WILEY-INDIA Edition, 2012.
2. Fundamentals of Power Electronics by Robert Erickson and Dragon Maksimovic, Springer Publications, 2nd Edition, 2001.
3. Fundamentals of Power Electronics by Issa Batarseh, John Wiley Publications, 2009.

Reference Books:

1. Elements of Power Electronics by Philip T.Krein, Oxford University Press, 1997.
2. Power Electronics by L. Umanand, Tata Mc-Graw Hill, 2004.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
14024206	PJ	ELECTRICAL MACHINE DESIGN	3	1	0	30	70	3

(ELECTIVE-IV)

Objective: This subject introduces the design specifications of Electrical Machines. It deals with basic design considerations of transformers, rotating machines - D.C. Machines, Three phase Induction motors Synchronous machines and Cooling of Machines.

UNIT I

The Design problem – Basic considerations, design specifications, ISI specifications, design constraints, specification of transformers, rotating machines.

Design of transformers – Types of transformer – core construction, output equation, principle of design of core, windings, yoke main dimensions (H & W) for single phase: core type, shell type. 3-phase – core type transformers estimation of no load current of transformer.

UNIT II

General concepts of rotating machines – Output equation of dc machines, ac machines, separation of D & L, choice of specific loadings.

Design of D.C machines – Choice of no. of poles, selection of no. of armature slots, choice of winding, estimation of conductor cross section of armature, design of field systems: tentative design of field winding of dc machines.

UNIT III

Design of 3-phase induction motor – Separation of D & L, ranges of Ampere conductors and B_{av}.

Stator design – Selection of no of stator slots, turns per phase, design of conductor cross section.

Rotor design - Selection of no of rotor slots, principles of design of squirrel cage rotor, design of slip ring rotor.

UNIT IV

Design of synchronous machines – Separation of D & L, choice of Ampere conductors & B_{av} - Short Circuit Ratio (SCR) and its significance.

Armature design – choice of no. of stator (Armature) slots, turns/phase, conductor cross section for both salient pole and cylindrical pole machines.

UNIT V

Heating & Cooling of electrical machines: Theory of Solid body heating, heating time constant- cooling time constant, elementary treatment of cooling and heating time curves.

Cooling of machines: Volume of coolant required, types of coolants, cooling methods of transformer- hydrogen cooling, transformer tank design.

Text Books

1. Electrical machine design by A. K. Sawhney, Dhanpatrai & Sons.
2. Electrical System Design by M. K. Giridharan, I. K. International Publishing House Pvt. Ltd., 2011.

3. Design of Electrical Machines by V. N. Mittle and A. Mittal, Standard Publishers Distributors, 4th Edition, 1998.

Reference Books

1. Principles of Electrical machine design by M. G. Say & Parker Smith.
2. Electrical machine design by Balbir Singh by Khanna Publishers.