VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

An Autonomous Institution

Aziznagar Gate, C.B. Post, Hyderabad – 500075, Telangana, India.

B.Tech Syllabus (R-18)

Department of

Electrical & Electronics Engineering

R18 COURSE STRUCTURE FOR B.TECH I YEAR

B. Tech. I Year I Semester

S.No.	Course Category	Course Title	L	T	P	Credits
1.	A21001	Mathematics-I	3	1	0	4.0
2.	A21002	Chemistry	3	1	0	4.0
3.	A21004	Chemistry Lab	0	0	3	1.5
4.	A21501	English	2	0	0	2.0
5.	A21081	English Language Skills Lab (ELSL)	0	0	2	1.0
6.	A21083	Programming for Problem Solving-I	2	0	0	2.0
7.	A21381	Programming for Problem Solving Lab-I	0	0	2	1.0
8.	A21581	Engineering Workshop	0	1	3	2.5
Total			**10**	**3**	**10**	**18**

B. Tech. I Year II Semester

S.No.	Course Category	Course Title	L	T	P	Credits
1.	A22006	Mathematics-II	3	1	0	4.0
2.	A22007	Engineering Physics	3	1	0	4.0
3.	A22302	Engineering Physics Lab	0	0	3	1.5
4.	A22202	Basic Electrical Engineering	3	0	0	3.0
5.	A22502	Basic Electrical Engineering Lab	0	0	2	1.0
6.	A22084	Engineering Graphics & Modeling	1	0	3	2.5
7.	A22282	English Communication Skills Lab (ECSL)	0	0	2	1.0
8.	A22085	Programming for Problem Solving-II	2	0	0	2.0
9	A22582	Programming for Problem Solving Lab-II	0	0	2	1.0
Total			**12**	**2**	**12**	**20**

R18 COURSE STRUCTURE FOR B.TECH II YEAR

B. Tech. II Year I Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	A23011	Complex Analysis & Fourier Transforms	3	0	0	3
2	A23010	Professional Communication	2	0	0	2
3	A23203	Power Systems –I	3	0	0	3
4	A23204	Network Analysis	3	0	0	3
5	A23205	Electro Magnetic Fields	3	0	0	3
6	A23206	Electrical Machines-I	3	0	0	3
7	A23283	Basic Simulation Tools Lab	0	0	0	1
8	A23284	Electric Circuits Lab	0	0	0	1
9	A23MC1	Environmental Science	2	0	0	0
		Total	**19**	**0**	**4**	**19**

B. Tech. EEE II Year II Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	A24014	Numerical Methods and Partial Differential Equations	3	0	0	3
2	A24109	Fluid Mechanics and Hydraulic Machinery	3	0	0	3
3	A24406	Electronic Devices and Circuits	3	0	0	3
4.	A24208	Electrical Machines-II	4	0	0	4
5	A24209	Power Systems - II	3	0	0	3
6	A24210	Control Systems	3	0	0	3
7	A24285	Electrical Machines-I Lab	0	0	2	1
8	A24484	Electronic Devices and Circuits Lab	0	0	2	1
9	A24MC1	Gender Sensitization	2	0	0	0

Total	**21**	**0**	**4**	0

R18 COURSE STRUCTURE FOR B.TECH III YEAR

B. Tech. EEE III Year I Semester

S.No	Course Category	Course Title	L	T	P	Credits
1	A25016	Managerial Economics and Financial Analysis	3	0	0	3
2	A25412	Switching Theory and Logic Design	3	0	0	3
3	A25212	Electrical Machines-III	3	0	0	3
4	A25213	Power Electronics	3	0	0	3
5	A25214/ A25215	Electrical Energy Conservation and Auditing/ Electrical Estimation and Costing	3	0	0	3
6	A25216/ A25217	Non-Conventional Energy Sources / Fundamentals of Electrical Power Generation and Protection	3	0	0	3
7	A25287	Electrical Machines-II Lab	0	0	2	1
8	A25087	Advanced Communication Skills Lab	0	0	2	1
9	A25TP1	Quantitative Methods & Logical Reasoning	2	0	0	1
		Total	**20**	**0**	**4**	**21**

B. Tech. EEE III Year II Semester

S.No	Course Category	Course Title	L	T	P	Credits
1	A26219	Electrical Measurements & Instrumentation	3	0	0	3
2	A26220	Computer Methods in Power Systems	3	0	0	3
3	A26221	Power Semiconductor Drives	3	0	0	3
4	A26222	Switch Gear and Protection	3	0	0	3
5	A26223/ A26224	Integrated Circuit and Applications/ Artificial Intelligence Techniques in Electrical Engineering	3	0	0	3
6	A26225/ A26226	Energy Auditing and Conservation/ Principles of Electric Power Utilization	3	0	0	3

7	A26288	Control Systems and Simulation Lab	0	0	2	1
8	A26289	Power Electronics and Simulation Lab	0	0	2	1
9	A26TP1	Personality Development &Behavioral Skills	2	0	0	1
Total			**20**	**0**	**4**	**21**

R18 COURSE STRUCTURE FOR B.TECH IV YEAR

B. Tech. EEE IV Year I Semester

S.No	Course Category	Course Title	L	T	P	Credits
1	A27428	Microprocessors and Interfacing Devices	3	0	0	3
2	A27227	Power Systems Operation and Control	3	0	0	3
3	A27228/ A27229	Electric Vehicles / Smart Grids	3	0	0	3
4	A27230/ A27231	Electrical Distribution Systems/ Industrial Electrical Systems	3	0	0	3
5	A27232/ A27233	Electric Vehicles and Hybrid Vehicles/ Energy Storage Systems	3	0	0	3
6	A27490	Microprocessors and Interfacing Lab	0	0	2	1
7	A27290	Electrical Measurements Lab	0	0	2	1
8	A272P1	Mini Project	0	0	0	3
Total			**15**	**0**	**4**	**20**

B. Tech. EEE IV Year II Semester

S.No	Course Category	Course Title	L	T	P	Credits
1	A28234	Utilization of Electrical Energy	3	0	0	3
2	A28235	Renewable Energy and Energy Storage Technologies	3	0	0	3
3	A282TS	Technical Seminar	2	0	0	2
4	A282CV	Comprehensive Viva-Voce	0	0	0	2
5	A282P2	Major Project	0	0	0	10
Total			**8**	**0**	**0**	**20**

R18 COURSE STRUCTURE (for FAST TRACK)

B. Tech. III Year I Semester

S.No.	Course Category	Course Title	L	T	P	Credits
1	H&S – 6	Managerial Economics and Financial Analysis	3	0	0	3
2	ES – 9	Switching Theory and Logic Design	3	0	0	3
3	PC – 8	Electrical Machines-III	3	0	0	3
4	PC – 9	Power Electronics	3	0	0	3
5	PE – 1	Electrical Energy Conservation and Auditing/ Electrical Estimation and Costing	3	0	0	3
6	OE – 1	Non-Conventional Energy Sources / Fundamentals of Electrical Power Generation and Protection	3	0	0	3
7	PC Lab – 5	Electrical Machines -II Lab	0	0	2	1
8	PC Lab – 6	Advanced Communication Skills Lab	0	0	2	1
9	MC – 3	Quantitative Methods & Logical Reasoning	2	0	0	1
		Total	**20**	**0**	**4**	**21**

B. Tech. III Year IISemester

S.No.	Course Category	Course Title	L	T	P	Credits
1	PC – 10	Electrical Measurements & Instrumentation	3	0	0	3
2	PC – 11	Computer Methods in Power Systems	3	0	0	3
3	PC – 12	Power Semiconductor Drives	3	0	0	3
4	PC – 13	Switch Gear and Protection	3	0	0	3
5	PE – 2	Integrated Circuit and Applications / Artificial Intelligence Techniques in Electrical Engineering	3	0	0	3
6	OE – 2	Energy Auditing and Conservation/ Principles of Electric Power Utilization	3	0	0	3
7	PC Lab – 7	Control Systems and Simulation Lab	0	0	2	1
8	PC Lab – 8	Power Electronics and Simulation Lab	0	0	2	1
9	MC – 4	Personality Development &Behavioural Skills	2	0	0	1
10	PC -16	Utilization of Electrical Energy	3	0	0	3
		Total	**23**	**0**	**4**	**24**

R18 COURSE STRUCTURE (for FAST TRACK)

B. Tech. IVYear ISemester

S. No.	Course Category	Course Title	L	T	P	Credits
1	PC -14	Microprocessors and Interfacing Devices	3	0	0	3
2	PC -15	Power Systems Operation and Control	3	0	0	3
3	PE - 3	Electric Vehicles/ Smart Grids	3	0	0	3
4	PE – 4	Electrical Distribution Systems/ Industrial Electrical Systems	3	0	0	3
5	OE-3	Electric Vehicles and Hybrid Vehicles/ Energy Storage Systems	3	0	0	3
6	PC Lab – 9	Microprocessors and Interfacing Lab	0	0	2	1
7	PC Lab – 10	Electrical Measurements Lab	0	0	2	1
8	PW-1	Mini Project		0	0	3
9	PC - 17	Renewable Energy and Energy Storage Technologies	3	0	0	3
Total			**18**	**0**	**4**	**23**

B. Tech. IV Year II Semester

S.No.	Course Category	Course Title	L	T	P	Credits
1	TS	Technical Seminar	2	0	0	2
2	CVV	Comprehensive Viva-Voce	0	0	0	2
3	PW-2	Major Project	0	0	0	10
Total			**2**	**0**	**0**	**14**

MATHEMATICS I
(Matrices and Calculus)

I Year I Semester

L	T	P	C
3	1	0	4

Course Outcomes:

1. Write the matrix representation of system of linear equations and identify the consistency of the system of equations.
2. Find the Eigen values and Eigen vectors of the matrix and discuss the nature of the quadratic form.
3. Analyze the convergence of sequence and series.
4. Discuss the applications of mean value theorems to the mathematical problems, Evaluation of improper integrals using Beta and Gamma functions.
5. Examine the extreme of functions of two variables with/ without constraints.

UNIT-I:
Matrices and Linear System of Equations:
Matrices and Linear system of equations: Real matrices – Symmetric, skew - symmetric, Orthogonal. Complex matrices: Hermitian, Skew – Hermitian and Unitary. Rank-Echelon form, Normal form. Solution of Linear Systems – Gauss Elimination, Gauss Jordan & LU Decomposition methods.

UNIT-II:
Eigen Values and Eigen Vectors:
Eigen values, Eigen vectors – properties, Cayley-Hamilton Theorem (without Proof) - Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonolization of matrix- Quadratic forms: Reduction to Canonical form, Nature, Index, Signature.

UNIT-III:
Sequences & Series:
Basic definitions of Sequences and series, Convergence and divergence, Ratio test, Comparison test, Cauchy's root test, Raabe's test, Integral test, Absolute and conditional convergence.

UNIT-IV:
Beta & Gamma Functions and Mean Value Theorems:
Gamma and Beta Functions-Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions.
Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Generalized Mean Value theorem (all theorems without proof) – Geometrical interpretation of Mean value theorems.

UNIT-V:
Functions of Several Variables:
Partial Differentiation and total differentiation, Functional dependence, Jacobian Determinant- Maxima and Minima of functions of two variables with constraints and without constraints, Method of Lagrange Multipliers.

Textbooks:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 36th Edition, 2010.
2. Advanced Engineering Mathematics, Jain &Iyengar, Narosa Publications.

Reference Books:

1. Calculus and Analytic Geometry, G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.
2. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
3. Advanced Engineering Mathematics (2nd Edition), Michael D. Greenberg.

CHEMISTRY

I Year I Semester

L	T	P	C
3	1	0	4

Course Outcomes:

1. Acquire knowledge of atomic, molecular and electronic changes related to conductivity.
2. Apply the various processes of treatment of water for both domestic and industrial purpose.
3. Apply the knowledge of electrode potentials for the protection of metals from corrosion.
4. Analyze the major chemical reactions that are used in the synthesis of compounds.
5. Apply the knowledge of polymers in every day's life.

UNIT- I:

Atomic and Molecular Structure:

Introduction, Concept of atomic and molecular orbitals, LCAO, Molecular orbitals of di-atomic molecules, Molecular orbital energy level diagrams of diatomic molecules (N_2, O2 & F_2). Pi-molecular orbitals of butadiene and benzene.

Crystal field theory (CFT): Crystal field theory, Crystal field splitting patterns of transition metal ion d-orbital- tetrahedral, octahedral and square planar geometries.

UNIT- II:

Water Technology:

Hardness of water, expression of hardness ($CaCO_3$ equivalent), units and types of hardness. Estimation of temporary and permanent hardness of water by EDTA method. Numerical problems based on hardness of water. Potable water: characteristics, treatment of water for domestic supply. Desalination of brackish water: reverse osmosis. Alkalinity of water and its determination. Boiler feed water and its treatment: Internal treatment (colloidal, phosphate calgon conditioning of water). External treatment (ion –exchange process).

UNIT- III:

Electrochemistry and Corrosion:

Electrode, electrode potential, galvanic cell, cell reactions and cell notation, cell EMF, types of electrodes (Calomel electrode and Quinhydrone electrode),Determination of P^H using quinhydrone electrode. Nernst equation, Numerical problems.

Batteries: Introduction to cell and battery, Primary (lithium cell) and secondary cells, (lead-Acid cell, and Lithium ion cells). Fuel cells – Hydrogen – Oxygen fuel cell, advantages and engineering applications of fuel cells.

Corrosion: Introduction, types of corrosion: chemical and electrochemical corrosion, factors affecting the rate of corrosion: nature of the metal, position of metal in galvanic series, purity of metal, nature of corrosion product, nature of environment: effect of temperature, effect of pH, humidity. Corrosion control methods: Cathodic protection: sacrificial anode method and impressed current cathode method. Protectivecoatings: metallic coatings (anodic and cathodic), methods of application on metals, electroplating (of copper), electroless plating (of Ni), organic coatings- paints.

UNIT-IV:

Stereochemistry:

Structural isomers and stereoisomers, configurations, symmetry and chirality, enantiomers, diastereomers, optical activity. Conformations of cyclic (cyclohexane) and acyclic systems (Ethane).

Organic Reactions and Synthesis of a Drug Molecule:

Introduction to reactions involving substitution (SN1 & SN2), addition (addition of HBr to propene, Markownikoff and Anti Markownikoff addition), elimination, oxidation (oxidation of alcoholsusing $KMnO_4$& CrO_3), reduction (reduction of carbonyl compounds by $LiAlH_4$& $NaBH_4$). Synthesis of a commonly used drug molecule- paracetamol and Asprin.

UNIT-V:

Polymer Chemistry:

Introduction, classification of polymers, types of polymerization (addition and condensation, mechanisms not included). Plastics- types of plastics -thermoplastics and thermosetting plastics.Preparation, properties and engineering applications of PVC, Teflon and Bakelite. Fibers: Nylon 6, 6 and Terelene (Dacron). Elastomers: natural rubber, structure, vulcanization. Synthetic rubbers: Buna-S, Butyl rubber &Thikol rubber. Conducting polymers: classification and applications.

Biodegradable polymers:Types, examples: Polyhydroxy butyrate (PHB) ,Poly-Hydroxybutyrate-co-bHydroxyvalerate (PHBV) ,Polyglycolic acid (PGA) , Polylactic acid (PLA) ,Poly (Î-caprolactone) (PCL). Applications of biodegradable polymers.

Textbooks:

1. Engineering Chemistry, P.C Jain & Monica Jain, DhanpatRai Publications, 2017.
2. Engineering Chemistry, BharathiKumari. Y, VGS Publications, 2018.

Reference Books:

1. March's Advanced Organic Chemistry, Smith, Wiley publications, 2017.
2. Engineering Chemistry, Shiva Sankar, TMH Publications, 2010.

CHEMISTRY LAB

I Year I Semester

L	T	P	C
0	0	3	1.5

Course Outcomes:

1. Determination of parameters like hardness, alkalinity and chloride content in water.
2. Estimation of rate constant of a reaction from concentration-time relationships.
3. Determination of physical properties like adsorption, surface tension and viscosity.
4. Synthesize a small drug molecule and analyze a salt sample.
5. Calculation of strength of compound using instrumentation techniques.

Choice of 10-12 experiments from the following:

1. Estimation of total hardness of water by EDTA method.
2. Determination of alkalinity of water.
3. Determination of chloride content of water.
4. Estimation of HCl by conductometric titration.
5. Estimation of mixture of acids by conductometric titration.
6. Estimation of HCl by potentiometric titration.
7. Estimation of Fe^{2+} by potentiometry using $KMnO_4$.
8. Determination of the rate constant of a reaction.
9. Determination of surface tension.
10. Determination of viscosity of a lubricant.
11. Chemical analysis of a salt.
12. Synthesis of a polymer/drug.
13. Adsorption of acetic acid by charcoal.
14. Determination of Saponification /acid value of an oil.

Reference Books:

1. Practical Engineering Chemistry, Mukkanti, B.S. Publications, 2010.
2. Volga's Qualitative Inorganic Chemistry, PEAR Publications 2010.

ENGLISH

I Year I Semester

L	T	P	C
2	0	0	2

Course Outcomes:

1. Infer the importance of scientific discoveries in promoting social responsibilities.
2. Comprehend the given texts and respond appropriately for technical and professional purposes.
3. Communicate confidently and transfer information into various forms of writing.
4. Understand the importance of health and nutrition for a better society.
5. Present various forms of business writing skills for successful careers.

UNIT-I:

'The Raman Effect' from the prescribed textbook **'English for Engineers'**

Grammar : Articles & Prepositions

Reading : Reading and Its Importance- Techniques for Effective Reading.

Writing : Organizing principles of paragraphs in documents.

Vocabulary: The concept of word Formation, synonyms, antonyms, and standard abbreviations.

UNIT-II:

'Ancient Architecture in India' from the prescribed textbook **'English for Engineers'**

Reading : Improving Comprehension Skills – Techniques for good comprehension

Writing : Sentence Structures, Use of phrases and clauses in sentences

Writing Formal Letters-Eg. Letter of Complaint, Letter of Requisition, Job Application with Resume.

Vocabulary: Root words and acquaintance with prefixes and suffixes from foreign languages in English, to form derivatives

UNIT-III:

'Blue Jeans' from the prescribed textbook **'English for Engineers'**

Grammar: Tenses: Types and uses.

Reading : Sub-skills of Reading- Skimming and Scanning

Writing : Identifying Common Errors in Writing

Subject-Verb agreement in number, gender and person

Information Transfer-Process writing

UNIT-IV:

'What Should You Be Eating' from the prescribed textbook **'English for Engineers'**

Reading : Intensive Reading and Extensive Reading

Writing : Nature and Style of Sensible Writing

Describing & Defining

Identifying common errors in writing

UNIT-V:

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook **'English for Engineers'**

Vocabulary : Technical Vocabulary and their usage

Reading : Reading Comprehension-Exercises for Practice

Writing : Cohesive Devices

Précis Writing

Technical Reports-Introduction, Characteristics of a Report – Categories of Reports, Formats- Structure of Reports (Manuscript Format) –Types of Reports - Writing a Report.

Textbooks:

1. English for Engineers,Sudarshana, N.P. and Savitha, C. Cambridge University Press, 2018.

Reference Books:

1. Effective Technical communication, Muhammed Rizvi, TMH, 2008.
2. Advanced English Grammar, Hewings, Cambridge University Press, 2010.

ENGLISH LANGUAGE SKILLS LAB

I Year I Semester

L	T	P	C
0	0	2	1

Course Outcomes:

1. Reproduce speech sounds and improve fluency in language.
2. Understand syllables and consonant clusters for appropriate pronunciation.
3. Exhibit effective professional skills with rhetoric eloquence.
4. Deliver enthusiastic and well-practiced presentation.
5. Learn Task-Based Language Learning (TBLL) through various language learning activities effectively.

Exercise-I:
CALL Lab:
Introduction to Pronunciation- Speech Sounds, Vowels and Consonants- Practice for Listening **ICS Lab**:
Ice-Breaking activity and JAM session

Exercise-II:
CALL Lab:

Silent Letters, Consonant Clusters, Homographs **ICS**
Lab:
Common Everyday Situations: Conversations and Dialogues

Exercise-III:
CALL Lab:
Syllables
ICS Lab:
Communication at Workplace, Social and Professional Etiquette

Exercise-IV:
CALL Lab:
Word Accent and Stress Shifts **ICS**
Lab:
Formal Presentations, Visual Aids in Presentations

Exercise-V:
CALL Lab:
Intonation, Situational dialogues for practice **ICS**
Lab:
Interviews, Types of Interviews

Reference Books:

1. A Textbook of English Phonetics for Indian Students, T. Balasubramanian, Macmillan Publishers, 2010.
2. Speaking English Effectively, Mohan, Macmillan Publishers, 2010.

PROGRAMMING FOR PROBLEM SOLVING-I

I Year I Semester

L	T	P	C
2	0	0	2

Course Outcomes:

1. Design Algorithms and Flowcharts for real world applications using 'C'.
2. Know the usage of various operators in Program development.
3. Design programs involving decision and iteration structures.
4. Apply the concepts code reusability using Functions.
5. Analyze various searching and sorting techniques using Arrays.

UNIT-I:
Problem Solving Using Computers: Introduction, Algorithms, Flowcharts and Pseudo code, Applications of C language.
Overview of C Language: Introduction, Salient Features of C Language, Structure of a "C" Program.

C Language Preliminaries: Keywords and Identifiers, Constants, Variables, Data Types, and Input / Output Statements with suitable illustrative "C" Programs.

UNIT-II:

Operators: Assignment Operators, Relational and Logical Operators, Increment and Decrement Operators, Bitwise Operators, Ternary Operator, Type Conversion, Precedence and Associativity with suitable illustrative "C" Programs.

UNIT-III:

Statements in C:

Conditional/Decision Statements: if, if-else, Nested if-else, else-if ladder, and Switch-Statement with suitable illustrative "C" Programs.

Loop Control Statements: while, do-while and for with suitable illustrative "C" Programs.

UNIT-IV:

Functions: Introduction to Functions, benefits of functions, types of functions, Function calls, return vs exit (), Parameter Passing mechanism: Call-by-Value, Recursion, Storage Classes.

UNIT-V:

Arrays: Introduction to Arrays, One-Dimensional Arrays, Two-Dimensional Arrays, Arrays and Functions.
Searching and Sorting: Linear Search, Binary Search, Bubble Sort, Insertion Sort.

Textbooks:

1. COMPUTER SCIENCE: A Structured Programming Approach Using C, B.A.Forouzon and R.F. Gilberg, Third edition, 2016.
2. C and Data Structures, Ashok N. Kamthane, Pearson Education.

Reference Books:

1. Problem Solving Using C, M.T. Somashekara, PHI, 2nd Edition 2009.
2. Computer Fundamentals and Programming in C, A.K.Sharma, 2nd Edition, University Press.
3. Programming in C 2/e, PradipDey and Manas Ghosh, Oxford University Press, 2nd Edition 2011.
4. The Fundamentals of Computers, Rajaraman V., 4th Edition, Prentice Hall of India, 2006.
5. Programming in C, R S Bichker, University Press, 2012.

PROGRAMMING FOR PROBLEM SOLVING LAB – I

I Year I Semester

L	T	P	C
0	0	2	1

Course Outcomes:

1. Apply the specification of syntax rules for numerical constants and variables, data types.
2. Know the Usage of various operators and other C constructs.
3. Design programs on decision and control constructs.
4. Develop programs on code reusability using functions.
5. Implement various searching and sorting techniques using arrays.

Week 1:

Ubuntu and Linux Commands.

Week 2:
Designing of flowcharts and algorithms using raptor tool 1.
Areas of Polygons.
2. Calculation of Simple and Compound Interest.
3. Swapping of Two numbers with and without temporary variable.
4. Checking whether a number is even or odd.
5. Sum of first 'n' natural numbers.
6. Checking a number whether it is divisible by any given number.
7. Evaluation of mathematical expressions.
8. Programs using scanf( ) and printf( ) statements.

Week 3:
Programs on operators (Minimum 4 Programs)

Week 4, 5 & 6:
Programs on Conditional Statements. (Minimum 12 Programs)

Week 7,8& 9:
Programs on Control Statements. (Minimum 12 Programs)

Week 10 &11:
Programs on Functions. (Minimum 6 Programs)

Week 12:
Programs on One Dimensional Arrays. (Minimum 3 Programs)

Week 13:
Programs on Two Dimensional Arrays. (Minimum 2 Programs)

Week 14:
Implementation of Linear Search and Binary Search.

Week 15:
Implementation of Bubble Sort and Insertion Sort.

Week 16:
Review

ENGINEERING WORKSHOP

I Year I Semester

L	T	P	C
0	1	3	2.5

Course Outcomes:

1. Understanding the tools and methods of using to fabricate engineering components
2. Applying the measuring techniques to verify the dimensional accuracy
3. Evaluating various methods and trades of workshop in the component building

(i) Lectures & videos:

Detailed contents

1. Manufacturing Methods- Metal Forming, Machining, Advanced manufacturing methods (2 lectures)
2. CNC machining, Additive manufacturing (2 lectures)
3. Fitting operations & power tools (1 lecture)
4. House wiring (1 lecture)
5. Carpentry (1 lecture)
6. Plastic moulding(1 lecture)
7. Metal casting (1 lecture)
8. Welding (1 Lecture)

(ii) Workshop Practice:

Detailed contents:

1. Machine shop (Lathe machine)
2. Fitting shop
3. Carpentry
4. House Wiring
5. Welding shop (Arc welding)
6. Tin Smithy

Reference Books:

1. Elements of Workshop Technology, Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Manufacturing Engineering and Technology, Kalpakjian S. and Steven S. Schmid, 4th edition, Pearson Education India Edition, 2002.

MATHEMATICS - II
(Ordinary Differential Equations and Vector Calculus)

I Year II Semester

L	T	P	C
3	1	0	4

Course Outcomes:

1. Classify the various types of differential equations of first order and first degree and apply the concepts of differential equations to the real world problems.
2. Solve higher order differential equations and apply the concepts of differential equations to the real world problems.
3. Find the Laplace Transform of various functions and apply to find the solutions of differential equations.
4. Evaluate the multiple integrals and identify the vector differential operators physicallyin engineering problems.
5. Evaluate the line, surface and volume integrals and converting them from one to another by using vector integral theorems.

UNIT-I:

First order Ordinary Differential Equations and their Applications:

Formation of Differential equations, Differential equations of first order and first degree: exact, linear and Bernoulli, Applications of ODE: Newton's law of cooling, law of natural growth and decay, orthogonal trajectories.

UNIT-II:

Higher Order Linear Differential Equations:

Linear differential equations of second and higher order with constant coefficients, RHS term of the type f(X) $= e^{ax}, \sin ax, \cos axand\ x^k, e^{ax}V(x), x^kV(x)$. Method of variation of parameters.

UNIT-III:

Laplace Transforms:

Laplace transform of standard functions – Inverse transform – first shifting Theorem, Transforms of derivatives and integrals – Unit step function – second shifting theorem – Dirac's delta function – Convolution theorem – Periodic function - Differentiation and integration of transforms – Application of Laplace transforms to ordinary differential equations.

UNIT-IV:

Multiple Integrals & Vector Differentiation:

Multiple integrals - double and triple integrals – change of order of integration (Only Cartesian form)- change of variables (Cartesian to Polar for double integral, Cartesian to Spherical for triple integral). Gradient- Divergence- Curl and their related properties - Potential function - Laplacian and second order operators.

UNIT-V:

Vector Integration:

Line integral, work done, Surface and Volume integrals. Vector integrals theorems: Green's, Stoke's and Gauss Divergence Theorems (Only Statements & their Verifications).

Textbooks:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 36th Edition, 2010.
2. Advanced Engineering Mathematics, Jain &Iyengar, Narosa Publications.

Reference Books:

1. Calculus and Analytic Geometry, G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.
2. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
3. Advanced Engineering Mathematics (2nd Edition), Michael D. Greenberg.

ENGINEERING PHYSICS

I Year II Semester

L	T	P	C
3	1	0	4

Course Outcomes:

1. Interpret the forced damped harmonic oscillations and Transverse waves.
2. Identify various optical phenomena of light.
3. Explain the working principle of optical fibers and lasers.
4. Describe the crystalline structures of solids.
5. Classify magnetic and dielectric behavior of materials.

UNIT-I:

Oscillations and Waves:

Simple harmonic motion, equation of simple harmonic motion, Simple Pendulum, Torsional pendulum, damped harmonic motion-heavy, critical and light damping, energy decay in a damped harmonic oscillator, power dissipation, quality factor. Forced vibration, steady state motion of forced damped harmonic oscillator, Amplitude of forced vibration, Resonance, Electrical analogy of simple harmonic oscillator. Transverse waves in a stretched string, differential equation, reflection and transmission of transverse waves at a boundary, standing waves.

UNIT-II:

Wave Optics:

Huygen's principle, superposition of waves, coherence and methods to produce coherent sources, young's double slit experiment, interference by parallel thin film by reflection, Newton's rings. Diffraction: Introduction, Fraunhofer diffraction at single slit, plane diffraction Gratings and its resolving power. Polarization: Introduction, methods of polarization, double refraction- Nicol Prism.

UNIT-III:

Fiber Optics and Lasers:

Introduction, total internal reflection, acceptance angle and numerical aperture, losses associated with optical fibers, step and graded index fibers, applications of optical fibers. Introduction to interaction of radiation with matter: stimulated absorption, spontaneous emission and stimulated emission, Einstein's coefficients and their relation, characteristics of a laser, components of a laser: active medium, pumping source, optical resonator. Population inversion, Construction and working of Ruby laser, He-Ne laser and Semiconductor laser. Applications of lasers. **UNIT-IV:**

Crystal Structures, Crystal Planes and XRD:

Space lattice – Unit cell – Lattice parameter – Crystal systems – Bravais lattices, Atomic radius – Coordination number - Structures and Packing fractions of Simple Cubic – Body Centered Cubic – Face Centered Cubic crystals. Miller Indices for Crystal planes and directions – Inter planar spacing of orthogonal crystal systems –Diffraction of X-rays by crystal planes and Bragg's law–Powder method – Applications of X-ray diffraction.

UNIT-V:

Dielectric and Magnetic properties of Materials:

Dielectric polarization, permittivity and dielectric constant, polar and non-polar dielectrics, Electronic, Ionic and Orientation Polarization – Calculation of electronic and Ionic Polarizability – Internal fields –

Claussius – Mossotti equation – Basic concepts of Piezo, Pyro and Ferro electricity, applications of dielectrics.Introduction to magnetism – Basic definitions - Origin of magnetic moment, Bohr magneton – Classification of magnetic materials (Dia, Para and Ferro)- Domain theory of ferromagnetism, Hysteresis curve – Soft and Hard magnetic materials – properties of Anti ferro and Ferri magnetic materials, applications.

Textbooks:

1. Engineering Physics, P K Palanisamy, Scietech publication.
2. Engineering Physics, Hitendra K Malik, A K Singh, McGraw Hill Edition (I) Private Limited.

Reference Books:

1. A Text book of Engineering Physics, M N Avadhanulu, P G Kshirsagar; S Chand.
2. Physics Volume I & II, Resnick and Halliday, John Wiley and sons, Inc.

ENGINEERING PHYSICS LAB

L	T	P	C
0	0	3	1.5

I Year II Semester

Course Outcomes:

1. Characterize the mechanical properties of given material.
2. Demonstrate various types of oscillation and rotational motion to determine mechanical parameters.
3. Evaluate the magnetic Induction along the axis of current carrying coil.
4. Apply optical phenomena to characterize optical sources and components.
5. Characterize LCR and RC circuits.

List of Experiments

1. Torsional pendulum: Determination of Rigidity modulus of a material.
2. Fly-wheel: Determination of moment of Inertia.
3. Melde's Experiment: Determination of frequency of electrically maintained tuning fork.
4. Sonometer: Determination of velocity of transverse wave in a string.
5. Newton's rings: Determination of the radius of curvature of the given lens by forming Newton's rings.
6. Diffraction grating: Determination of wavelength of given light using diffraction grating.
7. Dispersive power: Determination of dispersive power of the prism material using spectrometer.
8. Single Slit Diffraction using Lasers- Determination of Wavelength of a Monochromatic Source.
9. Stewart & Gee's experiment: Determination of magnetic field along the axis of current carrying coil.
10. LCR Circuit: Determination of Resonance frequency of forced electrical oscillator.
11. RC- Circuit: Determination of time constant of RC-circuit.
12. Optical Fiber: Determination of Numerical Aperture of Optical Fiber.

Note: Any 10 experiments are to be performed

I Year II Semester

BASIC ELECTRICAL ENGINEERING

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the fundamentals of basic circuit components and their characteristics.
2. Analyze basic electrical circuits with A.C excitation.
3. Understand the concepts of magnetic circuits and transformers.
4. Acquire the basic concepts of electrical motors.
5. Understand the concept of A.C generator and low voltage electrical installations.

UNIT I:

Introduction to Electrical Engineering and DC Circuits:

Basic definitions, types of elements, types of sources, Kirchhoff's Laws, resistive networks, inductive networks, series, parallel circuits, Star- Delta and Delta- Star transformation, Network theorems- Superposition, Thevenin's - simple problems.

UNIT II:

AC Circuits:

Representation of sinusoidal waveforms, peak, RMS and average values **-** Elementary treatment of singlephase AC circuits consisting of R, R-L, R-C, R-L-C combinations (series and parallel) **-** Phase representation, real power, reactive power, apparent power, resonance concept. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT III:

Magnetic Circuits &Transformers:

Magnetic circuits: Magnetic materials, Faraday's laws of Electromagnetic Induction, BH characteristics, Magnetic Circuits - concept of Self & Mutual Inductance.

Transformers: Ideal and practical single phase transformer, OC-SC tests, equivalent circuit, losses in transformer, regulation and efficiency - simple problems.

UNTI IV:

DC Machines and Induction Motors:

DC Machines: Construction, Principle and Operation of DC Motor, Voltage- torque equations - simple problems.

Three Phase Induction Motor: Construction, Principle and working of three phase Induction Motor, torque slip characteristics, - simple problems.

Single Phase Induction Motor: Single phase Induction Motor construction and working principle, capacitor start - applications

UNIT V:

AC Generator & Electrical Installation:

AC Generator: Construction, Principle of operation of Synchronous Generator, Pitch Factor- Distribution Factor (or winding factor) - EMF equation – simple problems.

Electrical Installation: Fuse, Circuit breakers, difference between fuse and circuit breaker, Types of Batteries, battery backup.

Textbooks:

1. Basic Electrical Engineering, D.P Kothari & I.J Nagrath, Tata McGraw Hill Publishing Company Limited, 2nd Edition.
2. Basic Electrical Engineering, T.K. Nagsarkar and M.S. Sukhija, Oxford University Press, 3rd Edition.

Reference Books:

1. Circuits and Networks, A.Sudhakar&ShyamMohan.S, Tata McGraw Hill Publishing Company limited, 5th Edition.
2. Basic Electrical Engineering, K.Uma Rao and A.Jayalakshmi, Pearson Publications.
3. Basic Electrical Engineering, D C Kulshreshtha, McGraw Hill Education Private limited, 1st Edition.

I Year II Semester

BASIC ELECTRICAL ENGINEERING LAB

L	T	P	C
0	0	2	1

Course Outcomes:

1. Get an exposure to basic electrical laws.
2. Understand the response of different types of electrical circuits to different excitations.
3. Understand the measurement, calculation and relation between the basic electrical parameters.
4. Understand the performance characteristics of D.C electrical machines. 5. Understand the performance characteristics of A.C electrical machines.

List of experiments/ demonstrations:
Any 5 experiments from Part-A and Part-B should be conducted (Total 10 Experiments)

Part A

1. Verification of Ohms law.
2. Verification of KVL and KCL.
3. Verification of Thevenin's Theorem
4. Verification of Superposition Theorem.
5. Transient Response of Series R- L and R - C circuits using DC excitation.
6. Determination and Verification of Impedance and Current of RL and RC series circuits.

Part B

1. Transient Response of R-L-C Series circuit using DC excitation.
2. Load Test on Single Phase Transformer. (Calculate Efficiency and Regulation)
3. OC & SC Test on Single phase transformer
4. Brake test on DC shunt motor
5. Brake test on Three Phase Squirrel cage induction motor.
6. OCC of Three phase alternator.

Reference Books:

1. Circuits and Networks, A. Sudhakar&ShyamMohan.S, Tata McGraw Hill Publishing Company Limited, 5th Edition.
2. Basic Electrical Engineering, by T.K. Nagsarkar and M.S. Sukhija, Oxford University Press, 3rd Edition
3. Basic Electrical Engineering, D.P Kothari & I.J Nagrath, Tata McGraw Hill Publishing Company Limited, 2nd Edition

ENGINEERING GRAPHICS & MODELING

I Year II semester

L	T	P	C
1	0	3	2.5

Course Outcomes:

1. Understand the concepts of engineering drawing of planes, solids and the CAD drawing software.
2. Applying the principles of engineering graphics while drawing the engineering components.
3. Analyze the sectional views for their configurations.
4. Evaluate the surfaces of solids developed for further processing in the engineering applications.

UNIT– I:

Introduction to Engineering Drawing: Principles of engineering graphics and their significance, usage of drawing instruments, conic sections, including the rectangular hyperbola- General method only. Cycloid, Epicycloid, Hypocycloid. Scales – Plain & Diagonal only.

Introduction to CAD: Introduction to CAD software and its importance, standard toolbar/menus and navigation tools used in the software, using basic commands limits ,units, grid, test , move, offset ,mirror, rotate, trim, extend, fillet etc. drawing lines using line command. Drawing spline, ellipse, circle, rectangle etc.. Concept of layers and dimensioning.

UNIT-II:

Principles of Orthographic Projections: Conventions, projections of points, projections of lines (first angle projection) inclined to both planes (traces and midpoint problem to be excluded).

Implementation of CAD: Drawing orthographic projections of points and lines using a CAD package.

UNIT – III:

Projections of the Planes: Projections of regular planes inclined to both the planes.

Projections of Solids: Projections of regular solids inclined to both the planes (prisms, pyramids, cones and cylinders, change of potion method only).

Implementation in CAD: Drawing orthographic projection of planes and regular solids using a CAD package.

UNIT – IV:

Sections and Sectional Views of Right Angular Solids: Prism, Cylinder, Pyramid, Cone. Development of surfaces of right regular solids - Prism, Pyramid, Cylinder and Cone.

Implementation in CAD: Concept of hatching, drawing sectional views of solids and the development of right regular solids using a CAD package.

UNIT-V:

I Year II Semester

Principles of Isometric projection: Isometric scale, isometric views, conventions, isometric views of lines, planes, simple solids, conversion of isometric views to orthographic views and vice-versa, conventions. **Implementation in CAD:** Drawing isometric views of simple solids. Drawing isometric views from giving orthographic views and vice-versa using a CAD package.
Note: Implementation in CAD (For Internal Evaluation Weightage Only)

Textbooks:

1. Engineering Drawing, Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Charotar Publishing House.

Reference Books:

1. Engineering Graphics, Agrawal B. & Agrawal C. M. (2012), TMH Publication, Text book on Engineering Drawing, Narayana, K.L. & P Kannaiah (2008), Scitech Publishers.
2. Engineering Drawing and Computer Graphics, Shah, M.B. &Rana B.C. (2008), Pearson Education.
3. http://docs.autodesk.com/ACDMAC/2013/ENU/PDFs/acdmac_2013_users_guide.pdf

ENGLISH COMMUNICATION SKILLS LAB

L	T	P	C
0	0	2	1

Course Outcomes:

1. Understand the variants in pronunciation.
2. Identify the diverse purposes of listening and speaking.
3. Discuss ideas in diverse communicative settings.
4. Exhibit increased confidence in public speaking.
5. Display critical thinking, problem solving and decision making skills through GD's.

Exercise-I:
CALL Lab:
Common Indian Variants in Pronunciation – Differences between British and American Pronunciation.
ICS Lab:
Spoken vs. Written language-Formal and Informal English- Introducing Oneself and Others.

Exercise-II:
CALL Lab:
Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening.
ICS Lab:
Features of Good Conversation – Strategies for Effective Communication Role-Play- Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise-III:
CALL Lab:
Information Transfer **ICS**
Lab:

Descriptions-Narrations-Giving Directions and Guidelines-Giving Instructions-Seeking ClarificationsAsking for and Giving Directions-Thanking and Responding-Agreeing and Disagreeing-Seeking and Giving Advice-Making Suggestions.

Exercise-IV:
CALL Lab:
Past Tense Marker and Plural Marker **ICS**
Lab:
Public Speaking- Exposure to Structured Talks - Non-verbal Communication- Making a Short Speech - Extempore

Exercise-V:
CALL Lab:
Intonation- Sentence Stress -Weak Forms and Strong Forms.
ICS Lab:
Group Discussion, Mock Group Discussion sessions

Reference Books:

1. A Textbook of English Phonetics for Indian Students, T. Balasubramanian Macmillan Publishers, 2010.
2. Speaking English Effectively, Mohan, Macmillan Publishers, 2010.

PROGRAMMING FOR PROBLEM SOLVING-II

L	T	P	C
2	0	0	2

I Year II Semester

Course Outcomes:

1. Identify various string handling functions in 'C'.
2. Develop programs with user defined data types.
3. Use Dynamic memory allocation functions with pointers.
4. Distinguish between Stacks and Queues.
5. Analyze various Dynamic Data Structures.

UNIT – I:
Overview of Arrays and Functions.
Strings: Introduction to Strings, String I/O, String Operations with and without built-in functions (strlen( ), strcmp( ), strcat( ),strcpy( ) and strrev( )).

UNIT -II:
Structures: Definition and Initialization of Structures, Accessing structure members, Nested Structures, Array of Structures, Structures and Functions, Unions, typedef, Enumerated Data types.

UNIT-III:

I Year II Semester

Pointers: Introduction to Pointers, Pointer Arithmetic, Pointers and Arrays, Pointer to Structure, Pointers and Strings, Parameter passing mechanism: Call by Reference, Pointer to Pointer, Dynamic Memory Allocation.

UNIT-IV:
Introduction to Data Structures: Lists and Operations, Linear and Nonlinear Data structures.
Stacks- Introduction to Stacks, Operations, Implementation of Stack using Arrays.
Queues- Introduction to Queues, Operations, Implementation of Queue using Arrays.

UNIT-V:
Linked Lists: Introduction to Linked List, Operations on Single Linked List (search, Insertion & Deletion).
Files: Introduction to Files, File Operations (Open, Close, read & Write).

Textbooks:

1. COMPUTER SCIENCE: A Structured Programming Approach Using C, B.A.Forouzon and R.F. Gilberg, Third edition, 2016.
2. C and Data Structures, Ashok N. Kamthane, Pearson Education.

Reference Books:

1. Problem Solving Using C, M.T. Somashekara, PHI, 2nd Edition 2009.
2. Computer Fundamentals and Programming in C, A.K.Sharma, 2nd Edition, University Press.
3. Programming in C 2/e, PradipDey and Manas Ghosh, Oxford University Press, 2nd Edition 2011.
4. The Fundamentals of Computers, Rajaraman V., 4th Edition, Prentice Hall of India, 2006.
5. Programming in C, R S Bichker, University Press, 2012.

PROGRAMMING FOR PROBLEM SOLVING LAB – II

L	T	P	C
0	0	2	1

I Year II Semester

Course Outcomes:

1. Build programs on various string handling functions.
2. Develop applications on user defined data types.
3. Apply dynamic memory allocation through pointers.
4. Implement linear data structures through stacks and queues.
5. Create linked list dynamically through stacks and queues.

Week 1:
Programs on Arrays and Functions. (Minimum 3 Programs)

Week 2 & 3:
Programs on Strings with and without string built-in Functions. (Minimum 6 Programs)

Week 4:
Programs on Accessing Structures and Nested Structures. (Minimum 3 Programs)

Week 5 & 6:
Programs on Array of Structures, Structures and Functions. (Minimum 5 Programs)

Week 7:
Programs on Unions, typedef and enum. (Minimum 4 Programs)

Week 8:
Programs on Pointers, pointer arithmetic, pointer expression, One Dimensional and Two dimensional arrays. (Minimum 4 Programs)

Week 9:
Programs on Pointer to structure, Call by Reference, Pointer to Pointer. (Minimum 3 Programs)

Week 10:
Programs on Dynamic Memory Allocation Functions. (Minimum 3 Programs)

Week 11:
Programs on Stacks and Queues using Arrays.

Week 12 & 13:
Programs on Single Linked List.

Week 14 & 15:
Programs on File Operations. (Minimum 6 Programs)

Week 16:
Review

COURSE STRUCTURE FOR B.TECH II YEAR

B. Tech. EEE II Year I Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	BS – 7	Complex Analysis & Fourier Transforms	3	0	0	3
2	H&S – 5	Professional Communication	2	0	0	2
3	PC – 1	Power Systems –I	3	0	0	3
4	PC – 2	Network Analysis	3	0	0	3
5	PC – 3	Electro Magnetic Fields	3	0	0	3
6	PC – 4	Electrical Machines-I	3	0	0	3
7	PC Lab – 1	Basic Simulation Tools Lab	0	0	2	1
8	PC Lab – 2	Electric Circuits Lab	0	0	2	1
9	MC – 1	Environmental Science	2	0	0	0
Total			**19**	**0**	**4**	**19**

B. Tech. EEE II Year II Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	BS – 8	Numerical Methods	3	0	0	3
2	ES – 8	Fluid Mechanics and Hydraulic Machinery	3	0	0	3
3	ES – 9	Electronic Devices and Circuits	3	0	0	3
4.	PC – 5	Electrical Machines-II	4	0	0	4
5	PC – 6	Power Systems - II	3	0	0	3
6	PC – 7	Control Systems	3	0	0	3

7	PC Lab-3	Electrical Machines-I Lab	0	0	2	1
8	PC Lab-4	Electronic Devices and Circuits Lab	0	0	2	1
9	MC – 2	Gender Sensitization	2	0	0	0
Total			**21**	**0**	**4**	**21**

COMPLEX ANALYSIS AND FOURIER TRANSFORMS
(Common to EEE & ECE)

L	T	P	C
3	0	0	3

II Year I Semester

Course Outcomes: At the end of the course, the student should be able to

1. Work with the functions of complex variables and evaluation of complexdifferentiation.
2. Acquire the knowledge of complex power series andintegration.
3. Apply the knowledge of contour integration to evaluate real integrals in engineering problems and acquire the knowledge of evaluating of conformal mapping and bilineartransformations.
4. Study Fourier series and define it for various types offunctions.
5. Apply Fourier sine and cosine integral theorems for a given function f(x), evaluate Fourier transforms, sine and cosinetransforms.

UNIT I

FUNCTIONS OF COMPLEX VARIABLES:

Introduction, Complex functions - limits and Continuity-Differentiability, Analytic functions and Properties, Cauchy-Riemann Equations (Cartesian and Polar), Harmonic functions, Construction of analytic functions.

UNIT II

COMPLEX INTEGRATION:

Introduction, Complex integration-Line integral, Cauchy's integral theorem, Cauchy's integral formula, Generalized Cauchy's integral formula, Power series: Taylor's series, Laurent series, Singular points, Types of Singularities, Residue, Cauchy's Residuetheorem.

UNIT III

EVALUATION OF INTEGRALS & CONFORMAL MAPPING:

□ □□
□

c□2□

Introduction, Evaluation of improper real integrals of the type (a) $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{c} f(\cos\theta,\sin\theta)d\theta$-

Conformal Mapping,-Critical Points-Bilinear transformation – fixed point – cross ratio - properties - invariance of circles.

UNIT IV

FOURIER SERIES:

Introduction- Periodic functions- Fourier series of periodic function- Dirichlet's conditions- Even and odd functions- Change of interval- Half-range sine and cosine series.

UNIT V

FOURIER TRANSFORMS:

Introduction- Fourier integral theorem (without proof)- Fourier integrals in complex form- Standard results- Fourier sine and cosine integrals- Fourier Transforms- Infinite and finite Fourier Transforms- Properties- Fourier sine and cosine transforms- inverse transforms, Finite Fourier transforms.

TEXT BOOKS:

1. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publisher-44thedition.
2. A Text book of Engineering Mathematics, N.P.Bali, ManeshGoyal- 9thedition.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, Kreyszig, John Wiley & Sons-10thedition.
2. Fundamentals of Complex Analysis, Saff, E. B. and A. D. Snider, Pearson-3rdedition.
3. Functions of Complex Variables, J.N.Sharma, Publisher Krishna prakashan-49thedition.

PROFESSIONAL COMMUNICATION

(Common to all branches)

L	T	P	C
2	0	0	2

II Year I Semester

Course Outcomes: At the end of the course, the student should be able to

1. Acquire enhancedpersonality
2. Exhibit appropriate professionaletiquette
3. Practice team building with strong communicationskills
4. Develop problem solving skills anddecision-making
5. Demonstrate effective presentation skills

UNIT I

SELF APPRAISAL:

Self-Introspection/ Self Retrospection
introducing self &
others Goal
setting
SWOT
Analysis,

UNIT II

PROFESSIONAL ETIQUETTE:

Etiquette-Telephone Etiquette- Netiquette
Email, Social Network
Behavioral
Traits Case
study

UNIT III

TEAM BUILDING:

Leadership skills-Case
Studies Team Essentials
Negotiation Skills
Group Discussion-Functional Aspects

UNIT IV

LOGICAL THINKING AND ANALYTICAL REASONING:

Decision Making
Problem Solving Conflict
management
Case Study

UNIT V

PRESENTATION SKILLS:

Poster Presentation
Oral Presentation-Individual Presentation, Team Presentation, Thematic Presentation

TEXT BOOK:

1. Effective technical communication, Ashrif Rizvi, Tata McGraw Hill-2011

REFERENCE BOOKS:

1. Speaking and writing for effective business, Soundaraja, MACMILLAN,2010.
2. English for professional success, Hector Sanchez, Thomson,2010.

POWER SYSTEMS – I

II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Understand the principle of generation of electric power in thermal, hydro, nuclear and gas powerstations.
2. Apply concepts in distribution systems to solveproblems.
3. Interpret the arrangement and operation of AIS and GISsubstations.
4. Analyze methods to improve the power factor and voltage control.
5. Evaluate various power tariffmethods.

UNIT I

POWER STATIONS:

Thermal Power Stations: Line diagram of Thermal PowerStation (TPS) showing paths of coal, steam, water, air, ash and flue gasses. Brief description of TPS components-Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and cooling towers.

Hydel Power Stations: Schematic Arrangement, Brief description of Hydraulic Structures, Water turbines.

Nuclear Power Stations: Nuclear Fission and Chain reaction, Nuclear fuels, Principle of operation ofNuclear reactor, Reactor Components- Moderators, Control rods, Reflectors and Coolants, Radiationhazards- Shielding and Safety precautions, Types of Nuclear reactors and brief description of PWR,BWR and FBR.

Gas Power Stations: Principle of Operation and Components (Block Diagram Approach Only).

UNIT II

D.C & A.C DISTRIBUTION SYSTEMS:

D.C Distribution Systems: Classification of Distribution Systems - Comparison of DC vs. AC and Under-Ground vs. Over -Head Distribution Systems- Requirements and Design features of Distribution Systems- Voltage,Drop Calculations (Numerical Problems inD.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal voltages) and Ring Main Distributor.

Distribution Systems: Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to related load voltages.

UNIT III

AIR INSULATED & GAS INSULATED (GIS) SUBSTATIONS:

Classification of substations: - Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single busbar, sectionalized single busbar, main and transfer busbar system with relevant diagrams. **Gas**

Insulated Substations (GIS): Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, busbar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

UNIT IV

POWER FACTOR & VOLTAGE CONTROL:

Causes of low power factor – Methods of Improving power factor – Phase advancing and generation of reactive KVAR using static Capacitors – Most economical power factor for constant KW load and constant KVA type loads, Numerical Problems. Dependency of Voltage on Reactive Power flow-Methods of Voltage Control: Shunt Capacitors, Series Capacitors, Synchronous Capacitors, Tap changing and BoosterTransformers.

UNIT V

ECONOMIC ASPECTS OF POWER GENERATION & TARIFF:

Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors- Numerical Problems.

Tariff methods: Costs of Generation and their division into Fixed, Semi-fixed and Running Costs. Desirable Characteristics of a Tariff Method-Tariff Methods: Flat Rate, Block- Rate, two-part, threepart, and power factor tariff methods and Numerical Problems.

TEXT BOOKS:

1. A text book on power system engineering, A.Chakrabarthi, M.L.Soni, P.V.Gupta and M.L Soni, DhanpathRai and Sons-2016 Edition
2. Principles of power systems, V.K.Mehtha and RohitMehtha, S.Chand Company Pvt. Ltd, 2005, RevisedEdition

REFERENCE BOOKS:

1. Generation, distribution and utilization of electrical energy, C.L.Wadhwa, New Age International-3rd Edition.
2. A course in power systems, J.B.Gupta, S.K. Kataria&Sons-11thEdition.
3. A text book of power system engineering, R.K. Rajput, Laxmi Publications (P) Limited-1st Edition.

NETWORK ANALYSIS

II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Apply network theorems for the analysis of electricalnetworks.
2. Obtain the transient and steady-state response of electricalcircuits.
3. Apply graph theory to formulate networkequations.
4. Analyze two portnetworks.
5. Evaluate circuits in the sinusoidal steady-state(Three-phase).

UNIT I

NETWORK THEOREMS (DC & AC), MESH AND NODAL ANALYSIS:

Analysis of Circuits using Mesh and Nodal methods, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and Compensation theorem

UNIT II

D.C AND A.C TRANSIENTANALYSIS:

Transient response of R-L, R-C, R-L-C circuits (series and parallel) for D.C excitation- Initial conditions- Solution method using differential equation and Laplace transforms .

Transient response of R-L, R-C, R-L-C circuits (series and parallel) for sinusoidal excitation- Initial conditions- Solution method using differential equation and Laplace transforms.

UNIT III

NETWORK TOPOLOGY:

Network Topology - Definitions, Graph, Tree, Incidence Matrix, Basic Cut Set and Basic Tie Set Matrices for Planar Networks, Loop and Nodal methods for analysis of Networks with Voltage and Current Sources, Duality & Dual Networks.

UNIT IV

TWO PORT NETWORKS:

Two port network parameters - Z, Y, ABCD and Hybrid parameters and their inter relations. Series, parallel and cascaded connection of two port networks, Concept of transformed network- Two port network parameters using transformed variables.

UNIT V

ANALYSIS OF THREE PHASE CIRCUITS:

Three phase Circuits – Generation of Three Phase Voltage - Review of Voltage and Current relations in Star and Delta systems. Analysis of balanced and unbalanced three phase circuits - Measurement of active and reactive power.

TEXT BOOKS

1. Circuit theory-analysis & synthesis, A.Chakrabarthy, DhanpatRai& Sons-7th revisedEdition.
2. Circuits & networks-analysis and synthesis, A.Sudhakar and ShyammohanS.Palli, Tata McGraw Hill-5thEdition.

REFERENCE BOOKS

1. Network analysis, Van Valkenburg, Prentice Hall-3rdEdition.

2. Network analysis, MahmoodNahvi, Joseph Edminister, Schaum's Outline series, McGraw Hill Companies -4thEdition.
3. Electric circuit analysis,C.L.Wadhwa, New Age International-2ndEdition.

ELECTRO MAGNETIC FIELDS

II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Understand the basic laws ofelectromagnetism.
2. Obtain the electric and magnetic fields' concepts for simple configurations under staticconditions.
3. Analyze time varying electric and magneticfields.
4. Examine Maxwell's equations in different forms and differentmedia.
5. Apply electromagnetic concepts to electricalmachines.

UNIT I

ELECTROSTATICS:

Vector Algebra – Divergence theorem. Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Work done in moving a point charge in an electrostatic field – Electric Potential– Properties of potential function – Potential gradient – Gauss's law – Application of Gauss's Law – Maxwell's first law. Laplace's and Poison'sequations.

UNIT II

DIPOLE& CAPACITANCE:

Electric Dipole – Dipole moment – Polarization – Potential due to an Electric Dipole and Torque. Capacitance – Capacitance of parallel plate and spherical and co-axial capacitors with composite dielectrics – Energy stored and energy density in a static electric field – Current density – conduction and Convection current densities – Ohm's law in point form – Equation of continuity.

UNIT III

MAGNETO STATICS, AMPERE'S CIRCUITAL LAW:

Biot-Savart's law – Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density– Maxwell's second Equation.

Ampere's circuital Law & Applications:

Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament – Point form of Ampere's circuital law-Curl-Stroke's Theorem **–** Maxwell's third equation.

UNIT IV

FORCE IN MAGNETIC FIELDS, MAGNETIC POTENTIAL:

Magnetic force - Lorentz force equation – force on a current element in a magnetic field - Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment –Torque in a magnetic field.

Scalar Magnetic potential and its limitations – vector magnetic potential and its properties.

UNIT V

INDUCTANCE, TIME VARYING FIELDS:

Self and Mutual inductance – Determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire– Energy stored and Density in a Magnetic field. Time varying fields – Faraday's laws of electromagnetic induction –Maxwell's fourth equation –Simple problems - Modification of Maxwell's equations for time varying fields – Displacement current.

TEXT BOOKS

1. Engineering electromagnetics by William H. Hayt& John. A. Buck, McGraw Hill Companies-7th Edition,2012.
2. Electromagnetic fields, Sadiku, Oxford Publications-7thEdition.

REFERENCE BOOKS

1. Engineering electromagnetics, J P Tewari, Khanna Publishers-2nd Edition, 2005.
2. Elements of electromagnetic fields, S. P. Seth, DhanpatRai& Co. (Pvt.) Ltd-2ndEdition.
3. Electromagnetic field theory, K. A. Gangadhar, P. M. Ramanathan, Khanna Publishers- 16th Edition.

ELECTRICAL MACHINES-I

II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Understand different types of DCMachines.
2. Identify different parts of a DC machine & understand itsoperation.
3. Carry out different testing methods to predetermine the efficiency of DCmachines.
4. Analyze speed control of DCmachines.
5. Carry out different testing methods to pre-determine the efficiency DCmachines.

UNIT I

D.C. GENERATORS – CONSTRUCTION & OPERATION:

Electromechanical Energy conversion – force and torque in magnetic field systems – energybalance- D.C. Generators – Principle of operation – Action of commutator – classification of DC generators – separately excited and self-excited generators – armature windings – lap and wave windings – use of laminated armature – E.M.F Equation – Armature reaction and commutation – cross magnetizing and demagnetizing AT/pole – compensating winding.

UNIT II

D.C. GENERATORS – OPERATING CHARACTERISTICS:

Commutation – reactance voltage – methods of improving commutation - Buildup of EMF – magnetization curve/OCC characteristics – critical field resistance and critical speed – causes for failure of self-excitation – remedial measures – internal and external characteristics of DC shunt, series and compound generators, Parallel operation of DC generators – use of equalizer bar and cross connection of field windings – load sharing- Different applications of DCGenerators.

UNIT III

D.C. MOTORS:

Principle of operation – Back EMF - Torque equation, Types of DC Motors (shunt, series and compound) – characteristics of DC Motors- applications.

UNIT IV

SPEED CONTROL OF DC MOTORS:

Principle of operation of 3 point and 4 point starters with protective devices – Speed control of DC Motors: armature voltage and field flux control methods – Ward-Leonard system - Different applications of DC Motors.

UNIT V

TESTING OF D.C. MACHINES:

Testing of D.C. machines: Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency. Methods of Testing: direct, indirect and regenerative testing – Swinburne's test – Hopkinson's test – Field's test – Retardation test – separation of stray losses in a DC motor.

TEXT BOOKS:

1. Theory and performance of Electrical machines, J.B Gupta, S.K Kataria& Sons publishers-Reprint 2013Edition.
2. Electrical Machines, R.K.Rajput, Lakshmi Publication-4thEdition.

REFERENCE BOOKS:

1. Electrical machinery, P.S. Bimbra, Khanna Publishers-7thEdition
2. Electrical machines, S.K. BhattaCharya, McGraw Hill Companies-4thEdition.
3. Electric machines, I.J. Nagrath& Kothari, McGraw Hill Companies-3rdEdition.

BASIC SIMULATION TOOLS LAB

II Year I Semester

L	T	P	C
0	0	2	1

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

1. Correlate the data usingplots.
2. Verify networktheorems.
3. Observe transient response of seriescircuits.
4. Simulate rectifiercircuits.
5. Analyze networks using networktheorems.

Any Ten of the following experiments should be conducted

1. Basic operation onmatrices.
2. Basic 2D plots of simpleequations.
3. Find loop currents using meshanalysis.
4. Find node voltage using nodalanalysis.
5. Transient analysis of RL seriescircuit.
6. Transient analysis of RC seriescircuit.
7. Transient analysis of RLC seriescircuit.
8. Analysis of half wave rectifier with and withoutfilter.
9. Analysis of full wave rectifier with and without filter.
10. Verification of Thevenin'stheorem.
11. Verification of Maximum power transfertheorem.
12. Verification of super positiontheorem.

ELECTRIC CIRCUITS LAB

II Year I Semester

L	T	P	C
0	0	2	1

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

1. Evaluate response in a given network by using networktheorems.
2. Analyze complex DC and AC linearcircuits.
3. Apply concepts of electricalcircuits.
4. Evaluate active power and reactive power of electriccircuits.
5. Determine two port networkparameters.

Any Ten of the following experiments should be conducted

1. Measurement of voltage, current and equivalent resistance of variouscircuits.
2. Verification of Norton's theorem.
3. Verification of maximum power transfer theorem on DCexcitation.

4. Verification of compensationtheorem.
5. Verification of reciprocity theorem &Millman'stheorem.
6. Resonance in series and parallel R, L, Ccircuits.
7. Determination of self-inductance, mutual inductance and coefficient ofcoupling.
8. Locus diagrams of series RL and RCcircuits.
9. Calculation of RMS, average values, form factor and peak factor of complex waveform.
10. Determination of Z & Yparameters.
11. Determination of transmission & hybridparameters.
12. Measurement of active power for three phase balancedloads.
13. Measurement of reactive power for three phase balancedloads.

ENVIRONMENTAL SCIENCE
(Common to all Branches)

II Year ISemester

L	T	P	C
2	0	0	0

Course Outcomes: At the end of the course, the student should be able to

1. Define and explain the structure and functions of ecosystem, values of biodiversity, threats to biodiversity and conservation ofbiodiversity.
2. Explain the limitations of the resources and impacts of over utilization of naturalresources.
3. Explain the sources and effects of environmental pollution and list and identify the available techniques to control the pollution.
4. Explain the global environmental issues like climate change, ozone depletion and can explain the scope of EIA, Environmental Management Plan and environmental audit and list the EIA methods.
5. Mention the salient features of environmental acts and rules and define the sustainable goals along with measures required for thesustainability.

UNIT I

ECOSYSTEM:

Definition, Scope and Importance of ecosystem, Structure and Functions of ecosystem: Food chains, Food Web and Ecological Pyramids, Flow of energy; Bio-magnification.

BIODIVERSITY AND BIOTIC RESOURCES:

Introduction, Definition, levels of Biodiversity, Value of biodiversity, Hot spots of biodiversity, Threats to biodiversity, conservation of biodiversity: In-Situ and Ex-situ conservation.

UNIT II

NATURAL RESOURCES:

Classification of Resources

WATER RESOURCES:

Use and over utilization of surface and ground water, Dams: benefits and problems, Rain water harvesting;

ENERGY RESOURCES:

Growing energy needs Renewable and Non Renewable Energy resources. **LAND RESOURCES**: land degradation – Landslide and Soil Erosion; **FOREST RESOURCES –** Uses and Exploitation.

UNIT III

ENVIRONMENTAL POLLUTION AND CONTROL:

Types of Pollution, Sources, Effects and Control measures of Air Pollution, WaterPollution, Soil Pollution and Noise Pollution.

UNIT- IV

GLOBAL ENVIRONMENTAL PROBLEMS AND GLOBAL EFFORTS:

Greenhouse effect, Global Warming, climate change and their impacts on human environment; Ozone depletion and Ozone depleting substances (ODS); AidRains.

ENVIRONMENTAL IMPACT ASSESSMENT (EIA):

Scope of EIA and EIA methods, scope of Environmental audit and Environmental Management Plan.

UNIT- V

ENVIRONMENTAL POLICY, LEGISLATION, RULES AND REGULATIONS:

Salient features of Environmental Protection act, Air (Prevention and Control of pollution) Act- 1981, Water (Prevention and Control of pollution) Act-1974, Forest Conservation Act, Municipal solid waste, Hazardous waste, E-waste, Bio-medical waste, Radioactive waste Rules.

TOWARDS SUSTAINABLE FUTURE:

Concept of Sustainable Development, Sustainable goals defined by UN, Threats to Sustainability, Environmental Education, Role of IT in Environment, Smart Cities, Concept of Green Building, Low Carbon Lifestyle, Life cycle assessment and Ecological Foot Print.

TEXTBOOKS:

1. Text Book of Environmental Studies, AnubhaKaushik New age International Publishers-4th Edition.
2. Environmental studies, ErachBharucha, University Grants Commission, University Press, 2005.

REFERENCE BOOKS:

1. Text book of Environmental Science and Technology, M.Anji Reddy, 2007
2. Environmental Science: Towards a Sustainable Future, Richard T. Wright. PHL Learning Private Ltd. New Delhi, 2008.

NUMERICAL METHODS AND PARTIAL DIFFERENTIAL EQUATIONS

II Year IISemester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Develop skills in solving engineering problems involving algebraic and transcendental equations.
2. Acquires the knowledge of interpolation in predicting future out comes based on the present knowledge and also to fit different types of curves.
3. To know various types of numerical methods in solving engineeringproblems.
4. Classify the nature of second and higher order partial differential equations and find the solutions of linear and nonlinearPDE.
5. To apply partial differential equations in different engineeringproblems.

UNIT I

NUMERICAL TECHNIQUES: SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:

Introduction - The Bisection Method- The Method of False Position- The Iteration Method-Newton-Raphson Method. Solving system of linear Non- Homogeneous equations by Jacobi's and Gauss-Seidel Iteration methods.

UNIT II

CURVE FITTING AND NUMERICAL INTEGRATION:

Curve fitting: Fitting a straight line -second degree curve-exponential curve, power curve by method of least squares.

Numerical integration – General Quadrature (Newton's Cote's formula), Trapezoidal rule, Simpson's 1rd 3th rule. 3 8

UNIT III

NUMERICAL SOLUTIONS OF IVP'S:

Numerical solution of Ordinary Differential equations: Introduction- Solution by Taylor's series method- Picard's Method of successive approximations- Single step methods-Euler's Method - Runge-Kutta (second and classical fourth order) Methods- Predictor Corrector method- Adam's - Bashforth method.

UNIT IV

PARTIAL DIFFERENTIAL EQUATIONS:

Introduction- Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions- Solutions of first order Linear (Lagrange) Equation, Nonlinear Equations- Charpits Method.

UNIT V

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS:

Introduction- Classification of general second order partial differential equations- Method of separation of variables for second order equations- Applications of Partial Differential Equations- One dimensional wave equation – One dimensional heat equation- Steady State two dimensional Heat equation (or Laplace equation).

TEXT BOOKS:

1. Higher engineering mathematics, B.S. Grewal, Khanna Publishers-43rdEdition.
2. Numerical methods, S. S. Sastry – PHIPublications.

REFERENCE BOOKS:

1. Introductions of numerical methods, Jain &Iyengar
2. Numerical methods, E. Balaguruswamy, Tata McGraw HillPublication.
3. Ordinary and partial differential equations, theory and applications, Shah and, Nita H, PHI Publications.

FLUID MECHANICS AND HYDRAULIC MACHINERY

II Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be ableto

1. Explain fluid properties, types of fluid flows and formulate one and three dimensional compressible fluid flow problems and solve thesame.
2. Apply conservation of mass, energy and momentum laws to fluid flow problems in engineering applications and study the losses inpipes.
3. Compute drag and lift forces using theory of boundary layer and understand the basics of turbo machinery.
4. Analyze practical problems of various turbines used in Industry and hydro powerplants.
5. Solve various engineering problems related to centrifugal and reciprocating pumps used in agriculture, domestic and industrialapplications.

UNIT I

FLUID PROPERTIES AND FLUID STATICS:

Density, Specific weight, Specific gravity, viscosity, Vapour pressure, compressibility, Surface tension Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Hydro static law, Piezometer, Simple and differentialmanometers.

UNIT II

FLUID KINEMATICS:

Stream line, path line, streak line, stream tube, classification of flows, steady,unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrigational flows, one, two and three dimensional flows. Fluid Dynamics: Surface and Body forces, Euler's and Bernoulli's equation derivation, Application of Bernoulis Equation: Venturimeter, Orifice meter, Pitot tube, Navier stokes equation (explanation only), Momentum equation –applications.

UNIT III

CLOSE CONDUIT FLOW:

Reynolds Experiment, Darcy's equation, Minor losses - pipes in series, pipes in parallel, total energy line and hydraulic gradient line.

Impact Of Water Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and a tip-velocity triangles at inlet and outlet expressions for work done and efficiency, Series vanes, Radial flow turbines.

UNIT IV

HYDRAULIC TURBINES:

Overshot and undershot water wheels, classification of Water turbines, Pelton Wheel, work done and working proportions, Francis, Kaplan turbines, draft tubes, types & its efficiency.

Performance Of Turbines: Performance under unit head, unit quantities, performance under specific conditions, specific speed, performance characteristic curves, governing of turbines, surge tanks. Water hammer.

UNIT V

CENTRIFUGAL PUMPS:

Types Component parts and working, work done by the impeller, Manometric head losses and efficiencies, minimum starting speed, loss, Specific speed, Multistage Pumps, Pumps in parallel, performance of pump, NPSH, Cavitation, priming devices, pump troubles and remedies.
Reciprocating Pumps: Main components and working of a reciprocating pump, types of reciprocating pumps, power required driving the pump, coefficient of discharge and slipping indicator diagram.

Hydraulics, fluid mechanics and hyraulic machinery,Modi and Seth, Standard Book House14th edition.

2. Fluid mechanics and hydraulic machines, Rajput, S. Chand- 6thEdition.

REFERENCES:

1. Fluid mechanics and fluid power engineering, D.S Kumar, Kotaria& sons.
2. Fluid mechanics and machinery by D. Rama Durgaiah, New Age international, Reprint2004.
3. Hydraulic machines by Banga& Sharma, KhannaPublishers.

TEXT BOOKS:

1.

ELECTRONIC DEVICES AND CIRCUITS

II Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Demonstrate the concepts of semiconductor theory.
2. Interpret the characteristics of different semiconductor devices with itsapplications.
3. Apply different biasing techniques of transistors foramplification.
4. Analyze transistor amplifiers using small signalmodel.
5. Analyze FET amplifiers using small signalmodel.

UNIT I

DIODE:

PN junction Diode – Characteristics, Current equation, Temperature dependence, Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances.

Diode Applications: Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive Filter, Clippers, Clampers.

UNIT II

BIPOLAR JUNCTION TRANSISTOR (BJT):

Principle of Operation and characteristics - Common Emitter, Common Base, Common Collector Configurations, Operating point, DC & AC load lines, Transistor Hybrid parameter model, Determination of h-parameters from transistor characteristics, Conversion of h-parameters.

UNIT III

TRANSISTOR BIASING AND STABILIZATION:

Bias Stability, Fixed Bias, Collector to Base bias, Self-Bias, Bias compensation using Diodes and Transistors.

Analysis and Design of Small Signal Low Frequency BJT Amplifiers: Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors on CE Amplifier.

UNIT IV

JUNCTION FIELD EFFECT TRANSISTOR:

Construction, Principle of Operation, Pinch-Off voltage, Volt-Ampere characteristic, comparison of BJT and FET, Biasing of FET, FET as voltage variable resistor, MOSFET construction and its characteristics in enhancement and depletion modes.

UNIT V

FET AMPLIFIERS:

Small Signal Model, Analysis of CS, CD, CG JFET Amplifiers. Basic Concepts of MOSFET Amplifiers. Special Purpose Devices: Zener Diode - Characteristics, Voltage Regulator; Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode.

Electronic devices and circuits, Millman and Halkias, McGraw Hill Publication-2nd Edition.

2. Electronic devices and circuits, R.L. Boylestad and Louis Nashelsky, PEI/PHI-9th Edition.

REFERENCES:

1. Electronic devices and circuits, S. Salivahanan, N. Suresh Kumar, A. Vallavaraj, TMH -2nd Edition.
2. Integrated electronics, J. Millman and Christos C. Halkias, TMH-Edition2008.
3. Electronic devices and circuits, J.B Gupta, katson series-6th Edition.

TEXT BOOKS:

1.

ELECTRICAL MACHINES – II

II Year IISemester

L	T	P	C
4	0	0	4

Course Outcomes:

1. Understand the concepts of rotating magnetic fields and the working principle of single phase transformer.
2. Analyze the operation & connection of three phasetransformer.
3. Understand the construction & operation of three phase inductionmotor.
4. Analyze the performance of three phase inductionmotor.
5. Understand the construction & operation of single phase inductionmotor.

UNIT I

SINGLE PHASE TRANSFORMERS:

Principle of operation **-**Types - constructional details- Losses, Minimization of hysteresis and eddy current losses- E.M.F equation - operation on no load and on load - phasor diagrams- Problems. Equivalent circuit – efficiency at different loads - Condition for maximum efficiency- All day efficiency -voltage regulation for different loads & different power factors - effect of variations of frequency & supply voltage on iron losses - Sumpner's test-separation of losses.

UNIT II

THREE PHASE TRANSFORMERS:

Three phase poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/ $\Delta$and open Δ, Third harmonics in phase voltages-three winding transformers-tertiary windings - Determination of Zp, Zs and Zt - off load and on load tap changing, Scott connection.

PARALLEL OPERATION AND AUTOTRANSFORMERS

Parallel operation of Single Phase Transformers with equal and unequal voltage ratios - Auto transformers - equivalent circuit - comparison with two winding transformers.

UNIT III

THREE PHASE INDUCTION MOTORS:

Construction details of cage and wound rotor machines-production of a rotating magnetic field - principle of operation - rotor emf and rotor frequency - rotor reactance, rotor current and pf. at standstill and during operation. Rotor power input, rotor copper loss and mechanical power developed. Torque equation- expressions for maximum torque and starting torque - torque slip characteristics - double cage and deep barrotors.

UNIT IV

PERFORMANCE OF THREE PHASE INDUCTION MOTORS:

Equivalent circuit - phasor diagram - crawling and cogging. Circle diagram-no load and blocked rotor tests-predetermination of performance. Methods of starting. Calculations of torque, efficiency at different loads from circle diagram.

Speed control - voltage control – variable voltage and variable frequency method- change of poles and methods of consequent poles; cascade connection, injection of an emf into rotor circuit (qualitative treatment only) -induction generator-principle of operation.

UNIT V

SINGLE PHASE INDUCTION MOTORS:

At the end of the course, the student should be able to

Single phase Induction motor – Constructional features- Double revolving field theory Equivalent circuit-spilt –Phase motors- Capacitor start Capacitor run motors, applications.

Electrical machinery, P.S. Bimbra, Khanna Publishers-7th edition.

2. Theory and performance of electrical machine, JB Gupta, SK Kataria&Sons-14th edition.

REFERENCE BOOKS:

1. Performance and design of AC machines, MG.Say, BPBPublishers-1968.
2. Electrical machines, R.K Rajput, LP publications-5th edition
3. Electric machines, I. J. Nagrath& D.P. Kothari, Tata McGraw Hill-7th Edition.

TEXT BOOKS:

1.

POWER SYSTEMS – II

II Year IISemester

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand transmission lineparameters.
2. Observe the performance of transmissionlines.
3. Analyze transient behavior of transmissionlines.
4. Evaluate mechanical design of transmissionlines.
5. Understand the construction, grading and capacitance of undergroundcables.

UNIT I

TRANSMISSION LINE PARAMETERS:

Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems. Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

UNIT II

PERFORMANCE OF SHORT, MEDIUM AND LONG LENGTH TRANSMISSION LINES:

Classification of Transmission Lines - Short, medium and long line and their model representations - Nominal-T, Nominal-Pie A, B, C, D Constants for symmetrical & Asymmetrical Networks, Numerical Problems. Mathematical Solutions to estimate regulation and efficiency of all types oflines - Numerical Problems. **Long Transmission Line**: Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations, -Surge Impedance and SIL of Long Lines, Wave Length and Velocity of Propagation of Waves - Representation of Long Lines - Equivalent-T and Equivalent Pie network models (numericalproblems).

UNIT III

POWER SYSTEM TRANSIENTS:

Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Incident, Reflected and Refracted Waves- Reflection and Refraction Coefficients - Termination of lines with different types of conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions (Numerical Problems). Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples).

UNIT IV

FACTORS GOVERNING THEPERFORMANCEOFTRANSMISSIONLINES, TRANSMISSION LINE INSULATORS, SAG AND TENSIONCALCULATIONS:

Skin and Proximity effects - Description and effect on Resistance of Solid Conductors - Ferranti effect-Charging Current - Effect on Regulation of the Transmission Line. Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.Types of Insulators, String efficiency and Methods for improvement, Numerical Problems- voltage distribution, calculation of string efficiency, Capacitance grading and StaticShielding.Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems - Stringing chart and sag template and itsapplications.

At the end of the course, the student should be able to

UNIT V

UNDERGROUND CABLES:

Types of Cables, Construction, Types of Insulating materials, Calculations of Insulation resistance and stress in insulation - Numerical Problems. Capacitance of Single and 3-Core belted cables, Numerical Problems. Grading of Cables - Capacitance grading, Numerical Problems, Description of Inter-sheathgrading.

TEXT BOOKS:

1. Electrical power systems, C.L.Wadhwa, New Age International (P) Limited,Publishers.
2. Principles of Power Systems, V.K.Mehta and Rohit Mehta, S.Chand Company Pvt. Ltd,2005.

REFERENCE BOOKS:

1. A Text Book on Power System Engineering, M.L.Soni, P.V. Gupta, U.S. Bhatnagar, A. Chakrabarthy, DhanpatRai& Co Pvt.Ltd.
2. Power System Engineering, I.J. Nagarath and D.P. Kothari,TMG.
3. Power System Analysis and Design, Dr. B. R. Gupta, S. Chand & CompanyLimited.

At the end of the course, the student should be able to

CONTROL SYSTEMS

II Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes:

1. Understand the fundamentals of classical and modern controlsystems.
2. Model various electrical and mechanicalsystems.
3. Analyze time and frequency responses of first and second-ordersystems.
4. Analyze stability of controlsystems.
5. Represent linear discrete time system in State space

UNIT I

INTRODUCTION

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback.

Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems

UNIT II

TRANSFER FUNCTION REPRESENTATION

Transfer Function of DC Servo motor - AC Servo motor- Synchro Transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction uses Mason's gain formula.

UNIT III

TIME RESPONSE AND STABILITY ANALYSIS

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability.

The root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

UNIT IV

FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin Stability Analysis from Bode Plots, Nyquist Plots-Stability Analysis.

UNIT V

CLASSICAL CONTROL DESIGN TECHNIQUES AND STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Introduction to Compensation techniques, PID Controllers.

Concepts of state, state variables and state model, derivation of state models - Solving the Time invariant state Equations - State Transition Matrix and its Properties, Concepts of Controllability and Observability.

TEXT BOOKS:

1. Control Systems Engineering, I.J.Nagrath and M.Gopal, New Age International (P) Limited, Publishers-2nd Edition.
2. Automatic Control Systems, B. C. Kuo, John wiley and sons-8thEdition.

REFERENCE BOOKS:

1. Control Systems, Nagoorkani-2ndEdition.
2. Control Systems, N.C.Jagan, BS Publications-2ndEdition.
3. Modern Control Engineering, Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd.-3rdEdition.

ELECTRICAL MACHINES - I LAB

II Year IISemester

L	T	P	C
0	0	2	1

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

1. Start and control the Different types of DCmotors.
2. Assess the performance of different types of DC machines using different testingmethods.
3. Identify different conditions required to be satisfied for self - excitation of DCGenerators.
4. Separation losses of DC motor into differentcomponents.
5. Analyze the performance of coupledmachines.

Any 10 out of the following 12 experiments should be conducted:

1. Magnetization characteristics of a DC shuntgenerator.
2. Load test on DC shuntgenerator.
3. Load test on DC compoundgenerator.
4. Load test on DC series generator.
5. Brake test on DC compoundmotor.
6. Hopkinson's test on DC Shuntmachines.
7. Field's test on DC Seriesmachines.
8. Separation of losses in DC shunts motor.

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

1. Retardation test on DC shuntmotor.
2. Speed control of DC shuntmotor.
3. Swinburne's test on DC shuntmachine.
4. Brake Test on DC shunt Motor.

ELECTRONIC DEVICES AND CIRCUITS LAB

II Year IISemester

L	T	P	C
0	0	2	1

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

1. Understand basic concepts of electronic devices andcircuits. 2.
Analyze the characteristics of electronic devices andcircuits.
3. Apply the concepts of electronics devices and circuits to find variousparameters.
4. Evaluate the behavior of basic electronicdevices.
5. Analyze the characteristics of FET and UJT.

PART-A: (Only for Viva-voce Examination) Electronic Workshop Practice (In 3 Lab Sessions):

1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards,PCB's.

2. Identification, Specifications and Testing of Active Devices, Diodes, BJT's, Low power JFET's, MOSFET's, Power Transistors, LED's, LCD's, SCR,UJT.
3. Study and operationof
    a. Multimeters (Analog andDigital).
    b. FunctionGenerator.
    c. Regulated PowerSupplies.
    d. CRO.

PART B: Minimum of 10 experiments of the following should be conducted

1. Forward & Reverse Bias Characteristics of PN JunctionDiode.
2. Zener diode characteristics and Zener as voltageRegulator.
3. Half Wave Rectifier with & withoutfilters.
4. Full Wave Rectifier with & withoutfilters.
5. Input & Output Characteristics of Transistor in CBConfiguration.
6. Input & Output Characteristics of Transistor in CEConfiguration.
7. FETcharacteristics.
8. Lissajous patterns usingCRO.
9. Frequency Response of CCAmplifier.
10. Frequency Response of CEAmplifier.
11. Frequency Response of Common Source FETamplifier.
12. SCRCharacteristics.
13. UJTCharacteristics.

GENDER SENSITIZATION

II Year IISemester

L	T	P	C
2	0	0	0

Course Outcomes: At the end of the course, the student should be able to

1. To develop awareness about gender discrimination and take measurable steps to counterit.
2. To identify the basic dimensions of biological, sociological, psychological and legal aspects of gender.
3. To acquire knowledge about gendered division of labour in relation to politics andeconomics.
4. To prepare the students against genderviolence.

5. To prepare the students to work and live together asequals.

UNIT I

UNDERSTANDING GENDER:

Gender: Why Should We Study It? (Towards a World of Equals: Unit -1)

Socialization: Making Women, Making Men (Towards a World of Equals: Unit -2) Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT II

GENDER AND BIOLOGY:

Missing Women: Sex Selection and Its Consequences (Towards a World of Equals: Unit -4) Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit -10) Two or Many? Struggles with Discrimination.

UNIT III

GENDER AND LABOUR:

Housework: the Invisible Labour (Towards a World of Equals: Unit -3) "My Mother doesn't Work." "Share the Load".

Women's Work: Its Politics and Economics (Towards a World of Equals: Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT IV

ISSUES OF VIOLENCE:

Sexual Harassment: Say No! (Towards a World of Equals: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".

Domestic Violence: Speaking Out (Towards a World of Equals: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Thinking about Sexual Violence (Towards a World of Equals: Unit -11)

Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT V

GENDER: CO – EXISTENCE:

Just Relationships: Being Together as Equals (Towards a World of Equals: Unit -12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

TEXT BOOKS:

1. Towards a World of Equals: A Bilingual Textbook on Gender,A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, VasudhaNagaraj, Asma Rasheed, GoguShyamala, DeepaSreenivas and Susie Tharu ,Telugu Akademi, Hyderabad,Telangana State in the year 2015.

REFERENCE BOOKS:

1. Seeing like a feminist, Menon, Nivedita, New Delhi, Zubaan-PenguinBooks-2012 2. I fought for my life and won, AbdulaliSohaila, Available online at:
http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal

COURSE STRUCTURE

B. Tech. EEE III Year I Semester

S. No	Course Category	Course Title	L	T	P	Credits
1	H&S – 6	Managerial Economics and Financial Analysis	3	0	0	3
2	ES – 10	Switching Theory and Logic Design	3	0	0	3
3	PC – 8	Electrical Machines III	3	0	0	3
4	PC – 9	Power Electronics	3	0	0	3
5	PE – 1	Electrical Energy Conservation and Auditing/ Electrical Estimation and Costing	3	0	0	3
6	OE – 1	Non-Conventional Energy Sources / Fundamentals of Electrical Power Generation and Protection	3	0	0	3
7	PC Lab – 5	Electrical Machines -II Lab	0	0	2	1
8	PC Lab – 6	Advanced Communication Skills Lab	0	0	2	1
9	MC – 3	Quantitative Methods & Logical Reasoning	2	0	0	1
		Total	**20**	**0**	**4**	**21**

B. Tech. EEE III Year II Semester

S. No	Course Category	Course Title	L	T	P	Credits
1	PC – 10	Electrical Measurements & Instrumentation	3	0	0	3
2	PC – 11	Computer Methods in Power Systems	3	0	0	3
3	PC – 12	Power Semiconductor Drives	3	0	0	3
4	PC – 13	Switch Gear and Protection	3	0	0	3
5	PE – 2	Integrated Circuit and Applications / Artificial Intelligence Techniques in Electrical Engineering	3	0	0	3

6	OE – 2	Energy Auditing and Conservation/ Principles of Electric Power Utilization	3	0	0	3
7	PC Lab – 7	Control Systems and Simulation Lab	0	0	2	1
8	PC Lab – 8	Power Electronics and Simulation Lab	0	0	2	1
9	MC – 4	Personality Development &Behavioural Skills	2	0	0	1
		Total	**20**	**0**	**4**	**21**

COURSE STRUCTURE (for FAST TRACK)

B. Tech. III Year I Semester

S.No.	Course Category	Course Title	L	T	P	Credits
1	H&S – 6	Managerial Economics and Financial Analysis	3	0	0	3
2	ES – 9	Switching Theory and Logic Design	3	0	0	3
3	PC – 8	Electrical Machines III	3	0	0	3
4	PC – 9	Power Electronics	3	0	0	3
5	PE – 1	Electrical Energy Conservation and Auditing/ Electrical Estimation and Costing	3	0	0	3
6	OE – 1	Non-Conventional Energy Sources / Fundamentals of Electrical Power Generation and Protection	3	0	0	3
7	PC Lab – 5	Electrical Machines -II Lab	0	0	2	1
8	PC Lab – 6	Advanced Communication Skills Lab	0	0	2	1
9	MC – 3	Quantitative Methods & Logical Reasoning	2	0	0	1
		Total	**20**	**0**	**4**	**21**

B. Tech. III Year II Semester

S.No.	Course Category	Course Title	L	T	P	Credits
1	PC – 10	Electrical Measurements & Instrumentation	3	0	0	3
2	PC – 11	Computer Methods in Power Systems	3	0	0	3
3	PC – 12	Power Semiconductor Drives	3	0	0	3
4	PC – 13	Switch Gear and Protection	3	0	0	3

5	PE – 2	Integrated Circuit and Applications/ Artificial Intelligence Techniques in ElectricalEngineering	3	0	0	3
6	OE – 2	Energy Auditing and Conservation/ Principles of Electric Power Utilization	3	0	0	3
7	PC Lab – 7	Control Systems and Simulation Lab	0	0	2	1
8	PC Lab – 8	Power Electronics and Simulation Lab	0	0	2	1
9	MC – 4	Personality Development &Behavioural Skills	2	0	0	1
10	PC -16	Utilization of Electrical Energy	3	0	0	3
		Total	**23**	**0**	**4**	**24**

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

III Year ISemester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Analyze the scope of managerialeconomics.
2. Apply managerial tools and techniques to attain optimaldecisions.
3. Analyze how production function is carried out to achieve maximumoutput.
4. Analyze changing business environment in post liberalizationscenario.
5. Evaluate and interpret the financial statements to make informeddecisions.

UNIT I

INTRODUCTION TO BUSINESS AND ECONOMICS:

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT II

DEMAND AND SUPPLY ANALYSIS:

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of DemandForecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT III

PRODUCTION, COST, MARKET STRUCTURES & PRICING:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale. Cost analysis: Types of Costs. Market **Structures**: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

UNIT IV

FINANCIAL ACCOUNTING:

Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, and Preparation of Final Accounts.

UNIT V

FINANCIAL ANALYSIS THROUGH RATIOS:

Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

TEXT BOOKS:

1. Business economics, theory and applications, D. D. Chaturvedi, S. L. Gupta, International Book House Pvt.Ltd.
2. Financial accounting, Dhanesh K Khatri, Tata McGrawHill.

REFERENCE BOOKS:

1. Financial accounting for management, Paresh Shah, Oxford Press, 2015- 2nd edition.
2. Financial accounting, S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Vikas Publications-5th edition.

SWITCHING THEORY AND LOGIC DESIGN

III Year ISemester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, gray andBCD.
2. Manipulate simple boolean expressions using the theorems and postulates of boolean algebra and to minimize combinationalfunctions.
3. Design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complexcircuits.
4. Design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complexcircuits.
5. To develop the state diagrams with the knowledge of Mealy and Moore circuits and algorithmic state machines for binarymultipliers.

UNIT I

NUMBER SYSTEM AND MINIMIZATION TECHNIQUES:

Number System: Review of number system and base conversion, complements, signed binary numbers, floating point number representation, Error detection (parity detection only).

Minimization techniques: Boolean Algebra, postulates ,basic logic gates, Canonical and Standard Form, NAND and NOR implementation, Minimization of switching function using theorem, The Karnaugh Map Method-Up to Five Variable Maps, Tabular Method.

UNIT II

COMBINATIONAL CIRCUITS:

Adders &Subtractor, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparators, Multiplexers, De-multiplexers, Decoders, Encoders and Code converters, Hazards and Hazard Free Relations.

UNIT III

SEQUENTIAL CIRCUITS-I:

Basic Architectural Distinctions between Combinational and Sequential circuits, Latches, Flip Flops: SR, JK, Race Around Condition in JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Design of a Clocked Flip-Flop, Timing and Triggering Consideration, Clock Skew, Conversion from one type of Flip-Flop to another.

UNIT IV

SEQUENTIAL CIRCUITS-II:

Synchronous – Asynchronous – Comparison, Design of Single mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter Using Shift Register, MOD Counters. Finite state machine**-**capabilities and limitations, Mealy and Moore models.

UNIT V

LOGIC FAMILIES AND SEMICONDUCTOR MEMORIES:

Logic Families: DCTL, RTL, DTL, TTL and CML Logic –gate realization - Comparison, **Semiconductor Memories**: Introduction to ROM, PAL, PLA, CPLD, FPGA.

TEXT BOOKS:

1. Switching and finite automata theory, ZviKohavi&NirajK. Jha, Cambridge-3rdEdition.
2. Modern digital electronics – R. P. Jain, Tata McGraw-Hill-3rdEdition.

REFERENCE BOOKS:

1. Digital design, Morris Mano, PHI-4thEdition.
2. Introduction to switching theory and logic design, Fredriac J. Hill, Gerald R.Peterson, John Wiley & Sons Inc-3rdEdition.
3. Fundamentals of logic design- Charles H. Roth, Cengage Learning-5thEdition.

ELECTRICAL MACHINES-III

III Year ISemester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Understand the construction and principle of operation of synchronous machine. Armature reaction, load characteristics, harmonics in generating EMFetc.
2. Solve regulation of synchronous generator using variousmethods.
3. Understand the concept of parallel operation of alternators, load sharing, change of excitation& prime-moverinput.
4. Understand the principle of operation of synchronous motor and working principle of a synchronous condenser in the system, powercircle.
5. Understand the use of special machines and theirperformances.

UNIT I

SYNCHRONOUS MACHINE & CHARACTERISTICS:

Constructional Features of round rotor and salient pole machines - Armature windings - Integral slot and fractional slot windings; Distributed and concentrated windings –Harmonics in generated EMF – suppression of harmonics –Excitation of Synchronous generators in thermal plants and Hydro plants- armature reaction - leakage reactance - synchronous reactance and impedance - experimental determination – phasor diagram - load characteristics.

UNIT II

REGULATION OF SYNCHRONOUS GENERATOR:

Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient pole alternators – two reaction analysis – experimental determination of Xd and Xq (Slip test) Phasor diagrams – Regulation of salient pole alternators.

UNIT III

PARALLEL OPERATION OF SYNCHRONOUS GENERATOR:

Synchronizing alternators with infinite bus bars – synchronizing power torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input. Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactances.

UNIT IV

SYNCHRONOUS MOTORS:

Synchronous Motors: Theory of operation – phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed - hunting and its suppression – Methods of starting – V and inverted V curves.

UNIT V

SPECIAL MACHINES:

Principles of operation of Reluctance Motors, Stepper Motors, Permanent magnet Brushless DC Motors, Principle and operation of Servomotor.

TEXT BOOKS:

1. Electrical machinery, P.S. Bimbra, KhannaPublishers.
2. Theory and performance of electrical machines, J.B.Gupta, KatsonBooks.

REFERENCE BOOKS:

1. Electric machines, I. J. Nagrath& D. P. Kothari, Tata McGraw HillPublishers 2.
Principles of electrical machines, V. K. Mehta, RohitMehta, S. ChandPublishing.
3. Electrical machines - III by M.V.BakshiU.A.Bakshi, TechnicalPublications.

POWER ELECTRONICS

III Year ISemester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Understand about various power electronic devices and their commutationprocedure.
2. Analyze the operation of various phase-controlledconverters.
3. Analyze AC-AC converters and solve theproblems.
4. Analyze the operation of DC-DC converters understanding and solve theproblems.
5. Analyze the operation of DC-AC converters and understanding theproblems.

UNIT I

POWER SEMI CONDUCTOR DEVICES & COMMUNICATION CIRCUITS:

Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics and other thyristors – Basic theory of operation of SCR – Static characteristics – Turn on and turn off methods- Dynamic characteristics of SCR - Turn on and Turn off times -Salient points. Two transistor analogy – SCR - UJT firing circuit - Series and parallel connections of SCR's – Snubber circuit details – Specifications and Ratings of SCR's, BJT, IGBT - Numerical problems – Line Commutation and Forced Commutationcircuits.

UNIT II

AC-DC CONVERTERS (1-PHASE CONTROLLED RECTIFIERS):

Phase control technique – Single phase Line commutated converters – Midpoint and Bridge connections – Half controlled converters with Resistive, RL loads and RLE load– Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with Freewheeling Diode –Numerical problems. Fully controlled converters, Midpoint and Bridge connections with Resistive, RL loads and RLE load– Derivation of average load voltage and current – Line commutated inverters -Active and Reactive power inputs to the converters without and with Freewheeling Diode, Effect of source inductance – Derivation of load voltage and current – Numericalproblems.

UNIT III

AC-DC CONVERTERS (3-PHASE CONTROLLED RECTIFIERS):

Three phase converters – Three pulse and six pulse converters – Midpoint and bridge connections average load voltage With R and RL loads – Effect of Source inductance–Dual converters (both single phase and three phase) - Waveforms –NumericalProblems.

AC-AC CONVERTERS (AC VOLTAGE CONTROLLERS) & FREQUENCYCHANGERS (CYCLO-CONVERTERS): AC voltage controllers – Single phase two SCR's in anti-parallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage, current and power factor wave forms – Firing circuits -Numerical problems -Cycloconverters

– Single phase mid-pointcycloconverters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cycloconverter (Principle of operation only) – Waveforms.

UNIT IV

DC-DC CONVERTERS (CHOPPERS):

Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression, Jones chopper, AC Chopper, Problems. Switched Mode Regulator - SMPS (Basic Principle of Operation).

UNIT V

DC-AC CONVERTERS (INVERTERS):

Inverters – Single phase inverter – Basic series inverter, parallel inverter - operation and waveforms - Three phase inverters (180, 120 degrees conduction modes of operation) - Voltage control techniques for inverters, Pulse width modulation techniques - Numerical problems.

TEXT BOOKS:

1. Power electronics, Dr. P. S. Bimbhra, KhannaPublishers.
2. Power electronics, circuits, devices and applications, M. H. Rashid, Prentice Hall ofIndia.

REFERENCE BOOKS:

1. Power electronics devices, circuits and industrial applications, V. R. Moorthi, Oxford UniversityPress.
2. Power electronics, M. D. Singh &K. B. Kanchandhani, Tata McGraw - Hill Publishing Company.
3. Power electronics, VedamSubramanyam, New Age International (P) Limited,Publishers.

ELECTRICAL ENERGY CONSERVATION AND AUDITING
(Professional Elective-1)

III Year ISemester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Understand the current energy scenario and importance of energyconservation.
2. Apply the concepts of energymanagement.
3. Evaluate energy efficiency in different electricalsystems.
4. Analyze the energy audit of different energysystems.
5. Analyze the energy audit of different energysystems.

UNIT I

ENERGY SCENARIO:

Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features.

UNIT II

BASICS OF ENERGY AND ITS VARIOUS FORMS:

Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion.

UNIT III

ENERGY MANAGEMENT & AUDIT:

Definition, energy audit, need, types of energy audit. Energy management (audit) approach understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

Energy Efficiency in Electrical Systems

Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

UNIT IV

ENERGY EFFICIENCY IN INDUSTRIAL SYSTEMS:

Compressed Air System: Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air system components, capacity assessment, leakage test, factors affecting the performance and savings opportunities in HVAC, Fans and blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Pumps andPumping System: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Cooling Tower: Types and performance evaluation,

efficient system operation, flow control strategies and energy saving opportunities, assessment of cooling towers.

UNIT V

ENERGY EFFICIENT TECHNOLOGIES IN ELECTRICAL SYSTEMS:

Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

TEXT BOOKS:

1. Guide books for national certification examination for energy manager/ energy auditors' book-1, general aspects.
2. Guide books for national certification examination for energy manager/ energy auditors' book-3, electricalutilities.

REFERENCE BOOKS:

1. Utilization of electrical energy and conservation, S. C. Tripathy, McGrawHill.
2. Success stories of energy conservation by BEE, NewDelhi.

ELECTRICAL ESTIMATION AND COSTING
(Professional Elective-I)

III Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Generalize estimation and costing aspects of all electricalequipment.
2. Determine the concepts of installation and designs to analyse the costviability.
3. Evaluate design aspects of wiring system, overhead and underground distribution lines, substations andilluminations.
4. Estimate the cost of various electrical designs andequipment.
5. Analyse overhead and underground transmission and distributionlines.

UNIT I

DESIGN OF SIMPLE ELECTRIC CIRCUITS:

Electrical diagrams- classification of diagrams according to purpose - methods of representation for wiring diagram. System of connection of appliances and accessories - schematic wiring and singleline diagram. Design and drawing of panel boards. Design conditions – standard sizes of boards – materialsused.

UNIT II

DESIGN CONSIDERATIONS OF ELECTRICAL INSTALLATIONS:

Electric Supply System - Three phase four wire distribution system - Protection of Electric Installation against over load - short circuit and Earth fault – Earthing - General requirements of electrical installations - testing of installations - Indian Electricity rules - Neutral and Earth wire.

UNIT III

Types of loads - Systems of wiring - Service connections - Service Mains- Sub-Circuits -Location of Outlets - Location of Control Switches - Location of Main Board and Distribution board - Guide lines for Installation of Fittings - Load Assessment - Permissible voltage drops and sizes of wires - Estimation and Costing of Electric installations.

UNIT IV

ELECTRICAL INSTALLATION FOR DIFFERENT TYPES OF BUILDINGS AND SMALL INDUSTRIES:

Electrical installations for residential buildings - estimating and costing of material - Electrical installations for commercial buildings - high rise buildings. Electrical installations for small industries.

UNIT V

OVERHEAD AND UNDERGROUND TRANSMISSION AND DISTRIBUTION LINES:

Introduction - Supports for transmission lines - Distribution lines - Materials used - Underground cables - Mechanical Design of overhead lines - Design of underground cables.

TEXT BOOKS:

1. Electrical design estimating and costing, K. B. Raina, S. K. Bhattacharya, New Age International Publisher-5thedition
2. Electrical installation estimating and costing, J.B.Gupta, S.K. Katria and Sons, New Delhi8thedition.

REFERENCE BOOKS:

1. Guide for electrical layout in residential buildings, Indian StandardInstitution
2. Electrical installation buildings indian standard institution, IS:2032.
3. Electrical Installation, estimating and costing, J. B. Gupta, Katson,Ludhiana.

NON CONVENTIONAL ENERGY SOURCES
(Open Elective-1)

III Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to 1. Realize the importance of renewable energy sources for energyplanning.

2. Understand the value of solar energy potential and exploit the solar energy for real world applications.
3. Understand the potential of wind energy, types of wind mills, performance characteristics and Betz criteria.
4. Analyze the potential of both tidal and ocean thermal energies and learn the extraction methods.
5. Know the potential of geothermal, bio-mass energies and learn relevant extractionmethods.

UNIT I

PRINCIPLE OF RENEWABLE ENERGY:

Comparison of renewable and conventional energy sources-ultimate energy sources-natural energy currents on earth-primary supply to end use-spaghetti & pie diagrams-energy planning-energy efficient andmanagement.

UNIT II

SOLAR RADIATION:

Extraterrestrial and terrestrial solar radiation solar thermal conversion- solar thermal central receiver photovoltaic energy conversion-solar cell configurations.

UNIT III

WIND ENERGY:

Planetary and local winds-vertical and horizontal axis wind mills-principles of wind power-maximum power-actual power - wind turbine operation - Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

UNIT IV

ENERGY FROM OCEANS:

Ocean thermal energy -principles of OTEC plant operations-wave energy – devices for energy extraction-tides – types of tidal stations.

UNIT V

GEOTHERMAL AND BIO FUEL ENERGY:

Origin and types – Bio fuels – classification-direct combustion for heat and electricity generator-anaerobic digestion for biogas-biogas digester-power generation.

TEXT BOOKS:

1. Renewable energy sources, John Twidell&Timey&Weir.
2. Non-conventional energy sources, G.D. Rai, Khannapublications.

REFERENCE BOOKS:

1. Power plant technology, EL-Wakil, McGraw-Hill.

2. Renewable energy resources: basic principles and applications, G.N.Tiwari, M K. Ghosal, Narosa publishers.
3. Energy conversion systems, Rakosh das Begamudre, New age Internationalpublishers.

FUNDAMENTALS OF ELECTRICAL POWER GENERATION AND PROTECTION
(Open Elective-1)

III Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Interpret the operation of thermal power station through its schematicdiagram.
2. Observe the arrangement of hydroelectric power station through itscomponents.
3. Show various components of nuclear powerstation.
4. Describe the operation of gas and diesel power station through its schematicdiagram.
5. Differentiate various power system protectioncomponents.

UNIT I

THERMAL POWER STATIONS:

Introduction to Generating stations -Steam Power Stations-Advantages and disadvantagesSchematic arrangement of Steam power system - Choice of site of steam power station-Efficiency of steam power station-Equipment of steam powerstation.

UNIT II

HYDRO ELECTRIC POWER STATION:

Introduction–Advantages and Disadvantages-Schematic arrangement of Hydro Electric Power Station, Choice of site for Hydro Electric Power Station-Constituents of Hydro Electric Power Station- Pumped storageplants.

UNIT III

NUCLEAR POWER STATIONS:

Introduction-Advantages and Disadvantages-Selection of site for nuclear power station- - Nuclear Fission and Chain reaction. - Nuclear fuels. - Principle of operation of nuclear reactor- Schematic arrangement of nuclear power stations-Components of Nuclear Power plant- Radiation hazards: Shielding and Safety precautions.

UNIT IV

GAS AND DIESEL POWER STATION:

Gas Turbine Power Station: Introduction-Advantages and Disadvantages-Schematic arrangement of Gas turbine Power station.

Diesel Power station: Introduction-Advantages and Disadvantages-Schematic arrangement of Diesel Power station.

UNIT V

INTRODUCTION TO POWER SYSTEM PROTECTION COMPONENTS (ELEMENTARY TREATMENT ONLY):

Fuses-Definition-Advantages and Disadvantages of fuses-Desirable characteristics of fuse-fuse element materials-Important terms.

Circuit Breakers-Definition-Important terms-Comparison of fuse and Circuit breaker – Isolators-Protective relay-Requirement of Protective relay-Electrical Hazards – need of Earthing.

TEXT BOOKS:

1. Principles of power systems, V.K Mehta and RohitMehta S. Chand Company Pvt. Ltd, New Delhi-4thEdition.
2. A course in power systems, J.B.Gupta, S.K.Kataria& Sons.

REFERENCE BOOKS:

1. A text book of power system engineering, R.K.Rajput, Laxmi Publications (P)Limited.
2. Electrical Power Generation:Transmission and distribution, S.N.Singh,PHI.
3. Generation of electrical energy, B.R. Gupta,S.Chand.

ELECTRICAL MACHINES – II LAB

III Year ISemester

L	T	P	C
0	0	2	1

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

1. Understand the basic working principle of a transformer; obtain the equivalent circuit parameters, estimate efficiency & regulation at various loads of 1-Φtransformers.
2. Understand load sharing of transformers & conversion of 3- Φ to 2- Φsupply.
3. Determine the equivalent circuit parameters of a single phase induction motor, determine the performance characteristics and efficiency by direct and indirect methods of three phase inductionmotor.
4. Analyze the regulation of an alternator by various methods at different powerfactors.
5. Understand synchronous motor performance curves at various power factors and field currents.

Any Ten of the following experiments are required to be conducted.

1. Sumpner's test on a pair of single phasetransformer.
2. Separation of core losses of a single phasetransformer.
3. Scott connection of transformer and Parallel operation of single phasetransformer.
4. No-load & Blocked rotor tests on three phase inductionmotor.
5. Regulation of a three – phase alternate by synchronous impedance m.m.fmethods.
6. V and inverted V curves of a three – phase synchronousmotor.
7. Equivalent circuit of a single phase inductionmotor.
8. Determination of Xd and Xq of a salient pole synchronousmachine.

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

9. Regulation of three phase alternator by Z.P.F. and A.S.Amethods.
10. Determination of sequence impedances of a three-phasealternator.
11. Determination of sequence impedances of a three-phasetransformer.
12. Speed control of three phase slip ring InductionMotor.

ADVANCED COMMUNICATION SKILLS (ACS)LAB (Common to all branches)

III Year ISemester

L	T	P	C
0	0	2	1

Course Outcomes: Upon the completion of Laboratory course, the student should be able to 1. Develop sound communication skills in various situations with the help of enriched vocabulary.

2. Practice reading techniques for a faster and bettercomprehension.
3. Exhibit strong writing skills to express ideaseffectively.

4. Demonstrate effective presentationskills.
5. Use appropriate verbal and non-verbal skills for a successfulcareer.

UNIT I

ACTIVITIES ON FUNDAMENTALS OF INTER-PERSONAL COMMUNICATION AND BUILDING VOCABULARY:

Starting a conversation – responding appropriately and relevantly – using the right body language - Role Play in different situations & Discourse Skills – using visuals – Synonyms and antonyms, word roots, one word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

UNIT II

ACTIVITIES ON READING COMPREHENSION:

General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.

UNIT III

ACTIVITIES ON WRITING SKILLS:

Structure and presentation of different types of writing – letter writing/ Resume writing/ Statement of purpose - E-correspondence/ Technical report writing / Portfolio writing – planning for writing – improving one's writing.

UNIT IV

ACTIVITIES ON PRESENTATION SKILLS:

Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/e-mails/assignments etc.

UNIT V

ACTIVITIES ON GROUP DISCUSSION AND INTERVIEW SKILLS:

Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation. Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video – conference and Mock Interviews.

REFERENCE BOOKS:

1. Technical communication, Meenakshi Raman &Sangeeta Sharma, Oxford University-2nd Edition.
2. Functional english for success, OrientLongman.

QUANTITATIVE METHODS AND LOGICAL REASONING

(Common to all branches)

III Year ISemester

L	T	P	C
2	0	0	1

Course Outcomes: At the end of the course, the student should be able to

1. Perform well in various competitive exams and placementdrives.
2. Solve basic and complex mathematical problems in short time.
3. Become strong in quantitative aptitude and reasoning this can be applied for GRE, GATE, GMAT or CAT examalso.
4. Develop problem solving skills and analytical abilities, which play a great role in corporate and industry setup.

UNIT I

Number System: Speed Maths, Numbers, Factors, Prime & Co Primes, LCM & HCF, Divisibility Rules, Finding Unit Place Digit and Last Two Digits of an Expression

Ratio, Proportion and Variations: Definition of Ratio, Ratio of Proportion, Comparison of Ratios, Compound ratio, Direct and Indirect Proportion

Percentages: Converting Fractions and Decimal into Percentages, Successive Percentage, Populations, Expenditure andSavings

Profit and loss: Relation between Cost Price and Selling Price, Discount and Marked Price, Gain or Loss Percentages on Selling Price

Simple and Compound Interest: Problems on Interest (**I**), Amount (**A**), Principal (**P**) and Rate of Interest (**R**) difference between the Simple Interest and Compound Interest for 2 and 3 years.

UNIT II

Partnership: Relation between Partners, Period of Investment and Shares

Averages, Ages and Allegation : Average of Different Groups, Change in Averages by Adding, Deleting and Replacement of Objects, Problems on ages, Allegation Rule, Mean Value of the Mixture, Replacement of Equal Amount ofQuantity.

Time and Work: Men and Days, Work and Wages, Pipes and Cisterns, Hours and Work, Alternate Days Concept,

Time and Distance: Difference between the Average and Relative Speeds, Reaching the Destination Late and Early, Stoppage Time Per Hour, Time and Distance between Two Moving Bodies : Train Crossing Man - same and opposite directions, Speed of Boat and Stream,

UNIT III

Progressions and Quadratic Equations: Arithmetic, Geometric and Harmonic Progressions, Arithmetic Mean, Geometric Mean and Harmonic Mean and their Relations. General form of Quadratic Equation, Finding the Roots of Quadratic Equation, Nature of the Roots.

Permutation and Combination: Fundamental Rules, Problems on Permutations & combinations.

Probability: Definition of probability, Notations and Formulae, Problems on Probability.

Data Interpretation and Data Sufficiency: Tabular and Pie-charts, Bar and Line Graphs, Introduction to Data Sufficiency, Problems on Data Sufficiency.

UNIT IV

Deductions: Statements and conclusions using Venn diagram and Syllogism Method **Series completion:** Number series, Alphabet series, Letter Series.

Coding and Decoding: Letter coding, Number coding, Number to letter coding, Matrix Coding, Substitution, Mixed Letter Coding, Mixed Number Coding, Deciphering Individual Letter Codes by Analysis.

Analytical Reasoning Puzzles:

Problems on Linear, Double line-up and Circular Aarrangements, Selections and Comparisons.

Blood Relations:

Defining the various Relations among the Members of a Family, Solving Blood Relation Puzzles by using Symbols and Notations. Problems on Coded Relations.

UNIT V

Direction sense Test: Sort of directions in puzzles distance between two points, problems on shadows, Application of triangulartriplets.

Clocks: Relation between Minute-Hour Hands, Angle vs Time, Exceptional Cases in Clocks
Calendars: Definition of a Leap Year, Finding the Odd days, finding the Day of any Random Calendar Date, repetition of Calendar Years.
Cubes and Dices: Finding the Minimum and Maximum Number of Identical Pieces and Cuts, Painting of Cubes and cuts, Problems on Dice.
Venn Diagrams: Circular Representation of given words, Geometrical Representation of Certain class, Set theory based Problems.

TEXT BOOKS:

1. Verbal reasoning, GL Barrons, Pinterest-Latest Edition,2019
2. A modern approach to logical reasoning & quantitative aptitude, R S Agarwal, S. Chand, Publications, Revised edition,2019

REFERENCE BOOKS:

1. Quantitative aptitude, G.L Barrons, Pinterest,2019
2. Quantitative aptitude, AbhijitGuha, McGraw Hills- Edition2019
3. Quantitative aptitude, U. Mohan Rao, SCITECH

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

III Year II Semester

Course Outcomes: At the end of the course, the student should be able to 1.
Analyze all the types of measuring instruments and errorcompensations.

2. Discuss the operation of DC Crompton potentiometer; compare the CT and PT with phasor diagram.
3. Discuss and learn the concepts of power and energy measurement by using wattmeter and energymeter.
4. Outline the concept of DC and AC bridges for the measurement of resistance, inductance & capacitance.
5. Analyze the concepts of transducers and cathode rayoscilloscopes.

UNIT I
INTRODUCTION TO MEASURING INSTRUMENTS:
Classification-deflection, control and damping torques- Ammeters and Voltmeters- PMMC, moving iron type instruments- expression for the deflecting torque and control torque- Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters- electrometer type and attracted disc type.

UNIT II
POTENTIOMETERS& INSTRUMENT TRANSFORMERS:
Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate types, standardization- applications. CT and PT- Ratio and Phase angle errors (of CTonly).

UNIT III
MEASUREMENT OF POWER & ENERGY:
Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of reactive power.
Single phase Induction type energy meter–driving and braking torques-errors and compensations – testing by phantom loading using RSS meter. Three phase energy meter- Maximum demand meters.

UNIT IV
D.C BRIDGES& A.CBRIDGES:
Method of measuring low, medium, high resistances – sensitivity of wheat- stone Bridge – carey foster's Bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistanceloss of chargemethod
Measurement of Inductance – Q Factor – Maxwell's Bridge, Hay's bridge, Anderson's bridge, Owen's bridge. Measurement of capacitance and loss angle – Desauty Bridge. Wien's Bridge – ScheringBridge.

UNIT V
TRANSDUCERS & OSCILLOSCOPES:

L	T	P	C
3	0	0	3

Definition of transducers, classification of transducers, Advantages of Electrical transducers, characteristics and choice of transducers; Principle operation of LVDT and capacitor transducers, LVDT Applications, Strain guage and its principle of operation, guage factor, Thermistors, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, photo diodes.

CRO: Cathode ray oscilloscope – cathode ray tube – time base generator- horizontal and vertical amplifiers- Lissajous Patterns.

TEXT BOOKS:

1. A course in electrical and electronic measurements and instrumentation by A. K. Sawhney, PuneetSawhney, DhanpatRai&Co.
2. Electrical and electronic measurements and instrumentation, R.K.Rajput, S.Chand& company Ltd.

REFERENCE BOOKS:

1. Electrical measurements and measuring instruments, Golding E.W, Widdis F.C, Publisher: AH Wheeler &Company.
2. Electrical and electronic measurements, G.K. Banerjee, PHI Learning Pvt.Ltd.
3. Electrical Measurements and Measuring Instruments, N. V. Suryanarayana, Tata McGraw Hill.

COMPUTER METHODS IN POWER SYSTEMS

III Year II Semester

Course Outcomes: At the end of the course, the student should be able to

1. Demonstrate the knowledge and abilityto develop Y-bus and Z-busmatrices.
2. Know the importance of load flow studies and itsimportance.
3. Understand Per unit system
4. Compare various types of short-circuit faults.
5. Understand the power system steady state stability and transient statestability.

UNIT I

POWER SYSTEM NETWORK MATRICES:

Graph Theory: Definitions, Bus Incidence Matrix, Y-bus formation by Singular Transformation Methods and Direct Inspection methods, Numerical Problems.

FORMATION OF Z-BUS: Partial network, Algorithm for the Modification of Z-bus Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses (Numerical Problems). Modification of Z-bus for the changes in network(Problems).

UNIT II

POWER FLOW STUDIES:

Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static load flow equations, classification of Buses and their relevance to Power Flow.**LOAD FLOW SOLUTION USING GAUSS SEIDEL METHOD:** Acceleration Factor, Load flow solution without and with P-V buses, Algorithm and Flowchart. Numerical Load flow Solution for Simple Power Systems (Max. 3- Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and finding Line Flows/Losses for the given Bus Voltages.

NEWTON RAPHSON METHOD IN RECTANGULAR AND POLAR CO-ORDINATES

FORM: Load Flow Solution without and with PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart (Max. 3-Buses).

DECOUPLED AND FAST DECOUPLED METHODS: Comparison of Different Methods – DC load Flow.

UNIT III

SHORT CIRCUIT ANALYSIS:

PER-UNIT SYSTEM OF REPRESENTATION: Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems. Needs and assumptions for short circuit analysis.

SYMMETRICAL FAULT ANALYSIS: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems.

SYMMETRICAL COMPONENT THEORY: Symmetrical Component Transformation, Positive, Negative and Zero sequence components: Voltages, Currents and Impedances. Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems.

UNSYMMETRICAL FAULT ANALYSIS: LG, LL, LLG faults without and with fault impedance, Numerical Problems.

UNIT IV

STEADY STATE STABILITY ANALYSIS:

L	T	P	C
3	0	0	3

Elementary concepts of Steady State, Dynamic and Transient Stabilities. Description of Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State stability and methods to improve steady state stability.

UNIT V

TRANSIENT STABILITY ANALYSIS:

Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Case study – sudden loss of parallel lines, Critical Clearing Angle Calculation- Solution of Swing Equation: Point-by-Point Method. Methods to improveStability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

TEXT BOOKS:

1. Power system analysis, Dr. N. V. Ramana, Pearson EducationIndia.
2. Computer methods in power system analysis, Stagg and EL-Abiad, McGrawHill

REFERENCE BOOKS:

1. Modern power system analysis, I. J. Nagrath& D.P. Kothari, Tata McGraw Hill Publishing Company-4thEdition
2. Power system analysis, A. Nagoorkani, RBA Publications-3rdEdition
3. Power system analysis and stability, S. S. Vadhera, KhannaPublications

POWER SEMICONDUCTOR DRIVES

III Year II Semester

Course Outcomes: At the end of the course, the student should be able to

1. Understand the concepts of the dynamics of electric drives and speed control of different types of DC drives.
2. Analyze four quadrant operationto control speed of DCdrives using dual converters.
3. Examine four quadrant operationto control speed of DCdrives using choppers.
4. Discuss speed control of induction motor drives.
5. Study speed control of synchronous motor drives.

UNIT I

CONTROL OF DC MOTORS THROUGH PHASE CONTROLLED RECTIFIERS:

Introduction to Thyristor controlled Drives, Single Phase semi and fully controlled converters connected to DC separately excited and DC series motors -continuous current operation - output voltage and current waveforms- Speed and Torque expressions - Speed - Torque Characteristics- Problems on Converter fed DC motors. Three phase semi and fully controlled converters Connected to DC separately excited and DC series motors - output voltage and current waveforms - Speed and Torque expressions - Speed - Torque characteristics - Problems.

UNIT II

FOUR QUADRANT OPERATIONS OF DC DRIVES THROUGH DUAL CONVERTERS:

Introduction to Four quadrant operation - Motoring operations, Electric Braking - Plugging, Dynamic and Regenerative Braking operations, Four quadrant operation of D C motors by dual converters - Closed loop operation of DC motor (Block Diagram Only).

UNIT III

CONTROL OF DC MOTORS BY CHOPPERS (1, 2, 4 QUADRANT OPERATIONS):

Single quadrant, Two -quadrant and four quadrant chopper fed separately excited and series exacted motors - Continuous current operation - Output voltage and current wave forms - Speed torque expressions - speed torque characteristics - Problems on Chopper fed DC Motors - Closed Loop operation (Block Diagram Only).

UNIT IV

CONTROL OF INDUCTION MOTORS:

Variable voltage& Frequency Characteristics:

Control of Induction Motor by AC Voltage Controllers - Waveforms - speed torque characteristics. Variable frequency control of induction motor by Voltage source and current source Inverter and cyclo-converters- PWM control - Comparison of VSI and CSI operations - Speed torque Characteristics - numerical problems on induction motor drives - Closed loop operation of induction motor delves (Block Diagram Only).

Static rotor resistance control:

Slip power recovery - Static Scherbius drive – Static Kramer Drive - their performance and speed torque characteristics - advantages applications - problems.

UNIT V

CONTROL OF SYNCHRONOUS MOTORS:

Separate control &self-control of synchronous motors - Operation of self-controlled synchronous motors by VSI and CSI cycloconverters. Load commutated CSI fed Synchronous Motor - Operation -

L	T	P	C
3	0	0	3

Waveforms - speed torque characteristics - Applications -Advantages and Numerical Problems Closed Loop control operation of synchronous motor drives (Block Diagram Only), variable frequency control, Cyclo converter, PWM, VFI, CSI. Principle of operation of BLDC motor drive.

TEXT BOOKS:

1. Fundamentals ofelectricaldrives, G. K.Dubey, Alpha Science International Limited-2nd Edition.
2. Power semiconductor drives, J.Gnanavadivel, AnuradhaPublications.

REFERENCE BOOKS:

1. Power semiconductor drives, PV Rao, BSPublications.
2. Thyristorcontrol of electric drives, VedamSubramanyam, Tata McGraw HillPublications.
3. A first course on electrical drives, S K Pillai, New Age International (P) Ltd-2ndEdition

SWITCH GEAR AND PROTECTION

III Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Know basic working of circuit breaker and classification of circuitbreakers.
2. Make out the application of different types of circuits breakers in powersystems.
3. Understand Principle of operation of over current, directional, differential and distancerelays.
4. Device protection methods for alternators, transformers,bus-bars.
5. Gain concept of neutral grounding and protection Method list from different types ofsurge.

UNIT I

CIRCUIT BREAKERS:

Circuit Breaker (CB) – Elementary principles of arc interruption, Recovery– Restriking Voltage and Recovery voltages–Restriking phenomenon–Average and Max. RRRV–Numerical problems-Current chopping and Resistance switching–CB ratings and specifications: Types and Numerical problems- Auto reclosing. Description and operation of following types Circuit Breaker: Minimum Oil Circuit Breaker, Air Blast Circuit Breaker–Vacuum and SF6 circuit breakers.

UNIT II

ELECTROMAGNETIC, STATIC RELAYS & NUMERICAL RELAYS:

Principle of operation and construction of attracted armature– Balanced beam– induction disc and induction cup relays– Relays classification– Instantaneous– DMT and IDMT types– Applications of relays: Over current/under voltage relays– Directional relays– Differential relays and percentage differential relays.

Distance relays: Impedance– Reactance– Mho and offset Mho relays– Characteristics of distance relays Comparison of numerical relays & static relays with electromagnetic relays.

UNIT III

GENERATOR & TRANSFORMER PROTECTION:

Protection of generators against stator faults– Rotor faults and abnormal conditions– restricted earth fault and inter turn fault protection– Numerical examples on percentage windings unprotected. Protection of transformers: Percentage differential protection– Numerical problems on Design of CT's ratio– Buchholz relay protection.

UNIT IV

FEEDER AND BUS BAR PROTECTION& GROUNDING PROTECTION OF LINES:

Over current– earth fault, Carrier current and three zone distance relay using impedance relays– Translay relay–Protection of bus bars– Differential protection.

NEUTRAL GROUNDING

Grounded & ungrounded neutral systems.-Effects of ungrounded neutral system performance. Methods of neutral grounding: Solid resistance, reactance-Arcing grounds& grounding practice.

UNIT V

PROTECTION AGAINST OVER VOLTAGE AND GROUNDING:

Generation of over voltages in power systems– Protection against lightning over voltages– Valve type and zinc–Oxide lighting arresters– Insulation coordination– BIL– impulse ratio–. Earthing Practices in Substations.

TEXT BOOKS:

1. Switchgear and protection, Sunil.S.Rao, Khannapublishers.
2. Power system protection and switchear gear, Badriram, D. N. Viswakarma Tata McGraw Hill Education-2nd Edition.

REFERENCE BOOKS:

1. Electrical power systems, C. L. Wadhwa, New age international (P) limited-4th Edition.
2. A Textbook on power system engineering, M. L. Soni, P. V. Gupta, U. S. Bhatnagar, A.Chakrabarthy, DhanapatRai& Copvt.ltd.
3. Principles of power system, V.K Mehtha&RohitMehtha, S.Chand company Pvt. Ltd-4th Edition.

INTEGRATED CIRCUITS AND APPLICATIONS
(Professional Elective-2)

III Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Remember the characteristics of different integrated circuitsfamilies.
2. Infer the different applications of operational amplifiers under differentconfigurations.
3. Recognize the importance of special function integrated circuits on different engineering applications.
4. Interpret the need for data converters for real timeapplications.
5. Design and analysis of first order active filter and waveform generators using operational amplifiers.

UNIT I

INTEGRATED CIRCUITS:

Classification, chip size and circuit complexity, Classification of Integrated circuits, comparison of various logic families, standard TTL NAND Gate-Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tri-state outputs, CMOS transmission gate, IC interfacing- TTL driving CMOS & CMOS driving TTL.

UNIT II

OP-AMP AND APPLICATIONS:

Basic information of OP-AMP, ideal and practical OP-AMP, internal circuits, OP-AMP characteristics, DC and AC characteristics, 741 OP-AMP and its features, modes of operation- inverting, noninverting, differential. Basic application of OP-AMP, instrumentation amplifier, ac amplifier, V to I and I to V converters, sample & hold circuits, multipliers and dividers, Differentiators and Integrators, Comparators, introduction to voltageregulators.

UNIT III

ACTIVE FILTERS & OSCILLATORS:

Introduction, 1st order LPF, HPF filters, Band pass, Band reject and all pass filters. Oscillator types and principle of operation - RC, Wien and quadrature type, waveform generators - triangular, saw tooth, square wave and VCO.

UNIT IV

TIMERS & PHASE LOCKED LOOPS:

Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.

UNIT V

D-A AND A-DCONVERTERS:

Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and slope ADC. DAC and ADC specifications.

TEXT BOOKS:

1. Linear integrated circuit, D. Roy Chowdhary, New Age International(p) Ltd-2nd Edition
2. Op-amps and linear Integrated Circuits, RamakanthA. Gayakwad,PHI.

REFERENCES BOOKS:

1. Operational amplifiers and linear integrated circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI.
2. Operational amplifiers and linear integrated circuits: Theory & Applications, Denton J. Daibey,TMH.
3. Digital fundamentals - Floyd and Jain, Pearson Education-8thEdition.

ARTIFICIAL INTELLIGENCE TECHNIQUES IN ELECTRICAL ENGINEERING
(Professional Elective-2)

III Year II Semester

L	T	P	C
3	0	0	3

Course Objectives:

1. To locate soft commanding methodologies, such as artificial neural networks, fuzzy logic and geneticalgorithms.
2. To observe the concepts of feed forward neural networks and about feedback neuralnetworks.
3. To practice the concept of fuzziness involved in various systems and comprehensive knowledge of fuzzy logic control and to design the fuzzycontrol.
4. To analyze genetic algorithm, genetic operations and geneticmutations.

Course Outcomes: At the end of the course, the student should be able to

1. Understanding artificial neural networks.
2. Generalize feed forward neural networks, feedback neural networks and learningtechniques.
3. Identify fuzziness involved in various systems and fuzzy settheory.
4. Discover fuzzy logic control for applications in electricalengineering.
5. Interpret genetic algorithm for applications in electrical engineering.

UNIT I

ARTIFICIAL NEURAL NETWORKS:

Introduction, Models of Neuron Network-Architectures –Knowledge representation, Artificial Intelligence and Neural networks–Learning process-Error correction learning, Hebbian learning – Competitive learning-Boltzman learning, supervised learning-Unsupervised learning–Reinforcement learning-Learning tasks.

UNIT II

ANN PARADIGMS:

Multi-layer perceptron using Back propagation Algorithm (BPA), Self –Organizing Map (SOM), Radial Basis Function Network-Functional Link Network (FLN), Hopfield Network.

UNIT III

FUZZYLOGIC:

Introduction –Fuzzy versus crisp, Fuzzy sets-Membership function –Basic Fuzzy set operations, Properties of Fuzzysets –Fuzzy Cartesian Product, Operations on Fuzzy relations - Fuzzy logic–Fuzzy Quantifiers, Fuzzy Inference-Fuzzy Rule based system, Defuzzification methods.

UNIT IV

GENETIC ALGORITHMS:

Introduction-Encoding –Fitness Function-Reproduction operators, Genetic Modeling -Genetic operators-Cross over-Single site cross over, Two point cross over –Multi point cross over Uniform cross over,

Matrix cross over-Crossover Rate-Inversion & Deletion, Mutation operator –Mutation – Mutation Rate-Bit-wise operators, Generational cycle-convergence of Genetic Algorithm.

UNIT V

APPLICATIONS OF AI TECHNIQUES:

Load forecasting, Load flow studies, Economic load dispatch, Load frequency control, Single area system and twoarea system, Reactive power control, Speed control of DC and AC Motors.

TEXT BOOKS:

1. Neural networks, fuzzy logic and genetic algorithms, S.Rajasekaran and G.A.V.Pai PHI, New Delhi.
2. Neural networks: A comprehensive foundation, Simon O Haykin, International Edition-2nd Edition.

REFERENCE BOOKS:

1. Neural computing theory & practice, P.D.Wasserman&Van Nostrand Reinhold, NewYork.
2. Neural network & fuzzy system, Bart Kosko, PrenticeHall.
3. Genetic algorithms, D.E.Goldberg, PearsonEducation.

ENERGY AUDITING & CONSERVATION
(Open Elective-2)

III Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Realize the need for energy auditing and conservation. Get awareness on types of energy audit; represent energy flows and energy consumption in tabular and graphicalmethods.
2. Understand and exploit energy saving opportunities in energy efficient motors and power factor improvementmethods.
3. Learn energy auditing and conservation opportunities in HVAC systems with respect to energy efficientbuildings.
4. Analyze economic viability with respect to real world problems using depreciationmethods.
5. Know the check lists for energy conservation in boilers, heat pumps, cooling systems, compressors andfans.

UNIT I

BASIC PRINCIPLES OF ENERGY AUDIT:

Energy audit-definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes. Energy audit of industries, Energy saving potential, Energy audit of process industry, and thermal power station.

UNIT II

ENERGY EFFICIENT MOTORS, POWER FACTOR IMPROVEMENT& LIGHTING:

Energy efficient motors, factors affecting efficiency, variable speed, variable duty cycle systems, effect of Voltage variation on motors, motor energy audit. Power factor- methods of improvement, location of capacitors, Pf with nonlinear loads- Good Lighting system design and practice, lighting control, lighting energyaudit.

UNIT III

ENERGY EFFICIENT BUILDINGS:

Green Buildings, Intelligent Buildings, Rating of Buildings, Efficient use of Buildings, Ventilation Solar Passive Architecture. Adoption to sustainable resources such as PV modules, solar heating, Cooling Techniques, Energy audit and conservation opportunities.

UNIT IV

ECONOMIC ASPECTS AND ANALYSIS:

Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis-calculation of simple payback method, net present worth method-Applications of cycle costing analysis, return ofinvestment.

UNIT V

ENERGY CONSERVATION OPPORTUNITIES:

Energy conservation checklist, Energy conservation opportunities in boilers, Heat pumps and cooling systems, chilled water Plants and Central air- conditioning systems, Water Heaters and coolers, Compressors and Fans.

TEXT BOOKS:

1. Energy management, W.R. Murphy and G. McKay Butter worth, Heinemannpublications.
2. Energy efficient electric motors, John .C. Andreas, Marcel Dekker Inc Ltd-3rdEdition

REFERENCE BOOKS:

1. Energy management, Paul o' Callaghan, McGraw Hill Book company-1stEdition.
2. Energy management hand book, W.C.Turner, John Wiley and sons-7thEdition.
3. Energy management and good lighting practice: fuel efficiency - booklet1&2 - Great Britain Energy EfficiencyOffice.

PRINCIPLES OF ELECTRIC POWER UTILIZATION
(Open Elective - 2)

III Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Understand terms and concepts ofillumination.
2. Apply the concepts of different electric lamps and good lighting Practices for artificial lighting systems.
3. Understands the methods of electric heating andwelding
4. Understands the concepts of different electric traction systems and existing traction system in India.
5. Analyze the mechanics of trainmovement.

UNIT I

ILLUMINATION FUNDAMENTALS:

Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light.

UNIT II

VARIOUS ILLUMINATION METHODS:

Discharge lamps, MV and SV lamps- comparison between tungsten filament lamps and fluorescent tubes, Basic Principles of Light Control, Types and design of lighting and flood lighting. Energy efficient Lights.

UNIT III

ELECTRIC HEATING & WELDING:

Advantages and methods of electric heating, resistance heating induction heating and dielectric heating. Electric Welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. welding.

UNIT IV

ELECTRIC TRACTION - I:

System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, Methods of electric braking-plugging Rheostatic braking and regenerative braking.

UNIT V

ELECTRIC TRACTION – II:

Mechanics of train movement, Speed-time curves for different services- trapezoidal and quadrilateral speed time curves.

TEXT BOOKS:

1. Utilization of electrical power,Er. R. K. Rajput, Laxmi Publications (P) Ltd-1stEdition.

2. Utilization of electric power and electric traction, J.B.Gupta, S.K.Kataria& Sons publication10thEdition.

REFERENCE BOOKS:

1. Utilization of electric energy, E. Openshaw Taylor, Orient Longman (P)Ltd
2. Generation, distribution and utilization of electrical energy, C.L.Wadhwa, New Age International (P) Ltd-3rdEdition.
3. Utilization of electric power, N. V. Suryanarayana, New Age International (P)Ltd.

CONTROL SYSTEMS AND SIMULATION LAB

III Year II Semester

L	T	P	C
0	0	2	1

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

1. Examine the time response of second order systems, synchros, and truth tables verification by PLC.
2. Design of AC servomotor and DC servomotor to find out their transfer functionpractically.
3. Design of DC motor, DC generator, and finding out their transfer function practically.
4. Analyze magnetic amplifiercharacteristics.
5. Explain stability analysis through bode, Nyquist and root locus plots usingMATLAB.

Any Ten of the following experiments are to be conducted

1. Time response of Second ordersystem.
2. Characteristics ofSynchros.
3. Programmable logic controller Study and verification of truth tables of logic gates, simple. Boolean expressions and application of speed control ofmotor.
4. Effect of feedback on DC servomotor.
5. Transfer function of DCmotor.
6. Transfer function of DC Shuntgenerator.
7. Characteristics of magneticamplifiers.
8. Characteristics of AC servomotor.
9. Simulation of Op-Amp based Integrator and Differentiatorcircuits.
10. Linear system analysis (Time domain analysis, Erroranalysis).
11. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using simulationsoftware.
12. State space model for classical transfer function– Verification using simulationsoftware.

POWER ELECTRONICS AND SIMULATION LAB

III Year II Semester

L	T	P	C
0	0	2	1

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

1. Examine the characteristics of SCR, MOSFET, & IGBT, and analyze triggeringcircuits.
2. Analyze input and output chrematistics of AC-DCconverters.
3. Synthesize input and output chrematistics of cycloconverters.
4. Examine input and output chrematistics of DC-DCConverters.
5. Design of converters and inverters using P-Spicesoftware.

Any ten of the following experiments are required to be conducted.

1. Study of the characteristics of SCR, MOSFET &IGBT.
2. Gate Firing Circuits for SCRs (R- Triggering, RC Triggering & UJTTriggering).
3. Single Phase AC voltage Controller with R & RL Loads.
4. Single Phase fully Controlled Bridge Converter with R& RLLoads.
5. DC Jones Chopper with R & RLLoads.
6. Single Phase Parallel Inverter with R& RLLoads.
7. Single Phase Cyclo-Converter with R& RLLoads.
8. Single Phase Series Inverter with R& RLLoads.
9. Single Phase Half controlled converter with R Load.
10. Simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLEloads.
11. Simulation of resonant pulse commutation circuit and BuckChopper.
12. Simulation of single phase Inverter with PWMcontrol.

PERSONALITY DEVELOPMENT AND BEHAVIOURAL SKILLS
(Common to all branches)

III Year II Semester

L	T	P	C
2	0	0	1

Course Outcomes: At the end of the course, the student should be able to

1. Practice optimistic attitude for an efficient socially viable and multi-facetedpersonality.
2. Demonstrate functions of non-verbal communication in formalcontext.
3. Build effective individual & team dynamics for professionalaccomplishments.
4. Analyze appropriate strategic Interpersonal Skills for productive workplacerelationships.
5. Correspond in multiple contexts, for varied audiences, across genres andmodalities.

UNIT I
PERSONALITY DEVELOPMENT:
Definition Various Aspects of Personality Development Behavioural Traits. Importance of Soft Skills for personal and professional development - Success stories.

UNIT II
NON VERBAL COMMUNICATION:
Kinesics, Haptics, Proxemics, Vocalics, Oculesics
Body Language in formal contexts such as Group Discussions, Presentations and Interviews.

UNIT III
TEAM DYNAMICS:
Different Types of Teams Role of an individual communicating as a group or team leader. Individual Presentations/Team Presentation - Project Presentations- Case Studies.

UNIT IV
INTERPERSONAL SKILLS:
Time Management Stress Management Emotional Intelligence Conflict Management Relationship Management.

UNIT V
DIGITAL CORRESPONDENCE:
Role of Multimedia in Communication Communication in a Digital Edge (Video Conference Etc.) Social Networking: Importance and Effects.

TEXT BOOK:

1. Personality Development and Soft Skills, Preparing for Tomorrow, Shikha Kapoor-2nd Edition, 2020.

REFERENCE BOOKS:

1. Personality Development and Soft Skills, Barun, K Mitra, Oxford University Press-2nd Edition, 2016
2. Professional Ethics. R Subramanian, Oxford University Press-2nd Edition,2015

COURSE STRUCTURE

IV Year I Semester

S. No	Course Category	Course Title	L	T	P	Credits
1	PC -14	Microprocessors and Interfacing Devices	3	0	0	3
2	PC -15	Power Systems Operation and Control	3	0	0	3
3	PE - 3	Electric Vehicles/ Smart Grids	3	0	0	3
4	PE – 4	Electrical Distribution Systems/ Industrial Electrical Systems	3	0	0	3
5	OE-3	Electric Vehicles and Hybrid Vehicles/ Energy Storage Systems	3	0	0	3
6	PC Lab – 9	Microprocessors and Interfacing Lab	0	0	2	1
7	PC Lab – 10	Electrical Measurements Lab	0	0	2	1
8	PW-1	Mini Project	0	0	0	3
		Total	**15**	**0**	**4**	**20**

IV Year II Semester

S. No	Course Category	Course Title	L	T	P	Credits
1	PC -16	Utilization of Electrical Energy	3	0	0	3
2	PC -17	Renewable Energy and Energy Storage Technologies	3	0	0	3
3	TS	Technical Seminar	2	0	0	2
4	CVV	Comprehensive Viva Voce	0	0	0	2
5	PW-2	Major Project	0	0	0	10
		Total	**8**	**0**	**0**	**20**

COURSE STRUCTURE (for FAST TRACK)

IV Year I Semester

S.No.	Course Category	Course Title	L	T	P	Credits
1	PC -14	Microprocessors and Interfacing Devices	3	0	0	3
2	PC -15	Power Systems Operation and Control	3	0	0	3
3	PE - 3	Electric Vehicles/ Smart Grids	3	0	0	3
4	PE – 4	Electrical Distribution Systems/ Industrial Electrical Systems	3	0	0	3
5	OE-3	Electric Vehicles and Hybrid Vehicles/ Energy Storage Systems	3	0	0	3
6	PC Lab – 9	Microprocessors and Interfacing Lab	0	0	2	1
7	PC Lab – 10	Electrical Measurements Lab	0	0	2	1
8	PW-1	Mini Project		0	0	3
9	PC - 17	Renewable Energy and Energy Storage Technologies	3	0	0	3
		Total	**18**	**0**	**4**	**23**

IV Year II Semester

S.No.	Course Category	Course Title	L	T	P	Credits
1	TS	Technical Seminar	2	0	0	2
2	CVV	Comprehensive Viva Voce	0	0	0	2
3	PW-2	Major Project	0	0	0	10
		Total	**2**	**0**	**0**	**14**

MICROPROCESSORS AND INTERFACING DEVICES

IV Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Illustrate the internal architecture of 8086 and8051.
2. Understand and apply the fundamentals of assembly level programming of microprocessors andmicrocontroller.
3. Explain the use of interrupts with suitableexamples.
4. Demonstrate the interfacing of various peripheral devices with the microprocessor8086.
5. Design electrical circuitry to the Microcontroller I/O ports in order to interface the controller to externaldevices.

UNIT I

8086 MICROPROCESSOR:

Introduction to 8085 microprocessor- 8086 architecture- Functional Diagram- Register Organization- Memory segmentation- Memory addresses- physical memory organization- Signal descriptions of 8086-common function signals- Minimum and Maximum mode operation- Timing diagrams- Interruptstructure.

UNIT II

ASSEMBLY LANGUAGE PROGRAMMING USING 8086:

Instruction formats- addressing modes- instruction set- assembler directives-procedures-macros- Simple programs.

UNIT III

INTERFACING WITH 8086 MICROPROCESSOR:

8255 Programmable Peripheral Interface-Various Modes of Operation-Interfacing Keyboard-Display- Stepper motor- ADC-DAC-8259 Programmable Interrupt Controller -8257 DMA controller.

UNIT IV

COMMUNICATION INTERFACE:

Serial communication standards- serial data transfer schemes- 8251 USART architecture and Interfacing- RS 232-TTL to RS 232C and RS 232C to TTL conversion. Simple programs on serial datatransfer-IEEE-488.

UNIT V

INTRODUCTION TO MICROCONTROLLERS:

Overview of 8051 microcontroller- Architecture- I/O ports and Memory organization- addressing modes and instruction set of 8051- Simple programs.

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals,A. K. Ray and K.M. Bhurchandi, TMH-3rd Edition2017.
2. The 8051 Micro controller, Kenneth. J. Ayala, Cengage Learning -3rdEdition.

REFERENCES:

1. The 8051Microcontrollers- Architecture and Programming and Applications,K.Uma Rao-AndhePallavi- Pearson-2009.
2. Micro Computer System 8086/8088 Family Architecture- Programming and Design, Liu and GA Gibson- PHI- 2ndEdition.
3. Microcontrollers and Application,Ajay. V. Deshmukh, TMGH-2005.

POWER SYSTEM OPERATION AND CONTROL

IV Year ISemester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Understand economic operation of power systems.
2. Analyze and compute optimal loading of generators for a particular loaddemand.
3. Develop mathematical models of turbines and governors.
4. Address load frequency control problem.
5. Explain how series and shunt compensation helps in reactive power control.

UNIT I

ECONOMIC OPERATION OF POWER SYSTEMS:

Optimal operation of Generators in Thermal Power Stations 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.

UNIT III

MODELING:

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.

Modeling of Excitation System: Fundamental Characteristics of an Excitation system, Transfer function, Block Diagram Representation of IEEE Type-1 Model

UNIT IV

LOAD FREQUENCY CONTROL:

Single Area Load Frequency Control: 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.

Load frequency control of 2-area system uncontrolled case and controlled case, tie-line bias control.

Load Frequency Controllers: Proportional plus Integral control of single area and its block diagram representation, steady state response Load Frequency Control and Economic dispatch control.

UNIT V

REACTIVE POWER CONTROL:

Overview of Reactive Power control Reactive Power compensation in transmission systems advantages and disadvantages of different types of compensating equipment for transmission systems. Load compensation–Specifications of load compensator,Uncompensated and compensated transmission lines: Shunt and SeriesCompensation.

TEXT BOOKS:

1. Modern power system analysis, I.J. Nagarath& D.P. Kothari, Tata McGraw Hill Publishing Company Ltd -4th Edition.
2. Power systems analysis and stability, S.S Vadhera, Khanna Publications- 4thEdition.

REFERENCE BOOKS:

1. Power generation, operation and control, Allen J. Wood, Bruce F. Wollenberg, Gerald B. Sheble, Wiley -3rdEdition.
2. Power system stability and control, PrabhaKundur, McGraw Hill companies-IndeanEdition.
3. Power system operation and control, Dr.K.Uma Rao, Wiley IndiaPvt.Ltd.

ELECTRIC VEHICLES
(Professional Elective – 3)

IV Year ISemester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Understand the components of Electric Vehicles and Fundamentals of ElectricVehicles.
2. Explain the types of batteries and principles of operation ofbatteries.
3. Pursue the basic principles of Electric motors which can be used in Electricvehicles.
4. Apprehend the transmission of the drive system and the components oftransmission.
5. Understand the concepts of hybrid vehicles and analyze the performance of hybridvehicles.

UNIT I
ELECTRIC VEHICLES:
Introduction to Electric Vehicles - History of Electric and Hybrid Vehicles – Components - vehicle mechanics - Roadway fundamentals - vehicle kinetics - Dynamics of vehicle motion - Propulsion System Design.

UNIT II
BATTERIES:
Basics - Types - Parameters - Capacity - Discharge rate - State of charge - State of Discharge - Depth of Discharge - Technical characteristics - Battery pack Design - Properties of Batteries. Fuel Cells - Types - Fuel Cell Electric Vehicle.

UNIT III
DC & AC ELECTRICAL MACHINES (Speed control Techniques):
Motor and Engine rating - Requirements - Speed control techniques of DC machines in Electric Vehicles - Speed control techniques of three phase A/c machines - Induction machines - Permanent Magnet Machines, Switched Reluctance Machines.

UNIT IV
ELECTRIC VEHICLE DRIVE TRAIN:
Transmission configuration - Components - gears, differential, clutch, brakes regenerative braking- motor sizing- Gear Ratio - Torque speed characteristics - EV Motor Sizing Initial Acceleration - Rated Vehicle Velocity - Maximum Velocity - MaximumGradability.

UNIT V
HYBRID ELECTRIC VEHICLES:
Types of Hybrid Vehicles - series and parallel Hybrid Electric Vehicles, series- parallel configuration - Internal Combustion Engines - Reciprocating Engines - Practical and Air-Standard Cycles - Air-Standard Otto Cycle - Air-Standard Diesel Cycle - Example IC Engines in HEVs - Design - Drive train - sizing ofcomponents.

TEXT BOOKS:

1. Electric & hybrid vehicles - Design Fundamentals, Iqbal Hussain, CRC Press - 2nd Edition.
2. Electric vehicle technology explained, James Larminie, John Lowry, and Wiley& Sons-2nd Edition.

REFERENCE BOOKS:

1. Modern electric, hybrid electric, and fuel cell vehicles: fundamentals, theory and design, MehrdadEhsani, YiminGao, Ali Emadi, CRC Press - 2nd Edition.
2. Electric vehicle battery systems,Sandeep Dhameja - KindleEdition.

SMART GRIDS
(Professional Elective-3)

IV Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Report the features of SmartGrid. 2.
Outline the smart gridarchitecture.
3. Optimize Transmission and Distribution systems.
4. Represent operation and importance of PMUs,WAMS.
5. Discover control techniques for micro grid and smartgrid.

UNIT I

INTRODUCTION TO SMART GRID:

Introduction to Smart Grid Working definitions of Smart Grid and Associated Concepts Smart Grid Functions Traditional Power Grid and Smart Grid New Technologies for Smart Grid Advantages Indian Smart Grid - Key Challenges for Smart Grid.

UNIT II

SMART GRID ARCHITECTURE:

Components and Architecture of Smart Grid Design - Review of the proposed architectures for Smart Grid, fundamental components of Smart Grid designs Transmission AutomationDistribution Automation Renewable energy Integration.

UNIT III

COMPUTATIONAL TECHNIQUES FOR SMART GRIDS:

Tools and Techniques for Smart Grid: Computational Techniques Static and Dynamic Optimization Techniques Computational Intelligence Techniques Evolutionary Algorithms Artificial Intelligence techniques.

Distribution Generation Technologies: Introduction to Renewable Energy Technologies Micro grids Storage Technologies Electric Vehicles and plug in hybrids Environmental impact and Climate Change Economic Issues.

UNIT IV

COMMUNICATION TECHNOLOGIES AND SMART GRID:

Introduction to Communication Technology - Synchro-Phasor Measurement Units (PMUs) Wide Area Measurement Systems (WAMS) Introduction to Internet of Things (IOT) Applications of IOT in Smart Grid.

UNIT V

CONTROL OF SMART POWER GRID SYSTEM:

Load Frequency Control (LFC) in Micro Grid System Voltage Control in Micro Grid System Reactive Power Control in Smart Grid. Case Studies and Test beds for the Smart Grids.

TEXT BOOKS:

1. Smart grids, infrastructure, technology and solutions, Stuart Borlase, CRC Press - 1st Edition.
2. Renewable and efficient electric power system, Gil Masters, Wiley–IEEE Press - 2nd Edition.

REFERENCE BOOKS:

1. Synchronizedphasor measurements and their applications, A.G.Phadke and J.SThorp, Springer - 2nd Edition.
2. Wind power in power systems, T. Ackermann, Hoboken, NJ, USA, John Wiley - 2nd Edition.

ELECTRICAL DISTRIBUTION SYSTEMS
(Professional Elective-4)

IV Year ISemester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Distinguish between transmission and distribution systems. Classification of loads and their characteristics.
2. Understand design considerations of distribution feeders andsubstations.
3. Compute voltage drop and power loss infeeders.
4. Understand protection and coordination of distributionsystems.
5. Examine the power factor improvement and voltagecontrol.

UNIT I
INTRODUCTION & GENERAL CONCEPTS:

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, Industrial loads and their characteristics.

UNIT II
DISTRIBUTION FEEDERS & SUBSTATIONS:

Design Considerations Of Distribution Feeders: Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system.
Substations:
Rating of distribution substation, service area with in primary feeders. Benefits derived through optimal location of substations.

UNIT III
DISTRIBUTION SYSTEM ANALYSIS:
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.

UNIT IV
PROTECTIVE DEVICES & CO-ORDINATION:
Objectives of distribution system protection, types of common faults and procedure for fault calculations. Protective Devices - Principle of operation of Fuses, Circuit reclosure, and line sectionalizers, and circuit breakers.
Coordination of Protective devices -General co-ordination procedure.

UNIT V
VOLTAGE CONTROL & POWER FACTOR IMPROVEMENT:
Equipment for voltage control, effect of series capacitors, line drop Compensation, effect of AVB/AVR. Power-factor control using different types of power capacitors, shunt and seriescapacitors, effect of

shunt capacitors (Fixed and Switched), capacitor allocation - Economic justification - Procedure to determine the best capacitor location.

TEXT BOOKS:

1. Electric power distribution system engineering, TuranGonen, CRC Press-3rdEdition.
2. Electrical distribution systems, Dr.S.Siva Naga Raju, Dr.K.Shankar, DanapathiRai Publications-2ndEdition.

REFERENCE BOOKS:

1. Electric power distribution, A.S. Pabla, Tata McGraw Hill Publishing Company - 7thEdition.
2. Electrical power distribution systems, V.Kamaraju, Tata McGraw Hill Publishing company - 2ndEdition.
3. Electrical power distribution hand book, G. Ram Murthy, University Press-2ndEdition.

INDUSTRIAL ELECTRICAL SYSTEMS
(Professional Elective-4)

IV Year ISemester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Review electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings,SLD.
2. Distinguish residential and commercial electricalsystems.
3. Identify various illuminationschemes.
4. Select industrial load, motor, transformer and othercomponents.
5. Carry out selection of industrial power backscheme.

UNIT I
ELECTRICAL SYSTEM COMPONENTS:
LT system wiring components, selection of cables, wires, switches, distribution box, metering system. Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices.

UNIT II
RESIDENTIAL AND COMMERCIAL ELECTRICAL SYSTEMS:
Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing ofcomponents.

UNIT III
ILLUMINATION AND INDUSTRIAL ELECTRICAL SYSTEM AUTOMATION:
Illumination Systems:
Understanding various terms regarding light, lumen intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

Industrial Electrical System Automation:
Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

UNIT IV
INDUSTRIAL ELECTRICAL SYSTEMS I:
HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction - kVAR calculations, types of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

UNIT V
INDUSTRIAL ELECTRICAL SYSTEMS II:

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

TEXT BOOKS:

1. Electrical wiring, estimating & costing, S.L.Uppal and G.C.Garg, Khannapublishers-2008.
2. Electrical design, estimating & costing, K. B. Raina, New age International-2007.

REFERENCE BOOKS:

1. Web site for ISstandards.
2. Residential commercial and industrial systems, H. Joshi, McGraw HillEducation-2008.
3. Electrical estimating and costing, S. Singh and R. D. Singh,DhanpatRai andCo-1997

ELECTRIC VEHICLES AND HYBRID VEHICLES

(Open Elective – 3)

IV Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Understand the components of electric vehicles and fundamentals of electricvehicles.
2. Explain the types of batteries and principles of operation ofbatteries.
3. Pursue the basic principles of electric motors which can be used in electricvehicles.
4. Apprehend the transmission of the drive system and the components oftransmission.
5. Understand the concepts of hybrid vehicles and analyze the performance of hybridvehicles.

UNIT I

ELECTRIC VEHICLES:

Introduction to Electric Vehicles History of Electric Vehicles Components vehicle mechanics Roadway fundamentals vehicle kinetics Dynamics of vehicle motion Propulsion System Design.

UNIT II

BATTERIES:

Basics Types Parameters Capacity Discharge rate State of charge state of Discharge Depth of Discharge Technical characteristics Battery pack Design Properties of Batteries. Fuel Cells Types Fuel Cell Electric Vehicle.

UNIT III

DC & AC ELECTRICAL MACHINES (Basics Principle of Operation Only)**:**

Motor and Engine rating Requirements DC machines three phase A/c machines -Induction machines Permanent Magnet Machines, Switched Reluctance Machines.

UNIT IV

ELECTRIC VEHICLE DRIVE TRAIN:

Transmission configuration Components gears, differential, clutch, brakes regenerative braking- motor sizing- Gear Ratio Torque speed characteristics EV Motor Sizing Initial Acceleration - Rated Vehicle Velocity - Maximum Velocity - MaximumGradability.

UNIT V

HYBRID ELECTRIC VEHICLES:

Types of Hybrid Vehicles series and parallel Hybrid Electric Vehicles, series- parallel configuration Internal Combustion Engines Reciprocating Engines Practical and Air-Standard Cycles Air- Standard Otto Cycle Air-Standard Diesel Cycle Example IC Engines in HEVs Design Drive train sizing ofcomponents.

TEXT BOOKS:

1. Electric & hybrid vehicles - design fundamentals, Iqbal Hussain, CRC Press 2nd Edition.
2. Electric vehicle technology explained, James Larminieand JohnLowry, Wiley&Sons2nd Edition.

REFERENCE BOOKS:

1. Modern electric, hybrid electric, and fuel cell vehicles: fundamentals,theory and design, MehrdadEhsani, YiminGao, Ali Emadi,", CRC Press - 2nd Edition.
2. Electric vehicle battery systems, Sandeep Dhameja - KindleEdition.

ENERGY STORAGE SYSTEMS

(Open Elective – 3) IV Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Understand electrical energy storagetechnologies.
2. Explain the needs for electric energystorage.
3. Analyze the characteristics and features of energy from varioussources.
4. Classify various types of energy storage and various devices used for thepurpose.
5. Apply the same concepts to real time solutions like electric vehicles, smart grid andSCADA.

UNIT I

ELECTRICAL ENERGY STORAGE TECHNOLOGIES:

Characteristics of electricity the roles of Electric Energy Storage - High generation cost during peak demand periods - Need for continuous and flexible supply - Long distance between generation and consumption- Congestion in power grids Transmission by cables.

UNIT II

NEEDS FOR ELECTRICAL ENERGY STORAGE:

Emerging needs for Electric Energy Storage Utilization of more renewable energy less fossil fuel Smart Grid uses the roles of electrical energy storage technologies the roles from the view point of a utility, from the view point of consumers, from the view point of generators of renewableenergy.

UNIT III

FEATURES OF ENERGY STORAGE SYSTEMS:

Classification of Electric Energy Storage systems Mechanical storage systems Pumped Hydro Storage (PHS) Compressed Air Energy Storage (CAES) Flywheel Energy Storage (FES) Electrochemical storage systems Secondary batteries Flow batteries Chemical energy storage, Hydrogen (H2) Synthetic Natural Gas (SNG).

UNIT IV

TYPES OF ELECTRICAL ENERGY STORAGE SYSTEMS:

Electrical storage systems Double-layer capacitors (DLC) Superconducting magnetic energy storage (SMES) Thermal storage systems Standards for Electric Energy Storage Technical comparison of EEStechnologies.

UNIT V

APPLICATIONS:

Present status of applications Utility use (conventional power generation, grid operation & service) Consumer use (uninterruptable power supply for large consumers) New trends in applications
Renewable energy generation Smart Grid Smart Micro grid, Smart House Electric vehicles Management and control hierarchy of storage systems Internal configuration of battery storage systems External connection of EES systems Aggregating EES systems and distributed generation (Virtual Power Plant) Battery SCADA -Aggregation of many dispersed batteries.

TEXT BOOKS:

1. Electrical energy storage, IEC Market StrategyBoard.
2. Energy storage benefits and market analysis,James M.Eyer, Joseph J.Jannucci and Garth. P.Corey, Sandia Nationallaboratories,2004.

REFERENCE BOOKS:

1. Energy storage for the electricity grid-benefits and market potential assessment guide, Jim Eyer, Garth Corey, Sandia National laboratories,2010.
2. Power system energy storage technologies, Paul Breeze, AcademicPress.
3. Electric energy storage systems, PrzemyslawKomarnicki,PioLombardi,ZbigniewStyczynski Springer.

MICROPROCESSORS AND INTERFACING LAB

IV Year ISemester

L	T	P	C
0	0	2	1

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

1. Apply the fundamentals of assembly level programming of microprocessor and microcontrollers.
2. Build a program on a microprocessor using instruction set of 8086 and8051.
3. Evaluate assembly language program for 8086 and 8051 microcontroller to interface peripheral devices for simple applications.
4. Understand the development of prototype using combination of hardware andsoftware.
5. Develop assembly language programs for various applications using 8051microcontroller.

Note: Minimum of 12 experiments to be conducted.

8086 MICROPROCESSOR:

1. Arithmetic Operations (addition, subtraction, multiplication and division)
2. Addition of two BCDnumbers.
3. Ascending order/Descending order of an array ofnumbers.
4. Finding Largest/Smallest numbers in an array ofnumbers.
5. Generation of Fibonacciseries.
6. Hexadecimal to Decimalconversions
7. ASCII to Decimalconversion
8. Program for sorting an array for8086.
9. Program for searching for a number or character in a string for8086.
10. Program for string manipulations for8086.

MASM PROGRAMMING:

1. Arithmetic Operations (addition, subtraction, multiplication anddivision)
2. Addition of two BCDnumbers.
3. Ascending order/Descending order of an array ofnumbers.
4. Finding Largest/Smallest numbers in an array ofnumbers.
5. Generation of Fibonacciseries.
6. Hexadecimal to Decimalconversions.

ELECTRICAL MEASUREMENTS LAB

IV Year ISemester

L	T	P	C
0	0	2	1

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

1. Calibrate voltmeters, ammeters and single phase energymeter.
2. Design the scale of PMMC voltmeter, LPF wattmeter, LVDT and resistance straingauge.
3. Calculate resistance, inductance and capacitance usingbridges.
4. Compute 3-Φ reactive power.
5. Test single phase energy meter and dielectric strength of oil oftransformers.

Any ten of the following experiments are required to be conducted

1. Calibration and Testing of single phase energyMeter.

2. Calibration of dynamometer type power factormeter.
3. Crompton D.C. Potentiometer - Calibration of PMMC ammeter and PMMCvoltmeter.
4. Kelvin's double Bridge - Measurement of resistance - Determination ofTolerance.
5. Dielectric oil testing using H.T. testingKit.
6. Schering Bridge & AndersonBridge.
7. Measurement of 3 Phase reactive power with single-phasewattmeter.
8. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammetermethods.
9. LVDT and capacitance pickup - characteristics andCalibration. 10. Resistance strain gauge - strain measurements andCalibration.
11. Transformer turns ratio measurement using A.C.Bridge.
12. Measurement of ratio error and phase angle of given C.T. bycomparison.

INDUSTRY ORIENTED MINI PROJECT

IV Year I Semester

L	T	P	C
0	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Undertake problem identification, formulation and solution.
2. Know the key stages in the devolvement of the project.
3. Inculcate software / hardware implementation skills
4. Understand methodologies and professional way of documentation and communication
5. Extend / use the idea of mini project for major project.

Three or four students constituting a batch, work on an industry oriented topic approved by the head of the department and prepare a comprehensive mini project report after completing the work to the satisfaction.

The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department comprising of senior faculty covering all the domains of electrical and electronics engineering. The student is required to submit a mini project report at the end of the semester.

The project work done by the student is evaluated based on the report submitted along with an oral presentation, jointly by external and internal examiners constituted by the Head of the Department.

UTILIZATION OF ELECTRICAL ENERGY (Professional Core – 16)

IV Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Study illumination methods &solutions forillumination.
2. Acquire knowledge of methods of electrical heating & welding and relatedproblems.
3. Understand various electrical drives, their characteristics &applications.
4. Analyze electric tractionmovement.
5. Observe the effect of varying acceleration and brakingretardation.

UNIT I

ILLUMINATION:

Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light.

Various Illumination Methods:

Discharge lamps, MV and SV lamps comparison between tungsten filament lamps and fluorescent tubes, Energy Efficient Lamps -principle of operation, Basic principles of light control, Types and design of lighting and flood lighting.

UNIT II

ELECTRIC HEATING &WELDING:

Electric Heating:

Advantages and methods of electric heating, resistance heating induction heating and dielectric heating.

Electric Welding:

Resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding

UNIT III

ELECTRIC DRIVES:

Type 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

ELECTRIC TRACTION-I:

System of electric traction and track electrification. Review of existing electric traction systems in India, Magnetic Levitation - Bullet Trains. Special features of traction motor, advantages of electric braking. Mechanics of train movement, Speed-time curves for different services – trapezoidal and quadrilateral speed time curves.

UNIT V

ELECTRIC TRACTION-II:

Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation, adhesive weight and coefficient of adhesion.

TEXT BOOKS:

1. Utilisation of electric power, Er. R.K. Rajput, Laxmi Publications-2nd Edition

2. Utilisation of electric energy , E.Openshaw Taylor, Orient Longman-1st Edition

REFERENCE BOOKS:

1. Utilization of electrical power including electric drives and electrictraction, N.V.Suryanarayana, New Age International (P) Limited Publishers,1996.
2. Generation, distribution and utilization of electrical energy ,C.L. Wadhwa, NewAge International (P) Limited-Revised 1st edition
3. Utilization of electric power & electric traction, J. B. Gupta, Katson Series,2013

RENEWABLE ENERGY AND ENERGY STORAGE TECHNOLOGIES
(Professional Core- 17)

IV Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Discuss the energy scenario and the consequent growth of the power generation from renewable energysources.
2. Explain the basicphysics of wind and wind generationtopologies
3. Describe the basics of solar powergeneration
4. Express the power electronic interfaces for solar PVgeneration.
5. Generalize the issues related to the grid-integration of solar and wind energysystems.

UNIT I
PHYSICS OF WIND POWER:
History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distributionfunctions.

UNIT II
WIND GENERATOR TOPOLOGIES:
Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent- Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, ConverterControl.

UNIT III
THE SOLAR RESOURCE:
Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.
Solar thermal power generation:
Technologies - Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis

UNIT IV
SOLAR PHOTOVOLTAIC:
Technologies - Amorphous, mono crystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control.

UNIT V
ENERGY STORAGE TECHNOLOGIES:
Role of Electrical Energy storage system -Electro chemical storage systems, secondary batteries, Management and control hierarchy of storage systems - Internal configuration of battery storage systems, design of electric energy storage system for solar and wind plants (block diagram).

TEXT BOOKS:

1. Renewable energy technologies:Apractical guide for beginners, Chetan Singh Solanki, PHI,2008
2. Wind power in power systems, T. Ackermann, John Wiley and Sons Ltd.,2005.

REFERENCE BOOKS:

1. Solar energy: Principles of thermal collection and storage, S.P.Sukhatme, McGraw Hill, 1984.
2. Grid integration of wind energy conversion systems, H. Siegfried and R. Waddington, John Wiley and Sons Ltd.,2006.
3. Renewable energy applications, G. N.Tiwari and M. K. GhosalNarosa Publications,2004.

IV Year II Semester

TECHNICAL SEMINAR

L	T	P	C
2	0	0	2

Course Outcomes: At the end of the course, the student should be able to

1. Identify promising new direction of various cutting edge technologies in electrical and electronics domain.
2. Do literature survey using library resources, internet, and technical journals for a thrust area.
3. Prepare a technical report and present with the latest tools of presentations.
4. Enhance the skills of self-study and lifelong learning.

METHOD OF EVALUATION:

During the seminar session each student is expected to prepare and present a topic on engineering / technology, for duration of about 8 to 10 minutes. In a session of two periods per week, 15 students are expected to present on the topic chosen and approved. Each student is expected to present before the end of the semester and his/her performance is evaluated based on the choice of the topic, content of the presentation, preparation of the presentation and quires answered. At the end of

the semester, he / she have to submit a report on his / her topic of seminar for evaluation. A Faculty guide is to be allotted for guidance and monitoring the progress of the work done by the student. Evaluation is 100% internal.

IV Year II Semester

COMPREHENSIVE VIVA VOCE

L	T	P	C
0	0	0	2

Course Outcomes: At the end of the course, the student should be able to

1. Acknowledge the understanding level in various areas of electrical and electronics engineering.
2. Prepare comprehensively to answer question from all the courses studied.
3. Attain oral presentation skills by answering question in precise and concise manner.
4. Preparedness to face interviews both in the academic and industrial sector.
5. Gain self-confidence and inter personal skills.

Comprehensive Viva-Voce will be conducted by a committee consisting of head of the department and two senior faculty members of the department. The comprehensive Viva-Voce is intended to assess the student's understanding of the subjects he / she studied during the course of study.

IV Year II Semester

MAJOR PROJECT

L	T	P	C
0	0	0	10

Course Outcomes: At the end of the course, the student should be able to

1. Develop comprehensive solution to issues identified in previous semester project work.
2. Formulate and develop a design proposal on a problem in area of interest.
3. Apply technical / managerial skills for analysis, design, simulation and modeling of various real time problems in the domain of electrical and electronic engineering.
4. Synthesize the results of detailed analytical studies conducted.
5. Present he or her work in a conference or publish work in a peer reviewed journal

Three or four students constituting a batch, work on a topic approved by the head of the department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor.

The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is submitted by the student before

the end of the semester. The project work is evaluated based on the project report submitted along with an oral presentation on the work done jointly by external and internal examiners constituted by the Head of the Department.