COURSE STRUCTURE

AND

DETAILED SYLLABUS

I - IV YEARS

ELECTRICAL AND ELECTRONICS ENGINEERING

For

B.TECH FOUR YEAR DEGREE PROGRAMME

(Applicable for the Batches Admitted From 2022-2023)

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VAAGDEVI COLLEGE OF ENGINEERING

(Autonomous)

Bollikunta, Warangal-506 005

Telangana State, India.

SVAAGDEVI COLLEGE OF ENGINEERING, WARANGAL

UGC-AUTONOMOUS

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

(R22 Regulations)
Applicable from AY 2022-23 Batch

I Year I Semester

Sl.No	Course Code	Course Title	L	T	P	Credits
1	B22MA01	Matrices and Calculus	3	1	0	4
2	B22CH01	Engineering Chemistry	3	1	0	4
3	B22CS01	C Programming and Data Structures	3	0	0	3
4	B22EE01	Electrical Circuit Analysis – I	3	0	0	3
5	B22ME03	Computer Aided Engineering Graphics	1	0	4	3
6	B22EE02	Elements of Electrical and Electronics Engineering	0	0	2	1
7	B22CH02	Engineering Chemistry Laboratory	0	0	2	1
8	B22CS07	C Programming and Data Structures Laboratory	0	0	2	1
		Induction Program				
		Total Credits	**13**	**2**	**10**	**20**

I Year II Semester

Sl.No	Course Code	Course Title	L	T	P	Credits
1	B22MA02	Ordinary Differential Equations and Vector Calculus	3	1	0	4
2	B22PH01	Applied Physics	3	1	0	4
3	B22ME01	Engineering Workshop	0	1	3	2.5
4	B22EN01	English for Skill Enhancement	2	0	0	2
5	B22EE05	Electrical Circuit Analysis – II	2	0	0	2
6	B22EN02	English Language and Communication Skills Laboratory	0	0	2	1
7	B22PH02	Applied Physics Laboratory	0	0	3	1.5
8	B22CS10	Applied Python Programming Laboratory	0	1	2	2
9	B22EE06	Electrical Circuit Analysis Laboratory	0	0	2	1
10	B22CH03	Environmental Science	3	0	0	0
		Total Credits	**13**	**2**	**14**	**20**

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II Year I Semester

Sl.No	Course Code	Course Title	L	T	P	Credits
1	B22MA07	Numerical Methods and Complex variables	3	1	0	4
2	B22EE07	Electrical Machines-I	3	1	0	4
3	B22EC10	Analog Electronic Circuits	3	0	0	3
4	B22EE08	Power System-I	3	0	0	3
5	B22EE09	Electro Magnetic Fields	3	0	0	3
6	B22EE10	Electrical Machines Laboratory-I	0	0	2	1
7	B22EC11	Analog Electronic Circuits Laboratory	0	0	2	1
8	B22EE11	Electrical Simulation tools Laboratory	0	0	2	1
9	B22MC07	Gender Sensitization Laboratory	0	0	2	0
		Total Credits	**15**	**2**	**08**	**20**

II Year II Semester

Sl.No	Course Code	Course Title	L	T	P	Credits
1	B22ME20	Solid Mechanics & Hydraulic Machines	3	1	0	4
2	B22EE13	Measurements and Instrumentation	3	0	0	3
3	B22EE14	Electrical Machines–II	3	0	0	3
4	B22EC22	Digital Electronics	2	0	0	2
5	B22EE15	Power System-II	3	0	0	3
6	B22EC23	Digital Electronics Laboratory	0	0	2	1
7	B22EE16	Measurements and Instrumentation Laboratory	0	0	2	1
8	B22EE17	Electrical Machines Laboratory-II	0	0	2	1
9	B22EE18	Real-time Research Project/ Field Based Project	0	0	4	2
10	B22MC08	Logical Reasoning & Quantitative Aptitude	3	0	0	0
		Total Credits	**17**	**1**	**10**	**20**

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COURSE STRUCTURE & SYLLABUS

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III Year I Semester

Sl.No	Course Code	Course Title	L	T	P	Credits
1	B22EE21	Power Electronics	3	1	0	4
2	B22EE22	Control Systems	3	0	0	3
3	B22EC06	Signals and Systems	3	1	0	4
4		Professional Elective-I	3	0	0	3
5	B22MB01	Business Economics and Financial Analysis	3	0	0	3
6	B22EE27	Power Electronics Laboratory	0	0	2	1
7	B22EE28	Control Systems Laboratory	0	0	2	1
8	B22EN03	Advanced English Communication Skills Laboratory	0	0	2	1
9	B22MB06	Intellectual Property Rights	3	0	0	0
		Total Credits	**18**	**2**	**6**	**20**

III Year II Semester

Sl.No	Course Code	Course Title	L	T	P	Credits
1		Open Elective-I	3	0	0	3
2		Professional Elective-II	3	0	0	3
3	B22EC36	Microprocessors & Microcontrollers	3	0	0	3
4	B22EE32	Power System Protection	3	0	0	3
5	B22EE33	Power System Operation and Control	3	0	0	3
6	B22EE34	Power System Laboratory	0	0	2	1
7	B22EC37	Microprocessors & Microcontrollers Laboratory	0	0	2	1
8	B22EE35	Electronics Design Laboratory	0	0	2	1
9	B22EE36	Industry Oriented Mini Project/ Internship	0	0	4	2
10	B22CH03	Environmental Science	3	0	0	0
		Total Credits	**18**	**0**	**10**	**20**

***MC609 - Environmental Science – Should be Registered by Lateral Entry Students Only.**

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IV Year I Semester

Sl.No	Course Code	Course Title	L	T	P	Credits
1	B22EE37	Power Electronic Applications to Renewable Energy Systems	3	1	0	4
2		Open Elective-II	3	0	0	3
3		Professional Elective-III	3	0	0	3
4		Professional Elective-IV	3	0	0	3
5	B22MB02	Management and Organizational Behavior	2	0	0	2
6	B22EE45	Simulation of Renewable Energy Systems Laboratory	0	0	4	2
7	B22EE46	Project Stage - I	0	0	6	3
		Total Credits	**14**	**1**	**10**	**20**

IV Year II Semester

Sl.No	Course Code	Course Title	L	T	P	Credits
1		Open Elective-III	3	0	0	3
2		Professional Elective-V	3	0	0	3
3		Professional Elective-VI	3	0	0	3
4	B22EE54	Project Stage – II	0	0	22	9
5	B22EE55	Technical Seminar	0	0	0	2
		Total Credits	**9**	**0**	**22**	**20**

***MC – Satisfactory/Unsatisfactory Professional Elective – I**

Professional Elective-I

1	B22EE23	Renewable Energy Systems
2	B22EE24	High Voltage Engineering
3	B22EE25	Computer Aided Electrical Machine Designs
4	B22EE26	Electrical Engineering Materials

Professional Elective-II

1	B22EE29	Flexible AC Transmission Systems
2	B22EE30	Power Semiconductor Drives
3	B22EC30	Digital Signal Processing
4	B22EE31	Advanced Control Systems

Professional Elective-III

1	B22EE38	Advanced Power Electronics
2	B22EE39	HVDC Transmission
3	B22EE40	Electric and Hybrid Vehicles
4	B22EE41	Utilization of Electrical Energy

Professional Elective-IV

1	B22EE42	Advanced Electrical Drives
2	B22EE43	Soft Computing Techniques
3	B22EC60	VLSI Design
4	B22EE44	IoT Applications in Electrical Engineering

Professional Elective-V

1	B22EE47	Power Quality
2	B22EE48	Solar Power Batteries
3	B22EE49	AI Techniques in Electrical Engineering
4	B22EC61	Embedded Systems Applications

Professional Elective-VI

1	B22EE50	Smart Grid Technologies
2	B22EE51	Electrical Distribution Systems
3	B22EE52	Digital Control Systems
4	B22EE53	Machine Learning Applications to Electrical Engineering

Open Elective-I

1	B22EE56	Concepts of Control Systems
2	B22EE57	Fundamental of Electric Vehicles

Open Elective-II

1	B22EE58	Electric Power Utilization & Safety
2	B22EE59	Energy Storage Systems

Open Elective-III

1	B22EE60	Charging Infrastructure for Electric Vehicles
2	B22EE61	Reliability Engineering

(B22MA01) MATRICES AND CALCULUS

B.Tech. I Year I Sem. **L T P C**
3 1 0 4

COURSE OBJECTIVES: To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigen values and eigenvectors and to reduce the quadratic form to canonical form
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications

COURSE OUTCOMES: After learning the contents of this paper the student must be able to

- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigen values and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Find the extreme values of functions of two variables with/ without constraints.
- Evaluate the multiple integrals and apply the concept to find areas, volumes

UNIT - I: Matrices

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT - II: Eigen values and Eigen vectors

Linear Transformation and Orthogonal Transformation: Eigen values, Eigenvectors and their properties, Eigen values and Vectors with reference to Symmetric, Skew-symmetric, Hermitian, Skew- Hermitian, orthogonal and Unitary Matrices. Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem,

Quadratic Forms: Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms.

UNIT - III: Calculus

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series. Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates),

Beta and Gamma Functions: Introduction toImproper Integrals, Definition of Beta and Gamma functions, properties and other forms. Relation between Beta and Gamma functions. Evaluation of Improper integrals using Beta and Gamma functions

UNIT - IV: Multivariable Calculus (Partial Differentiation and applications)

Definitions of Limit and continuity. Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V: Multivariable Calculus (Integration)

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Editon, 2016.

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. RajnishVerma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

(B22CH01) ENGINEERING CHEMISTRY

B.Tech. I Year I Sem.

L	T	P	C
3	1	0	4

PRE-REQUISITES: Chemistry Knowledge at pre-university level

COURSE OBJECTIVES:

- To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
- To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
- To imbibe the basic concepts of petroleum and its products.
- To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

COURSE OUTCOMES:

1. Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
2. The students are able to understand the basic properties of water and its usage in domesticand industrial purposes.
3. They can learn the fundamentals and general properties of polymers and other engineering materials.
4. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT - I: Water and its treatment:

Introduction to hardness of water – Estimation of hardness of water by complex metric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation of water by Nalgonda technique.

Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange processes. Desalination of water – Reverse osmosis.

UNIT – II Battery Chemistry & Corrosion

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Characteristics of batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods.

UNIT - III: Polymeric materials

Definition – Classification of polymers with examples – Types of polymerization– addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene.

Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation,Properties and engineering applications of PVC and Bakelite, Teflon.

Rubbers: Natural rubber and its vulcanization.

Elastomers: Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokolrubber.

Conducting polymers: Characteristics and Classification with examples-mechanism of conduction intrans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

UNIT - IV: Energy Sources:

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.

UNIT - V: **Engineering Materials:**

Cement: Portland cement, its composition, setting and hardening.

Smart materials and their engineering applications

Shape memory materials- Poly L- Lactic acid. Thermoresponse materials- Polyacryl amides, Poly vinyl amides

Lubricants: Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K.Shashikala, Pearson Publications, 2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

REFERENCE BOOKS:

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi

(B22CS06) C PROGRAMMING AND DATA STRUCTURES

B.Tech. I Year I Sem. **L T P C**
3 0 0 3

COURSE OBJECTIVES: Introduce the importance of programming, C program development, data structures, searching and sorting.

COURSE OUTCOMES:

- **CO-1:** Understand the various steps in Program development.
- **CO-2:** Explore the concepts of control statements and functions in C Programming Language.
- **CO-3:** Understand the concepts of pointers and its applications.
- **CO-4:** Ability to design and implement different types of file structures.

UNIT-I introduction to computers- Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development.
Introduction to C Language –Background, Simple C programs, Identifiers, Basic data

types, Variables, Constants, Input/Output

Structure of a C Program- Operators, Bit-wise operators, Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Statements.

UNIT-II Statements–if and switch statements, Repetition statements–while, for, do-while statements, Loop examples, other statements related to looping–break, continue, go to, Recursion. Designing Structured Programs-Functions, basics, user defined functions, inter function communication, standard functions**.**

Arrays-Concepts, using arrays in C, inter function communication, array applications, two–dimensional arrays, multidimensional arrays.

UNIT-III Pointers – Introduction, Pointers for inter function communication, pointers to pointers, compatibility, Pointer Applications – Passing an array to a function, Memory allocation functions, array of pointers Strings Concepts, C Strings, String Input/Output functions, arrays of strings, string manipulation functions, string /data conversion.

UNIT-IV Derived types – The Type def, enumerated types, Structures – Declaration, definition and initialization of structures, accessing structures, operations on structures, complex structures. Unions–Referencing unions, initializes, unions and structures.
Input and Output – Text vs Binary streams, standard library functions for files, converting file types, File programs– copy, merge files.

UNIT–V Sorting-selection sort, bubble sort, insertion sort, Searching- linear and binary search methods.
Data Structures – Introduction to Data Structures, abstract data types, Stack Operations using arrays, stack applications, Queue operations using arrays.
Apply data structures such as stacks, queues in problem solving and analyze various

TEXTBOOKS:

1. C Programming & Data Structures, B.A. Forouzan and R.F.Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Designin C,J.R.Hanly and E.B.Koffman, Fifth Edition, Pearson Education.
3. The C Programming Language, B.W.Kernighan and Dennis M.Ritchie, PHI/Pearson Education

REFERENCEBOOKS:

1. C & Data structures–P. Padmanabham, 3rdEdition, B.S. Publications.
2. C Programming with problem solving, J.A.Jones & K.Harrow, Dreamtech Press
3. Programming in C– Stephen G.Kochan, IIIEdition, Pearson Education.
4. CforEngineersandScientists,H.Cheng,McGraw-HillInternationalEdition
5. Data Structures using C A.M. Tanenbaum, Y.Langsam, and M.J.Augenste in, Pearson Education/PHI
6. C Programming & Data Structures, E. Balagurusamy, TMH.
7. C Programming & Data Structures, P.Dey, M Ghosh R Thereja, Oxford University Press
8. C& Data structures– E V Prasad and NB Venkateswarlu, S.Chand & Co.

(B22EE01) ELECTRICAL CIRCUIT ANALYSIS –I

B.Tech. I Year I Sem. **L T P C**
3 0 0 s3

Prerequisites: Mathematics

Course Objectives:

- To gain knowledge in circuits and to understand the fundamentals of derived circuit laws.
- To learn steady state and transient analysis of single phase and 3-phase circuits.
- To understand Theorems and concepts of coupled circuits.

Course Outcomes: After learning the contents of this paper the student must be able to

1. Understand the basics of electrical circuits such as laws, transformation and network reduction techniques.
2. Explore the basic principles and concepts involved in AC circuits and analyze power in series and parallel AC circuits
3. Apply network theorems to analyze electrical circuits
4. Analyze balanced and unbalanced three phase circuits and measure voltage, current and power in three phase star and delta connections
5. Explore various network topologies and analyze the networks with cut-set and tie-set

UNIT-I:

Network Elements & Laws: Active elements, Independent and dependent sources. Passive Elements — R, L and C, Energy stored in inductance and capacitance, Kirchhoff's laws, Source transformations, Star-delta transformations, Node voltage method, Mesh current method including super node and supermesh analysis.

UNIT-II:

Single-Phase Circuits: RMS and average values of periodic sinusoidal and non- sinusoidal waveforms, Phasor representation, Steady-state response of series, parallel and series-parallel circuits. Impedance, Admittance, Current locus diagrams of RL and RC series and parallel circuits with variation of various parameters. Resonance: Series and parallel circuits, Bandwidth and Q-factor.

UNIT-III:

Network theorems: Superposition theorem, Thevinin's theorem, Norton's theorems, Maximum Power transfer theorem, Tellegen's theorem, Compensation theorem, Milliman's theorem and Reciprocitytheorem. (AC & DC).

UNIT-IV:

Poly-phase Circuits: Analysis of balanced and unbalanced 3-phase circuits, Star and delta connections, Measurement of three-phase power for balanced and unbalanced loads.

UNIT-V:

Coupled circuits: Concept of self and mutual inductance, Dot convention, Coefficientof coupling,Analysis of circuits with mutual inductance.

Topological Description of Networks: Graph, tree, chord, cut-set, incident matrix, circuit matrix and cut-set matrix,

TEXTBOOKS:

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, "Network Analysis and Synthesis", McGrawHill, 2nd Edition, 2019.

REFERENCE BOOKS:

1. B. Subramanyam, "Electric Circuit Analysis", Dreamtech Press & Wiley, 2021.
2. James W.Nilsson, Susan A.Riedel, "Electric Circuits", Pearson, 11th Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, "Circuits and Networks: Analysis and Synthesis", McGrawHill, 5th Edition, 2017.
4. Jagan N.C, Lakshrninarayana C., "Network Analysis", B.S. Publications, 3rd Edition, 2014.

5. William Hayt H, Kimmerly Jack E. and Steven Durbin M, "Engineering Circuit Analysis", McGrawHill, 6th Edition, 2002.
6. Chakravarthy A., "Circuit Theory", Dhanpat Rai & Co., First Edition, 1999.

Online Resources

1. Basic Electrical Circuits - Course (nptel.ac.in)
2. https://nptel.ac.in/courses/117106108

(B22ME03) COMPUTER AIDED ENGINEERING GRAPHICS

B.Tech. I Year I Sem. **L T P C**
1 0 4 3

COURSE OBJECTIVES: The objectives of this course are to

- To develop the ability of visualization of different objects through technical drawings.
- To acquire computer drafting skill for communication of concepts, ideas in the designof engineering products.

COURSE OUTCOMES: At the end of the course, the student will be able to:

CO 1: Apply computer aided drafting tools to create 2D and 3D objects sketch Conicsand different types of solids

CO 2: Appreciate the need of Sectional views of solids and Development of Surfacesof solids

CO 3: Read and interpret engineering drawings

CO 4: Conversion of orthographic projection into isometric view and vice Versamanually and by using computer aided drafting

UNIT - I: Introduction to Engineering Graphics:
Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics

UNIT- II: Orthographic Projections:
Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures..Computer aided orthographic projections – points, lines and planes.

UNIT – III:
Projections of Regular Solids - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Computer aided projections of solids – sectional views

UNIT – IV:
Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting.

UNIT – V: Isometric Projections:
Principles of Isometric Projection – Isometric Scale – Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Conversion of Isometric Views to Orthographic Views and Vice-versa –Conventions. Conversion of orthographic projection into isometric view using computer aided drafting.

TEXT BOOKS:

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan,Vikas: S.Chand and company Ltd.

REFERENCE BOOKS:

1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
5. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

ONLINE RESOURCES:

1. NPTEL Course on “Engineering Graphics and Design” by Prof. Naresh Varma Datla,Prof. S. R. Kale, IIT Delhi.
2. NPTEL Course on “Engineering Drawing and Computer Graphics” by Prof. Rajaram Lakkaraju, IIT Kharagpur.

(B22EE02) ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. I Year I Sem.

L	T	P	C
0	0	2	1

PREREQUISITES: Electrical Circuit Analysis-I

COURSE OBJECTIVES:

- To measure the electrical parameters for different types of DC and AC circuits usingconventional and theorems approach.
- To study the transient response of various R, L and C circuits using different excitations.
- To determine the performance of different types of DC machines and Transformers.

COURSE OUTCOMES: After learning the contents of this paper the student must be able to

- Verify the basic electrical circuits through different laws and theorems
- Measure voltage, current and power of a single phase transformer
- Calculate the impedance of series RL, RC and RLC circuits
- Determine the form factor of a non sinusoidal waveform
- Analyse the transient responses of R, L and C circuits for DC excitation

LIST OF EXPERIMENTS/DEMONSTRATIONS:

1. Verification Ohm's Law
2. Verification of KVL and KCL
3. Verification of Thevenin's and Norton's theorem
4. Verification of Superposition theorem
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of aSingle-Phase Transformer
7. Verification of Reciprocity and Milliman's Theorem.
8. Verification of Maximum Power Transfer Theorem.
9. Determination of form factor for non-sinusoidal waveform
10. Transient Response of Series RL and RC circuits for DC excitation

TEXTBOOKS:

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition,2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition,2008.

REFERENCE BOOKS:

1. P.Ramana, M.Suryakalavathi, G.T.Chandrasheker,"Basic Electrical Engineering", S.Chand, 2ndEdition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M.S.Sukhija, T.K.Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition,2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic ElectricalEngineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

ONLINE RESOURCES

1. https://onlinecourses.nptel.ac.in/noc22_ee93/preview

(B22CH02) ENGINEERING CHEMISTRY LABORATORY

B.Tech. I Year I Sem.

L	T	P	C
0	0	2	1

COURSE OBJECTIVES: The course consists of experiments related to the principles of chemistryrequired for engineering student. The student will learn:

- Estimation of hardness and chloride content of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry, potentiometry methods.
- Students will learn to prepare polymers such as Bakelite and nylon-6,6 in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value and viscosity of oils.

List of Experiments:

I. Volumetric Analysis: Estimation of Hardness of water by EDTA Complexometry method.

II. Conductometry: Estimation of the concentration of an acid by Conductometry.

III. Potentiometry: Estimation of the amount of Fe^{+2} by Potentiomentry.

IV. Determination of P^H: Determination of P^H of unknown acid solution by using Quinhydrone electrode.

V. Preparations:

1. Preparation of Bakelite.
2. Preparation Nylon - 6,6.

VI. Lubricants:

1. Estimation of acid value of given lubricant oil.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

VII. Determination of surface tension of a given liquid using Stalagmometer.

VIII. Virtual lab experiments

1. Construction of Fuel cell and it's working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

COURSE OUTCOMES: The experiments will make the student gain skills on:

- Able to determine the hardness of water
- Able to perform methods such as conductometry, and potentiometry in order to find out the concentrations or equivalence points of acid, and P^H of unknown solutions..
- Students are able to prepare polymers like bakelite and nylon-6,6.
- Estimations saponification value, and viscosity of lubricant oils.

REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications,New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

(B22CS07) C PROGRAMMING AND DATA STRUCTURES LABORATORY

B.Tech. I Year I Sem.

L	T	P	C
0	0	2	1

COURSE OBJECTIVES: Introduce the importance of programming, Language constructs, Program development, data structures, searching and sorting.

COURSE OUTCOMES:

CO-1: Develop modular and readable C Programs

CO-2: Solve problems using strings, functions. Handledatain files.

CO-3: Implement stacks, queues using arrays.

CO-4: To understand and analyze various searching and sorting algorithms.

List of Experiments:

1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are0and1.Subsequenttermsarefound by adding the preceding two terms in the sequence. Write a C program to generate the first terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a values applied by the user.
4. Write a C program to find the roots of a quadratic equation.
5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following:
    i) Addition of Two Matrices
    ii) Multiplication of Two Matrices
11. Write a C program that uses functions to perform the following operations:
    i) To insert a sub-string in to a given main string from a given position.
    ii) To delete Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not
13. Write a C program that displays the position or index in the string S where the string T begins, or– 1if S doesn't contain T.
14. Write a C program to count the lines, words and characters in a given text.
15. Write a C program to generate Pascal' striangle.
16. Write a C program to construct a pyramid of numbers.
17. Write a C program that uses functions to perform the following operations:
    i) Reading a complex number
    ii) Writing a complex number
    iii) Addition of two complex numbers
    iv) Multiplication of two complex numbers
    (Note: represent complex number using a structure.)
18. i. Write a C program which copies one file to another.
    ii. Write a C program to reverse the first n characters in a file.(Note: The file Name and n are specified on the command line.)
19. i. Write a C program to display the contents of a file.
    ii. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)
20. Write C programs that implement stack (its operations)using Arrays
21. Write C programs that implement Queue (its operations) using Arrays

22. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order
    i) Bubble sort ii)Selection sort iii) Insertion sort

23. Write C programs that use recursive functions to perform the following searching operations for a Key value in a given list of integers:
    i) Linear search ii)Binary search

24. Write C programs that use non recursive functions to perform the following searching operations for a Key value in a given list of integers:
    i) Linear search ii) Binary search

TEXTBOOKS:

1. C Programming & Data Structures, B.A. Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Letus C, Yeswanth Kanitkar
3. C Programming, Balaguruswamy.

s (B22MA02) ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

B.Tech. I Year II Sem. **L T P C**
3 1 0 4

COURSE OBJECTIVES: To learn

- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

COURSE OUTCOMES: After learning the contents of this paper the student must be able to

- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems.
- Extend the basic concepts of differential calculus to vector functions in a simple and natural fashion.
- Extend the basic concepts of differential calculus to vector functions in a simple and natural fashion.
- Evaluate the line, surface and volume integrals and converting them from one to another

UNIT-I:

First Order ODE: Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II:

Ordinary Differential Equations of Higher Order : Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type $e^{ax}, \sin ax, \cos ax,$ polynomials in $x, e^{axy}V(x)$ and $xV(x)$ method of variation of parameters, equation. Applications: Electrical Circuits (Both first and second order).

UNIT-III:

Laplace transforms : Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving differential equations with constant coefficients with give conditions by Laplace Transform method.

UNIT-IV:

Vector Differentiation : Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, , Vector Identities(without proofs) Tangent plane and normal line, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT-V:

Vector Integration: Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. H. K. Dass and Er. RajnishVerma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

(B22PH01) APPLIED PHYSICS

B.Tech. I Year II Sem

L	T	P	C
3	1	0	4

COURSE OBJECTIVES: The objectives of this course for the student are to:

- Understand the basic principles of quantum physics and band theory of solids.
- Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
- Study the fundamental concepts related to the dielectric, magnetic and energy materials.
- Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
- Study the characteristics of lasers and optical fibres.

COURSE OUTCOMES: At the end of the course the student will be able to:

- Understand physical world from fundamental point of view by the concepts of Quantum
- Mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
- Identify the role of semiconductor devices in science and engineering Applications.
- Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
- Appreciate the features and applications of Nanomaterials.
- Understand various aspects of Lasers and Optical fibre and their applications in diverse fields.

UNIT - I: QUANTUM PHYSICS AND SOLIDS

QUANTUM MECHANICS: Introduction To Quantum Physics - Blackbody Radiation – Stefan-Boltzmann's Law, Wein's And Rayleigh-Jean's Law, Planck's Radiation Law (qualitative) - Photoelectric Effect- waves and particles – de Broglie hypothesis – properties of matter waves- Davisson And Germer Experiment –Heisenberg Uncertainty Principle - Born Interpretation Of The Wave Function – Time Independent Schrodinger Wave Equation - Particle in One Dimensional Potential Box – **SOLIDS:** Free Electron Theory (Drude & Lorentz, Sommerfeld) - Fermi-Dirac Distribution - Bloch's Theorem -Kronig-Penney Model (qualitative) - E-K Diagram- Effective Mass Of electron- Origin Of Energy Bands- Classification Of Solids.

UNIT - II: SEMICONDUCTORS AND DEVICES

Intrinsic And Extrinsic Semiconductors – Hall Effect - Direct And Indirect Band Gap Semiconductors -Construction, Principle , Operation And Characteristics Of P-N Junction Diode, Zener Diode And Bipolar Junction Transistor (BJT)– LED, PIN Diode, Avalanche Photo Diode (APD) And Solar Cells, Their Structure, Materials, Working Principle And Characteristics.

UNIT - III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS

DIELECTRIC MATERIALS: Basic Definitions- Types of Polarizations (Qualitative) - Ferroelectric, Piezoelectric, and Pyroelectric Materials – Applications – Liquid Crystal Displays (LCD) And Crystal Oscillators. **MAGNETIC MATERIALS:** Hysteresis - Soft And Hard Magnetic Materials - Magnetostriction, Magnetoresistance - Applications - Bubble Memory Devices, Magnetic Field Sensors And Multi-Ferroics. **ENERGY MATERIALS**: Conductivity of Liquid and Solid Electrolytes- Superionic Conductors - Materials Andelectrolytes for Super Capacitors - Rechargeable Ion Batteries, Solid Fuel Cells.

UNIT - IV: NANOTECHNOLOGY

Nanoscale, Quantum Confinement, Surface to Volume Ratio, Bottom-Up Fabrication: Sol-Gel,Precipitation, Combustion Methods – Top-Down Fabrication: Ball Milling - Physical Vapor Deposition (PVD) - Chemical Vapor Deposition (CVD) - Characterization Techniques - XRD, SEM &TEM -Applications of Nano materials.

UNIT - V: LASER AND FIBER OPTICS

LASERS: Laser Beam Characteristics-Three Quantum Processes-Einstein Coefficients And Their Relations- Lasing Action - Pumping Methods- Ruby Laser, He-Ne Laser, Nd: YAG Laser- Semiconductor Laser-Applications Of Laser. **FIBER OPTICS**: Introduction To Optical Fiber- Advantages Of Optical Fibers - Total Internal Reflection construction of Optical Fiber - Acceptance Angle - Numerical Aperture- Classification Of Optical Fibers losses in Optical Fiber - Optical Fiber For Communication System - Applications.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G. Kshirsagar& TVS Arun Murthy" A Text book of Engineering Physics"-S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill,4thEdition,2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons, 11th Edition,2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, PragathiPrakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group
7. Energy Materials, Taylor & Francis Group, 1st Edition

(B22ME01) ENGINEERING WORKSHOP

B.Tech. I Year II Sem. **L T P C**
0 1 3 2.5

PRE-REQUISITES: Practical skill

COURSE OBJECTIVES:

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineeringproducts.
- To provide hands on experience about use of different engineering materials, tools,equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipmentand machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work toprescribed tolerances.

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- CO 1: Study and practice on machine tools and their operations
- CO 2: Practice on manufacturing of components using workshop trades including pluming,fitting, carpentry, foundry, house wiring and welding.
- CO 3: Identify and apply suitable tools for different trades of Engineering processes includingdrilling, material removing, measuring, chiseling.
- CO 4: Apply basic electrical engineering knowledge for house wiring practice.

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
V. Welding Practice – (Arc Welding & Gas Welding)
VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

2. TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and WoodWorking.

TEXT BOOKS:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOKS:

1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
2. Workshop Manual / Venkat Reddy/ BSP

(B22EN01) ENGLISH FOR SKILL ENHANCEMENT

B.Tech. I Year II Sem. **L T P C**
2 0 0 2

COURSE OBJECTIVES: This course will enable the students to:

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. To study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

COURSE OUTCOMES: Students will be able to:

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills using known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.

UNIT - I

Chapter entitled '***Toasted English*' by R. K. Narayan** from ***"English: Language, Context and Culture"*** published by Orient Black Swan, Hyderabad.2022

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

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

Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Simple, Compound & Complex Sentences - Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT - II

Chapter entitled **'Appro JRD' by Sudha Murthy** from ***"English: Language, Context and Culture" published*** by Orient BlackSwan, Hyderabad. 2022. Print.

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement, Collocations.

Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

UNIT - III

Chapter entitled **'Lessons from Online Learning' by F. Haider Alvi, Deborah Hurst et al** from ***"English: Language, Context and Culture"*** published by Orient Black Swan, Hyderabad. 2022. Print.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and tenses

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

UNIT - IV

Chapter entitled **'Art and Literature' by Abdul Kalam** from ***"English: Language, Context and Culture"*** published by Orient Black Swan, Hyderabad. 2022. Print.

Vocabulary: Standard Abbreviations in English, Idioms & Phrasal Verbs.

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

UNIT - V

Chapter entitled **'Go, Kiss the World' by Subroto Bagchi** from ***"English: Language, Context and Culture"*** published by Orient Black Swan, Hyderabad. 2022. Print.

Vocabulary: Technical Vocabulary and their Usage

Grammar: Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous units*)

Reading: Reading Comprehension-Exercises for Practice

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

Note: *Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.*

Note: 1. As the syllabus of English given in AICTE *Model Curriculum-2018 for B. Tech First Year is* ***Open-ended***, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

Note: **2**.Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents .They are advised to teach 40 percent of each topic from the syllabus in blended mode.

TEXTBOOK:

1. ***English: Language, Context and Culture*** by Orient Black Swan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS:

1. Effective Academic Writing (Second Edition)by Rhonda Liss and Jason Davis *Oxford University Press*
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1, 2, 3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. Technical Communication. Wiley India Pvt. Ltd, (2019).
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael.(2016).Practical English Usage. Oxford University Press.4th Edition.

(B22EE05) ELECTRICAL CIRCUIT ANALYSIS – II

B.Tech. I Year II Sem.

L	T	P	C
2	0	0	2

PREREQUISITES: Mathematics

COURSE OBJECTIVES:

- To study the transient analysis of various R, L and C circuits for different inputs
- To understand the Fourier series and Laplace transformation.
- To learn about two-port networks and concept of filters.

COURSE OUTCOMES: After learning the contents of this paper the student must be able to

1. Evaluate the network parameters in two port network
2. Design the different kinds of two port network filters.
3. Study the transient response of series and parallel RLC circuits for DC and sinusoidal excitations
4. Analyze the response of an electrical circuit for step, ramp, impulse etc., using Laplace transformation
5. Learn the Fourier series and integral to analyze the AC circuits

UNIT-I:

Two port network parameters: Open circuit impedance, short-circuit admittance, Transmission, Hybrid parameters & inter-relationships, Series, parallel and cascade connection of two port networks, System function, and Impedance and admittance functions.

UNIT-II:

Filters: Classification of filters – Low pass, High pass, Band pass and Band Elimination, Constant-k and M-derived filters-Low pass and High pass Filters and Band pass and Band elimination filters (Elementary treatment only)

UNIT-III:

Transient analysis: Transient response of R, L & C circuits, Formulation of integral differential equations, Initial conditions, Transient Response of RL, RC and RLC (series and parallel) networks subjected to internal energy, Response to impulse, step, and ramp, exponential and sinusoidal excitations.

UNIT-IV:

Electrical circuit Analysis using Laplace Transforms: Application of Laplace Transforms to RL, RCand RLC (series and parallel) Networks for impulse, step, and ramp, exponential and sinusoidal excitations.

UNIT-V:

Fourier Series and Integral: Fourier series representation of periodic functions, Symmetry conditions, Exponential Fourier series, Discrete spectrum, Fourier integral and its properties, Continuous spectrum, Application to simple networks

TEXTBOOKS:

1. Van Valkenburg M.E, “Network Analysis”, Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, “Network Analysis and Synthesis”, McGrawHill, 2nd Edition, 2019.

REFERENCE BOOKS:

1. B. Subramanyam, “Electric Circuit Analysis”, Dreamtech Press & Wiley, 2021.
2. James W. Nilsson, Susan A.Riedel, “Electric Circuits”, Pearson, 11th Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, “Circuits and Networks: Analysis and Synthesis”, McGrawHill, 5th Edition, 2017.
4. Jagan N.C, Lakshrninarayana C., “Network Analysis”, B.S. Publications, 3rd Edition, 2014.
5. William Hayt H, Kimmerly Jack E. and Steven Durbin M, “Engineering Circuit Analysis”, McGrawHill, 6th Edition, 2002.
6. Chakravarthy A., “Circuit Theory”, Dhanpat Rai & Co., First Edition, 1999.

ONLINE RESOURCES

1. Basic Electrical Circuits - Course (nptel.ac.in)
2. https://nptel.ac.in/courses/117106108

(B22PH02) APPLIED PHYSICS LABORATORY

B.Tech. I Year II Sem.

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES: The objectives of this course for the student to

1. Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fibre and measurement of energy gap and resistivity of semiconductor materials.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Able to measure the time Constant of RC Circuit.

.

COURSE OUTCOMES: The students will be able to:

1. Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Gain the knowledge of applications of dielectric constant.
4. Understand the variation of magnetic field and behavior of hysteresis curve.
5. Gain the knowledge of decay of charge and determine time constant of RC circuit

LIST OF EXPERIMENTS:

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode.
5. Input and output characteristics of BJT (CE, CB & CC configurations).
6. a) V-I and L-I characteristics of light emitting diode (LED)
   b) V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.
9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material.
11. a) Determination of the beam divergence of the given LASER beam.
    b) Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
12. Study of Decay Charge and Determination of Time Constant of RC Circuit

Note: *Any 8 experiments are to be performed.*

REFERENCE BOOK:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics" S Chand Publishers, 2017.

(B22EN02) ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

B.Tech. I Year II Sem. **L T P C**
0 0 2 1

sThe **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

COURSE OBJECTIVES:

- ✓ To facilitate computer-assisted multi-media instruction enabling individualized andindependent language learning
- ✓ To sensitize the students to the nuances of English speech sounds, word accent,intonation and rhythm
- ✓ To bring about a consistent accent and intelligibility in students' pronunciation ofEnglish by providing an opportunity for practice in speaking
- ✓ To improve the fluency of students in spoken English and neutralize the impact ofdialects.
- ✓ To train students to use language appropriately for public speaking, group discussionsand interviews

COURSE OUTCOMES: Students will be able to:

1. Understand the nuances of English language through audio- visual experience and groupactivities
2. Neutralize their accent for intelligibility
3. Develop their listening skills so that they may appreciate its role in developing LSRW skills of language and improve their pronunciation.
4. Involve in speaking activities in various contexts.
5. Speak with clarity and confidence which in turn enhance their employability skills

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:

a. **Computer Assisted Language Learning (CALL) Lab**
b. **Interactive Communication Skills (ICS) Lab**

Listening Skills:

Objectives

1 To enable students develop their listening skills so that they may appreciate the role in the LSRWskills approach to language and improve their pronunciation
2 To equip students with necessary training in listening, so that they can comprehend the speechof people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professionalcontexts.

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities
- Just A Minute (JAM) Session

The following course content is prescribed for the **English Language and Communication Skills Lab**.

Exercise –I

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. *Practice*: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs-Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*

ICS Lab:

Understand: Spoken vs. Written language- Formal and Informal English.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II
CALL Lab:

Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern insentences – Intonation.
Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern insentences – Intonation - *Testing Exercises*

ICS Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication.
Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests andSeeking Permissions - Telephone Etiquette.

Exercise - III
CALL Lab:

Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).
Practice: Common Indian Variants in Pronunciation – Differences between British and AmericanPronunciation -*Testing Exercises*

ICS Lab:

Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing
Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise – IV
CALL Lab:
Understand: Listening for General Details.

Practice: Listening Comprehension Tests - *Testing Exercises*

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication-Presentation Skills.
Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise – V
CALL Lab:
Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests -*Testing Exercises*

ICS Lab:
Understand: Introduction to Group Discussion, Interview Skills.

Practice: Group Discussion/Mock Interview.

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:**

The Computer Assisted Language Learning Lab has to accommodate 30 students with 30 systems,with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement (Hardware component):
Computer network with LAN facility (minimum 30 systems with multimedia) with the followingspecifications:

i) Computers with Suitable Configuration
ii) High Fidelity Headphones

2. **Interactive Communication Skills (ICS) Lab:**

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio- visual aids with a Public Address System, LCD and camcorder.

Source of Material (Master Copy):

- *Exercises in Spoken English. Part 1, 2, 3.* CIEFL and Oxford University Press

Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contentsof the syllabus.

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge UniversityPress.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All
- Orell Digital Language Lab (Licensed Version)

REFERENCE BOOKS:

1. *English Language Communication Skills – Lab Manual cum Workbook.* CengageLearning India Pvt. Ltd, (2022).
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* CambridgeUniversity Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford UniversityPress
4. *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd, (2016).
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* CambridgeUniversity Press.
6. https://www.wix.com//

(B22CS10) APPLIED PYTHON PROGRAMMING LABORATORY

B.Tech. I Year II Sem. **L T P C**
0 1 2 2

Course Outcomes: Up on completing this course, the students will be able to

CO-1: Install Python in linux and windows, Installing O Son Raspberry Pi
CO-2: Build basic programs using fundamental programming constructs
CO-3: Write and execute python codes for different applications
CO-4: Capable to implement to n hard ware boards

SSLecture- 1: Introduction to Python, Write and Execute a simple python Program, Basic Commands, Variables, Statements, Input /Output, Keywords, Standard Data Types, Strings, Operands and operators.

Lecture- 2: Understanding the Decision Control Structures: The if Statement, A Word on Indentation, The if … else Statement, The if … elif … else Statement.

Lecture- 3: Loop Control Statements: The while Loop, The for Loop, Infinite Loops, Nested Loops.The break Statement, The continue Statement.

Lecture- 4: Function Definition and Execution, Scoping, Arguments, Argument Calling by Keywords, Default Arguments, Function Rules, Return Values.

Lecture- 5: Lists: List, Creating List, Updating the Elements of a List, Sorting the List Elements. Storing Different Types of Data in a List, Nested Lists, Nested Lists as Matrices.

Lecture- 6: Files: Working with Files and Directories, File Processing, reading from files, writing to files, merging file contents, Controlling File I/O.

Lecture- 7: numpy, Plotpy and Scipy libraries of python and their functionalities. Basic GUI Programming using these libraries: text labels and buttons.

Lecture- 8: Explanation on Raspberry pi device and exploring various parts of raspberry pi.

Lecture- 9: GPIO pins layout on raspberry pi, its classification and installation, configuration of required packages to access the GPIO pins through python code.

Lecture- 10: Different types of sensors with its required libraries to access through python code.

LIST OF EXPERIMENTS:

Cycle -1

1. **(Lecture- 1,2&3)** Downloading and Installing Python and Modules
   a) Python3 on Linux
   FollowtheinstructionsgivenintheURLhttps://docs.python-guide.org/starting/install3/linux/
   b) Python3onWindows
   FollowtheinstructionsgivenintheURLhttps://docs.python.org/3/using/windows.html(Please remember that Windows installation of Python is harder!)
   c) pip3onWindowsand Linux
   Install the Python package installer by following the instructions given in the URL
   https://www.activestate.com/resources/quick-reads/how-to-install-and-use-pip3/
   d) Installing numpy and scipy
   You caninstallanypython3packageusingthecommandpip3install<packagename>
   e) Installing jupyter lab
   Install from pip using the command pip install up jyter lab
2. **(Lecture-1, 2&3)**Introduction toPython3
   a) Printing your bio data on the screen
   b) Printing all the primes less than a given number
   c) Finding all the factors of a number and show whether it is a *perfect* number, i.e., the sum of all its factors (excluding the number itself) is equal to the number itself

3. **(Lecture- 4)**Defining and Using Functions
   a) Write a function toread data from a file and display ito n the screen
   b) Define a Boolean function *is palindrome*(<input>)
   c) Write a function *collat z(x)* which does the following: if *x* is odd, $x = 3x + 1$; if *x* is even, then $x=x/2$.Returnthe number of steps it takes for $x=1$
   d) Writeafunction$N(m,s)=exp(-(x-m)^2/(2s^2))/sqrt(2\pi)s$thatcomputestheNormaldistribution
4. **(Lecture- 5)** The package numpy
   a) Creating a matrix of given order *m x n* containing *random numbers* in the range 1 to99999
   b) Write a program that adds, subtracts and multiplies two matrices. Provide an interface such that, based on the prompt, the function (addition, subtraction, multiplication)should be performed
   c) Write a program to solve a system of *n* linear equations in *n* variables using matrix inverse
5. **(Lecture- 7)** The packages cipy and pyplot
   a) Finding if two sets of data have the same *mean* value
   b) Plotting data read from a file
   c) Fitting a function through haste a data points using *polyfit* function
   d) Plotting a his to gram of a given dataset
6. **(Lecture- 6)** The strings package
   a) Read text from a file and print the number of lines, words and characters
   b) Read text from a file and return a list of all *n* letter words beginning with a vowel
   c) Finding a secret message hidden in a paragraph of text
   d) Plot a his to gram of words according to their length from text read from a file

Cycle -2

7. Installing O Son Raspberry Pi
   a) Installation using Pi Imager
   b) Installation using image file
      - Downloading an Image Writing the image to an S D card
      - Using Linux
      - Using Windows
      - Booting up

   Follow the instructions given in the URLhttps://www.raspberrypi.com/documentation/computers/getting-started.html
8. Accessing GPIO pins using Python
   a) Installing GPIO Zero library.
   First, update your repositories list:
   Sudoapt update

   Then install the package of or Python 3:
   Sudoapt installpython3-gpiozero

   b) Blinking an LED connected to one of the GPIO pin
   c) Adjusting the brightness of an LED
   d) Adjust the brightness of an LED (0to100, where 100 means maximum brightness) using the in-built PWM wavelength.
9. Collecting Sensor Data
   a) DHT Sensor interface
   - Connect the terminals of DHTGPIO pins of Raspberry Pi.
   - Import the DHT library using *import Ada fruit_ DHT*
   - Read sensor data and display it on screen.

TEXTBOOKS:

1. Super charged Python: Take y sour code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCEBOOKS:

1. Python for Data Science,Dr.Mohd.AbdulHameed,WileyPublications-1st Ed.2021.
2. Python Programming: A Modern Approach, VamsiKurama, Pearson
3. PythonProgrammingAModularApproachwithGraphics,Database,Mobile,andWebApplications,SheetalTaneja,NaveenKumar,Pearson
4. ProgrammingwithPython,AUser'sBook,MichaelDawson,CengageLearning,IndiaEdition
5. Think Python, Allen Downey, Green Tea Press
6. Core Python Programming, W. Chun, Pearson
7. Introduction to Python, Kenneth A. Lambert, Cengage

(B22EE06) ELECTRICAL CIRCUIT ANALYSIS LABORATORY

B.Tech. I Year II Sem.

L	T	P	C
0	0	2	1

PREREQUISITES: Elements of Electrical Engineering & Electrical Circuit Analysis

COURSE OBJECTIVES:

- To design electrical systems and analyze them by applying various Network Theorems
- To measure three phase Active and Reactive power.
- To understand the locus diagrams and concept of resonance.

COURSE OUTCOMES: After learning the contents of this paper the student must be able to

1. Draw locus diagrams for series RLC circuit
2. Create resonance condition in R-L-C series and parallel circuit and learn how to draw phasor diagram for the circuit.
3. Determine Z, Y and ABCD parameters for a given two port network
4. Analyze filters in frequency domain
5. Measurement of Active Power and Reactive Power for Star and Delta connected balanced loads

The following experiments are required to be conducted as compulsory

1. To draw the locus Diagrams of RL (R-Varying) and RC (R-Varying) & RL (L-Varying) and RC (C-Varying) Series Circuits.
2. Verification of Series and Parallel Resonance.
3. Determination of Time response of first order RL and RC circuit for periodic non – sinusoidal inputs – Time Constant and Steady state error.
4. Determination of Two port network parameters – Z & Y parameters.
5. Determination of Two port network parameters – A, B, C, D parameters.
6. Determination of Co-efficient of Coupling and Separation of Self and Mutualinductance in a Coupled Circuits.
7. Frequency domain analysis of Low-pass filter.
8. Frequency domain analysis of Band-pass filter.
9. Measurement of Active Power for Star and Delta connected balanced loads.
10. Measurement of Reactive Power for Star and Delta connected balanced loads

TEXTBOOKS:

1. Van Valkenburg M.E, “Network Analysis”, Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, “Network Analysis and Synthesis”, McGrawHill, 2nd Edition, 2019.

REFERENCE BOOKS:

1. B. Subramanyam, “Electric Circuit Analysis”, Dreamtech Press & Wiley, 2021.
2. James W.Nilsson, Susan A. Riedel, “Electric Circuits”, Pearson, 11th Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, “Circuits and Networks: Analysis and Synthesis”, McGrawHill, 5th Edition, 2017.
4. Jagan N.C, Lakshrninarayana C., “Network Analysis”, B.S. Publications, 3rd Edition, 2014.
5. William Hayt H, Kimmesrly Jack E. and Steven Durbin M, “Engineering Circuit Analysis”, McGrawHill, 6th Edition, 2002.
6. Chakravarthy A., “Circuit Theory”, Dhanpat Rai & Co., First Edition, 1999.

(B22CH03) ENVIRONMENTAL SCIENCE

B.Tech. I Year II Sem. **L T P C**

3 00 0

PREREQUISITES: Bio magnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and usingmineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT - III

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In- Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha forUniversity Grants Commission.
2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHLLearning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHILearning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BSPublications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

VAAGDEVI COLLEGE OF ENGINEERING

UGC-Autonomous

NUMERICAL METHODS AND COMPLEX VARIABLES

B.Tech. II Year I Sem. **L T P C**

3 1 0 4

Pre-requisites: Mathematics courses of first year of study.

Course Objectives: To learn

- Expressing periodic function by Fourier series and a non-periodic function by Fourier transforms
- Various numerical methods to find roots of polynomial and transcendental equations.
- Concept of finite differences and to estimate the value for the given data using interpolation.
- Evaluation of integrals using numerical techniques
- Solving ordinary differential equations of first order using numerical techniques.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
- Expansion of complex functions using Taylor's and Laurent's series.

Course outcomes: After learning the contents of this paper the student must be able to

- Express any periodic function in terms of sine and cosine
- Find the root of a given polynomial and transcendental equations.
- Estimate the value for the given data using interpolation
- Find the numerical solutions for a given first order ODE's
- Analyze the complex function with reference to their analyticity, integration using Cauchy'sintegral and residue theorems
- Taylor's and Laurent's series expansions in complex function

UNIT-I: Fourier Series &Fourier Transforms: **10 L**

Fourier series - Dirichlet's Conditions - Half-range Fourier series - Fourier Transforms: Fourier Sine andcosine transforms - Inverse Fourier transforms.

UNIT-II: Numerical Methods-I **10 L**

Solution of polynomial and transcendental equations: Bisection method, Iteration Method, Newton- Raphson method and Regula-Falsi method. Jacobi and Gauss-Seidal iteration methods for solving linear systems of equations.

Finite differences: forward differences, backward differences, central differences, symbolic relations and separation of symbols, Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae, Lagrange's method of interpolation.

UNIT-III: Numerical Methods-II **8 L**

Numerical integration: Trapezoidal rule and Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.

Ordinary differential equations: Taylor's series, Picard's method, Euler and modified Euler's methods, Runge-Kutta method of fourth order for first order ODE

UNIT-IV: Complex Differentiation **10 L**

Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne-Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithm) and their properties. (All theoremswithout Proofs), Conformal mappings, Mobius transformations.

UNIT-V: Complex Integration: **10 L**

Line integrals, Cauchy's theorem, Cauchy's Integral formula, zeros of analytic functions, singularities, Taylor's series, Laurent's series, Residues, Cauchy Residue theorem.and their properties. (All theorems without Proofs)

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

REFERENCE BOOKS:

1. M. K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations, New Age International publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, Mc-Graw Hill,2004.

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ELECTRICAL MACHINES - I

B.Tech. II Year I Sem. **L T P C**

3 1 0 4

Prerequisites: Electrical Circuit Analysis-1 & Electrical Circuit Analysis-2

Course Objectives:

- To study and understand different types of DC machines and their performance evaluationthrough various testing methods.
- To understand the operation of single and ploy-phase Transformers
- To analyze the performance of transformers through various testing methods.

Course Outcomes: After learning the contents of this paper the student must be able to

- Identify different parts of a DC machines & understand their operation. with various excitation
- Learn various methods of starting, speed control of dc motors
- Analyze the performance of DC machines with various methods of testing.
- Understand the construction, operation and performance of single phase transformer
- Learn the methods of testing of single phase transformers and explore the polyphase connections of transformer.

UNIT-I:

D.C. GENERATORS: Principle of operation – Action of commutator – constructional features – armature windings – lap and wave windings – simplex and multiplex windings – use of laminated armature – E. M.F Equation.

Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation – reactance voltage – methods of improving commutation.

Methods of Excitation – separately excited and self-excited generators – build-up of E.M.F - critical field resistance and critical speed - causes for failure to self-excited and remedial measures. Load characteristics and applications of shunt, series and compound generators.

UNIT-II:

D.C MOTORS: Principle of operation – Back E.M.F. - Torque equation – characteristics andapplication of shunt, series and compound motors – Armature reaction and commutation.

Speed control of D.C. Motors - Armature voltage and field flux control methods.

Motor starters (3-point and 4-point starters) Testing of D.C. machines - Losses – Constant &Variable losses – calculation of efficiency – condition for maximum efficiency.

UNIT-III:

TESTING OF DC MACHINES: Methods of Testing – direct, indirect, and regenerative testing – Braketest – Swinburne's test – Hopkinson's test –Field's test - separation of stray losses in a D.C. motor test.

UNIT-IV:

SINGLE PHASE TRANSFORMERS: Types - constructional details-minimization of hysteresis and eddy current losses- EMF equation - operation on no load and on load - phasor diagrams and Applications.

Equivalent circuit - losses and efficiency – regulation - All day efficiency - effect of variations of frequency &supply voltage on iron losses.

UNIT-V:

TESTING OF TRANSFORMERS AND POLY-PHASE TRANSFORMERS: Open Circuit and Short

Circuit tests - Sumpner's test - predetermination of efficiency and regulation-separation of losses test- parallel operation with equal and unequal voltage ratios - auto transformers-equivalent circuit - comparison with two winding transformers.

Poly-phase transformers – Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ, Scott connection and Applications.

TEXT BOOKS:

1. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
2. I.J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.

REFERENCE BOOKS:

1. Prithwiraj Purkait, Indrayudh Bandyopadhyay, “Electrical Machines”, Oxford, 2017.
2. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.
3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013.
4. A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers,2004.

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POWER SYSTEM - I

B.Tech. II Year I Sem. **L T P C**

3 0 0 3

Prerequisites: Electrical Circuit Analysis-1 & Electrical Circuit Analysis-2
Electrical Machines-I & Electrical Machines-II

Course Objectives:

- To understand the power generation through conventional and non-conventional sources.
- To illustrate the economic aspects of power generation and tariff methods.
- To know about overhead line insulators, substations and AC & DC distribution systems.

Course Outcomes: After learning the contents of this paper the student must be able to

- Understand the operation of conventional and renewable electrical power generating stations.
- Evaluate the power tariff methods and Economics associated with power generation.
- Modelling of various parameters of transmission lines and classification of overhead line insulators and evaluation of string efficiency.
- Analyze the operations of AIS and GIS
- Compare and evaluate various distribution systems

UNIT-I:
GENERATION OF ELECTRIC POWER:

Conventional Sources (Qualitative): Hydro station, Steam Power Plant, Nuclear Power Plant and GasTurbine Plant.

Non-Conventional Sources (Elementary Treatment):
Solar Energy, Wind Energy, Fuel Cells, Ocean Energy, Tidal Energy, Wave Energy, Cogeneration,Energy conservation and storage.

UNIT-II:
ECONOMICS OF POWER GENERATION: Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load duration curve, number and size of generator units. Base load and peak load plants.
Cost of electrical energy-fixed cost, running cost, Tariff on charge to customer.

UNIT-III:
OVER HEAD TRANSMISSION LINES: Line conductors, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, Composite conductors- transposition, bundled conductors, and effect of earth on capacitance,skin and proximity effects.
OVERHEAD LINE INSULATORS: Introduction, types of insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, testing of insulators, Sag and tension calculations.

UNIT-IV:
SUBSTATIONS:

AIR INSULATED SUBSTATIONS (AIS): Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar 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, bus bar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gasinsulated substations.

UNIT-V:
DC DISTRIBUTION: 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) in D.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.

A.C. DISTRIBUTION: Introduction, AC distribution, Single phase, 3-phase, 3 phase 4 wire system, bus bar arrangement, Selection of site for substation. Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

TEXT BOOKS:

1. C.L. Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", 2nd Edition,New AgeInternational, 2009.
2. V.K Mehta andRohit Mehta, "Principles of Power Systems", S. Chand & Company Ltd, NewDelhi, 2004.

REFERENCE BOOKS:

1. A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Text book on Power System Engineering", Dhanpat Rai Publishing Company (P) Ltd, 2008.
2. C.L. Wadhwa, "Electrical Power Systems", 5th Edition, New Age International, 2009.
3. M.V. Deshpande, "Elements of Electrical Power Station Design", 3rd Edition, Wheeler Pub.1998.
4. H.Cotton & H. Barber, "The Transmission and Distribution of Electrical Energy", 3rd Edition,1970.
5. W.D.Stevenson, "Elements of Power System Analysis", 4th Edition, McGraw Hill, 1984.

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ANALOG ELECTRONIC CIRCUITS

B.Tech. II Year I Sem. **L T P C**

3 0 0 3

Course Objectives:

- To introduce components such as diodes, BJTs and FETs their switching characteristics, applications
- Learn the concepts of high frequency analysis of transistors.
- To give understanding of various types of basic and feedback amplifier circuits such assmall signal,cascaded, large signal and tuned amplifiers.
- To introduce the basic building blocks of linear integrated circuits.
- To introduce the concepts of waveform generation and introduce some special function ICs.

Course Outcomes: At the end of this course, students will be able to

- Know the characteristics, utilization of various components.
- Understand the biasing techniques
- Design and analyze various rectifiers, small signal amplifier circuits.
- Design sinusoidal and non-sinusoidal oscillators.
- Designs OP-AMP based circuits with linear integrated circuits.

UNIT-I:

Diode and Bipolar Transistor Circuits: P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, clamping and clipping circuits. Input output characteristics of BJT in CB, CE, CC configurations, biasing circuits, Load line analysis, common-emitter, common-base and common collector amplifiers;Small signal equivalent circuits,

UNIT-II:

FET Circuits: FET Structure and VI Characteristics, MOSFET structure and I-V characteristics. MOSFET as a switch. small signal equivalent circuits - gain, input and output impedances, small-signal model and common-source, common-gate and common-drain amplifiers, trans conductance, high frequencyequivalent circuit.

UNIT-III:

Multi-Stage and Power Amplifiers: Direct coupled and RC Coupled multi-stage amplifiers; Differential Amplifiers, Power amplifiers - Class A, Class B, Class C

UNIT-IV:

Feedback Amplifiers: Concepts of feedback – Classification of feedback amplifiers – General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems.

Oscillators: Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators,LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators.

UNIT-V:

Operational Amplifiers: Ideal op-amp, Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product, Inverting and non-inverting amplifier, Differentiator, integrator, Square-wave andtriangular- wave generators.

TEXT BOOKS:

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education, 2nd edition2010
2. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.

REFERENCE BOOKS:

1. Electronic Devices Conventional and current version -Thomas L. Floyd 2015, pearson.
2. J. Millman and A. Grabel, “Microelectronics”, McGraw Hill Education, 1988.
3. P. Horowitz and W. Hill, “The Art of Electronics”, Cambridge University Press, 1989.
4. P. R. Gray, R. G. Meyer and S. Lewis, “Analysis and Design of Analog IntegratedCircuits”,John Wiley & Sons, 2001.

VAAGDEVI COLLEGE OF ENGINEERING

UGC-Autonomous

ELECTROMAGNETIC FIELDS

B.Tech. II Year I Sem. **L T P C**

3 0 0 3

Prerequisites: Mathematics & Applied Physics

Course Objectives:

- To introduce the concepts of electric field and magnetic field.
- To know Applications of electric and magnetic fields in the development of the theory for power transmission linesand electrical machines.
- To study about electromagnetic waves.

Course Outcomes: After learning the contents of this paper the student must be able to

- Understand the basic laws of electromagnetism and their applications.
- Understand the behavior of conductors and dielectrics, their boundary conditions, Maxwell's equations with respect to electrostatics
- Analyze the relation between the electric field and magnetic field
- Analyze time varying electric and magnetic fields.
- Understand the propagation of EM waves.

UNIT-I:

STATIC ELECTRIC FIELD: Review of conversion of a vector from one coordinate system to another coordinate system, Coulomb's law, Electricfield intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law andits applications. Absolute Electric potential, potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.

UNIT-II:

CONDUCTORS, DIELECTRICS AND CAPACITANCE: Current and current density, Ohms Law in Point form, Continuity equation, Boundary conditions of conductors and dielectric materials. Capacitance, Capacitance of a two-wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation.

UNIT-III:

STATIC MAGNETIC FIELDS AND MAGNETIC FORCES: Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced bycurrent carrying conductors.

Force on a moving charge, Force on a differential current element, Force between differential current elements, Magnetic boundary conditions, Magnetic circuits, Self-inductances and mutual inductances.

UNIT-IV:

TIME VARYING FIELDS AND MAXWELL'S EQUATIONS: Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces.

UNIT-V:

ELECTROMAGNETIC WAVES: Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane wave in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors. Poynting theorem.

TEXT BOOKS:

1. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.
2. W. Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2012.

REFERENCE BOOKS:

1. A. Pramanik, “Electromagnetism-Problems with solution”, Prentice Hall India, 2012.
2. G. W. Carter, “The electromagnetic field in its engineering aspects”, Longmans, 1954.
3. W. J. Duffin, “Electricity and Magnetism”, McGraw Hill Publication, 1980.
4. W. J. Duffin, “Advanced Electricity and Magnetism”, McGraw Hill, 1968.
5. E. G. Cullwick, “The Fundamentals of Electromagnetism”, Cambridge University Press, 1966.
6. B. D. Popovic, “Introductory Engineering Electromagnetics”, Addison-Wesley Educational Publishers,International Edition, 1971.
7. A. Pramanik, “Electromagnetism - Theory and applications”, PHI Learning Pvt. Ltd, New Delhi,2009.

VAAGDEVI COLLEGE OF ENGINEERING

UGC-Autonomous

ELECTRICAL MACHINES LABORATORY – I

B.Tech. II Year I Sem. **L T P C**

0 0 2 1

Prerequisites: Electrical Machines- I

Course Objectives:

- To expose the students to the operation of DC Generators.
- To know the operation of various types of DC Motors.
- To examine the performance of Single and Three Phase Transformers.

Course Outcomes: After learning the contents of this paper the student must be able to

- Start and control the Different DC Machines.
- Assess the performance of different machines using different testing methods
- Evaluate the performance of different Transformers using different testing methods

The following experiments are required to be conducted compulsory experiments:

1. Magnetization characteristics of DC shunt generator (Determination of critical field resistanceand critical speed)
2. Load test on DC shunt generator (Determination of characteristics)
3. Load test on DC series generator (Determination of characteristics)
4. Hopkinson's test on DC shunt machines (Predetermination of efficiency)
5. Swinburne's test on DC Shunt machine(Predetermination of efficiencies)
6. Speed control of DC shunt motor
7. Brake test on DC compound motor (Determination of performance curves)
8. Brake test on DC shunt motor (Determination of performance curves)
9. Load test on DC compound generator (Determination of characteristics.
10. Fields test on DC series machines (Determination of efficiency)

TEXT BOOKS:

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. I.J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

REFERENCE BOOKS:

1. Prithwiraj Purkait, Indrayudh Bandyopadhyay, "Electrical Machines", Oxford, 2017.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
4. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers,2004.

VAAGDEVI COLLEGE OF ENGINEERING

UGC-Autonomous

ANALOG ELECTRONIC CIRCUITS LABORATORY

B.Tech. II Year I Sem. **L T P C**

0 0 2 1

Prerequisites: Analog Electronic Circuits

Course Objectives:

- To introduce components such as diodes, BJTs and FETs their switching characteristics, applications
- Learn the concepts of high frequency analysis of transistors.
- To give understanding of various types of basic and feedback amplifier circuits such as smallsignal, cascaded, large signal and tuned amplifiers.
- To introduce the basic building blocks of linear integrated circuits.
- To introduce the concepts of waveform generation and introduce some special function ICs.

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Know the characteristics, utilization of various components.
- Understand the biasing techniques
- Design and analyze various rectifiers, small signal amplifier circuits.
- Design sinusoidal and non-sinusoidal oscillators.
- Design OP-AMP based circuits with linearintegrated circuits.

List of Experiments:

1. Draw the VI Characteristics of given PN Junction diode. Determine the Static and Dynamic resistance of the Diode.
2. Determine the Ripple factor, %Regulation PIV and TUF of the given Rectifier with & withoutfilter.
3. Obtain the I/O Characteristics of CE configurations of BJT. Calculate h-parameters from the Characteristics.
4. Obtain the I/O Characteristics of CB configurations of BJT. Calculate h-parameters from the Characteristics.
5. Obtain the I/O Characteristics of CC configurations of BJT. Calculate h-parameters from the Characteristics.
6. Obtain the Drain and Transfer characteristics of CD,CS configuration of JFET. Calculategm, rd from the Characteristics Adder and Subtractor using Op Amp.
7. Inverting and Non-inverting Amplifiers using Op Amps
8. Adder and Subtractor using Op Amp
9. Integrator Circuit using IC 741.
10. Differentiator circuit using Op Amp.
11. Current Shunt Feedback amplifier
12. Design an RC phase shift oscillator circuit and derive the gain condition for oscillations practically for given frequency.
13. Design a Colpitts oscillator circuit for the given frequency and draw the output waveform.
14. Design transformer coupled class A power amplifier and draw the input and output waveforms, find its efficiency

- Experiments related to MOSFET may be included

VAAGDEVI COLLEGE OF ENGINEERING

UGC-Autonomous

ELECTRICAL SIMULATION TOOLS LABORATORY

B.Tech. II Year I Sem. **L T P C**

0 0 2 1

Prerequisites: Mathematics, ECA-I, & ECA-II,

Course Objectives:

- To understand basic block sets of different simulation platform used in electrical/electroniccircuit design.
- To understand use and coding in different software tools used in electrical/ electronic circuitdesign.
- To understand the simulation of electric machines/circuits for performance analysis.

Course Outcomes: After learning the contents of this paper the student must be able to

- Develop knowledge of software packages to model and program electrical and electronicssystems.
- Model different electrical and electronic systems and analyze the results.
- Articulate importance of software packages used for simulation in laboratory experimentationby analyzing the simulation results.

Students should be encouraged to use open-source software's such as **SCILAB, ORCAD, LTSPICE, Ngspice, Octave, Solve Elec, Simulide, CircuitLab, QElectroTech, Circuit Sims, DcAcLab, Every Circuit, DoCircuits**etc. for carrying out the lab simulation listed below.

Use of Professional Licensed versions of softwares**like MATLAB, LabVIEW, NI Multisim, PSpice,PowerSim, TINA** etc. is also allowed.

Use of **'Python'** platform for simulating components/ circuit behaviour.

Suggested List of Laboratory Experiments:

The following experiments need to be performed from various subject domains.

1. Introduction to basic block sets of simulation platforms. Basic matrix operations, Generation of standard test signals
2. Solving the linear and nonlinear differential equations
3. Verification of different network theorems with independent sources using suitable simulation tools.
4. Analysis of series and parallel resonance circuits using suitable simulation tools
5. Obtaining the response of the electrical network for standard test signals using suitable simulation tools.
6. Modeling and Analysis of Low pass and High pass Filters using suitable simulation tools.
7. Performance Analysis of DC Motor using suitable simulation Tools.
8. Analysis of single-phase bridge rectifier with and without filter using suitable Simulation tools.
9. Modeling of transmission line using simulation tools.
10. Performance Analysis of Solar PV Model using suitable Tools

VAAGDEVI COLLEGE OF ENGINEERING

UGC-Autonomous

GENDER SENSITIZATION LAB

(An Activity-based Course)

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	0

COURSE DESCRIPTION

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questionsabout the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions aboutsex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence anddiscrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Objectives of the Course

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Learning Outcomes

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labor and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

Unit-I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men
- Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

Unit – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.
-Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping withEveryday Harassment- Further Reading: "*Chupulu".*
Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives.Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

Unit – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender andPopular Literature - Just Relationships: Being Together as Equals
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Note: **Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.**

- ***Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments.Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".***

 ESSENTIAL READING: The Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender"* written by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu **published by Telugu Akademi, Telangana Government in 2015.**

Assessment and Grading:

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

VAAGDEVI COLLEGE OF ENGINEERING

UGC-Autonomous

SOLID MECHANICS AND HYDRAULIC MACHINES

B.Tech. II Year II Sem. **L T P C**

3 1 0 4

Course Objectives:

- To identify an appropriate structural system and work comfortably with basic engineering mechanics and types of loading & support conditions that act on structural systems.
- To Understand the meaning of centers of gravity, centroids, moments of Inertia and rigidbody dynamics.
- To Study the characteristics of hydroelectric power plant and Design of hydraulic machinery.

Course Outcomes: After learning the contents of this paper the student must be able to

- Solve problems dealing with forces, beam and cable problems and understand distributedforce systems.
- Solve friction problems and determine moments of Inertia and centroid of practical shapes.
- Apply knowledge of mechanics in addressing problems in hydraulic machinery and its principlesthat will be utilized in Hydropower development and for other practical usages.

UNIT–I:

INTRODUCTION OF ENGINEERING MECHANICS: Basic concepts of System of Forces-Coplanar Forces–Components in Space–Resultant- Moment of Forces andits Application – Couples and Resultant of Force System-Equilibrium of System of Forces-Free body diagrams-Direction of Force Equations of Equilibrium of Coplanar Systems and Spatial Systems – Vector cross product- Support reactions different beams for different types of loading – concentrated, uniformly distributedand uniformly varying loading. Types of friction – Limiting friction – Laws of Friction – static and Dynamic Frictions – Angle of Friction –Cone of limiting friction

UNIT–II:

CENTROID AND CENTER OF GRAVITY: Centroids – Theorem of Pappus- Centroids of Composite figures – Centre of Gravity of Bodies – Area momentof Inertia:–polar Moment of Inertia–Transfer– Theorems - Moments of Inertia of Composite Figures.

SIMPLE STRESSES AND STRAINS ANALYSIS: Concept of stress and strain- St. Venant's Principle-Stress and Strain Diagram - Elasticity and plasticity – Types of stresses and strains- Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Pure shear and Complementary shear - Elastic modulii, Elasticconstants and the relationship between them

UNIT–III:

KINEMATICS & KINETICS: Introduction – Rectilinear motion – Motion with uniform and variable acceleration–Curvilinear motion– Components of motion– Circular motion Kinetics of a particle – D'Alembert's principle – Motion in a curved path – work, energy and power. Principleof conservation of energy – Kinetics of a rigid body in translation, rotation – work done – Principle of work-energy – Impulse-momentum.

UNIT-IV:

BASICS OF HYDRAULIC MACHINERY: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, expressions for work done and efficiency Elements of a typical Hydropower installation – Heads and efficiencies

UNIT-V:

TURBINES & PUMPS: Classification of turbines – Pelton wheel – Francis turbine – Kaplan turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube – Classification, functions and efficiency. Governing of turbines, Performance of turbines

Pump installation details – classification – work done – Manometric head – minimum starting speed –losses and efficiencies – specific speed. Multistage pumps – pumps in parallel

TEXT BOOKS:

1. M.V. Seshagirirao and Durgaih, "Engineering Mechanics",University Press.
2. P.N Modi and Seth, "Fluid Mechanics and Hydraulic Machinery", standard Book House

REFERENCE BOOKS:

1. B. Bhattacharya, "Engineering Mechanics", Oxford University Publications.
2. Hibbler, "Engineering Mechanics (Statics and Dynamics)", Pearson Education.
3. Fedrinand L. Singer, "Engineering Mechanics" Harper Collings Publishers.
4. A.K.Tayal, "Engineering Mechanics", Umesh Publication.
5. Domkundwar & Domkundwar, "Fluid mechanics & Hydraulic Machines", Dhanpat Rai & C
6. R.C.Hibbeler, "Fluid Mechanics", Pearson India Education Servieces Pvt. Ltd
7. D.S.Kumar, "Fluid Mechanic & Fluid Power Engineering", Kataria & Sons Publications Pvt. Ltd.
8. Banga & Sharma, "Hydraulic Machines" Khanna Publishers.

VAAGDEVI COLLEGE OF ENGINEERING

UGC-Autonomous

MEASUREMENTS AND INSTRUMENTATION

B.Tech. II Year II Sem. **L T P C**
3 0 0 3

Prerequisites: Electrical Circuit Analysis-1 & Electrical Circuit Analysis-2, Analog Electronics
Electro Magnetic Fields.

Course Objectives:

- To introduce the basic principles of all measuring instruments.
- To deal with the measurement of voltage, current, Power factor, power, energy, R, L,C and magnetic measurements.
- To understand the basic concepts of smart and digital metering.

Course Outcomes: After learning the contents of this paper the student must be able to

- Understand different types of measuring instruments, their construction, operation andcharacteristics and identify the instruments suitable for typical measurements.
- Apply the knowledge about transducers and instrument transformers to use them effectively.
- Apply the knowledge of smart and digital metering for industrial applications.

UNIT - I:

INTRODUCTION TO MEASURING INSTRUMENTS: Classification – deflecting, 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 – extension of range of E.S. Voltmeters.

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 type's standardization – applications. CT and PT – Ratio and phase angle errors

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 active andreactive powers in balanced and unbalanced systems.

Single phase induction type energy meter – driving and braking torques – errors and compensations –testing by phantom loading using R.S.S. meter. Three phase energy meter – tri-vector meter, maximumdemand meters.

UNIT-IV:

DC & AC BRIDGES: Method of measuring low, medium and high resistance – sensitivity of Wheat- stone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method.

Measurement of inductance- Maxwell's bridge, Hay's bridge, Anderson's bridge - Owen's bridge. Measurement of capacitance and loss angle –Desaunty's Bridge - Wien's bridge – Schering Bridge.

UNIT-V:

TRANSDUCERS: 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 gauge and its principle of operation, gauge factor, Thermistors,Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, and photo diodes.

INTRODUCTION TO SMART AND DIGITAL METERING: Digital Multi-meter, True RMS meters, Clamp- on meters, Digital Energy Meter, Cathode Ray Oscilloscope, Digital Storage Oscilloscope.

TEXTBOOKS:

1. A. K. Sawhney, "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co. Publications,2005.
2. Dr. Rajendra Prasad, "Electrical Measurements & Measuring Instruments", Khanna Publishers1989.

REFERENCE BOOKS:

1. G. K. Banerjee, "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition,2016.
2. R. K. Rajput, "Electrical & Electronic Measurement & Instrumentation", S. Chand andCompany Ltd.,2007.
3. S. C. Bhargava, "Electrical Measuring Instruments and Measurements", BS Publications, 2012.
4. Buckingham and Price, "Electrical Measurements", Prentice – Hall, 1988.
5. Reissland, M. U, "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1st Edition 2010.
6. E.W. Golding and F. C. Widdis, "Electrical Measurements and measuring Instruments",fifth Edition,Wheeler Publishing, 2011.

VAAGDEVI COLLEGE OF ENGINEERING
UGC-Autonomous
ELECTRICAL MACHINES – II

B.Tech. II Year II Sem. **L T P C**

3 0 0 3

Prerequisites: Electrical Circuit Analysis-1 & Electrical Circuit Analysis-2 & Electrical Machines-I

Course Objectives:

- To deal with the detailed analysis of poly-phase induction motors & Alternators.
- To understand operation, construction and types of single-phase motors and their applicationsin household appliances and control systems.
- To introduce the concept of parallel operation of alternators.

Course Outcomes: After learning the contents of this paper the student must be able to

- Understand the concepts of rotating magnetic fields,operation of ac machines.
- Learn the various methods of testing, speed control of induction motors
- Understand the construction of synchronous machines, analyze performance characteristics of synchronous generators.
- Explore the parallel operation ,analyze the performance of synchronous motor.
- Analyze\ study the various single-phase induction motors

UNIT-I:

POLY-PHASE INDUCTION MACHINES: Constructional 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 Power factor at standstill and during operation. Rotor power input, rotor copper loss and mechanical power developed and their inter relation.

UNIT-II:

CHARACTERISTICS OF INDUCTION MACHINES: Torque equation-expressions for maximum torqueand starting torque - torque slip characteristic - equivalent circuit - phasor diagram - crawling and cogging, No-load Test and Blocked rotor test –Predetermination of performance-Methods of starting and starting current and Torque calculations, Applications.

SPEED CONTROL METHODS: Change of voltage, change of frequency, voltage/frequency, injection of an EMF into rotor circuit (qualitative treatment only)-induction generator-principle of operation.

UNIT-III:

SYNCHRONOUS MACHINES: Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings –distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated e.m.f. – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasor diagram – load characteristics.

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 X_d and X_q (Slip test) Phasor diagrams – Regulation of salient pole alternators.

UNIT-IV:

PARALLEL OPERATION OF SYNCHRONOUS MACHINES: 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 reactance's and Applications.

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 – synchronous induction motor.

UNIT-V:

SINGLE PHASE MACHINES: Single phase induction motor – Constructional Features-Double revolving field theory – split-phase motors – AC series motor- Universal Motor- -Shadedpole motor andApplications.

TEXT BOOKS:

1. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
2. I.J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.

REFERENCE BOOKS:

1. Prithwiraj Purkait, Indrayudh Bandyopadhyay, “Electrical Machines”, Oxford, 2017.
2. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.
3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013.
4. A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers,2004.

VAAGDEVI COLLEGE OF ENGINEERING

UGC-Autonomous

DIGITAL ELECTRONICS

B.Tech. II Year II Sem.

L	T	P	C
2	0	0	2

Prerequisites: Analog Electronics

Course Objectives:

- To learn fundamental concepts of digital system design and common forms of number representations and their conversions.
- To implement and design logical operations using combinational logic circuits and sequentiallogic circuits.
- To understand the semiconductor memories and programmable logic devices.

Course Outcomes: After learning the contents of this paper the student must be able to

- Understand the working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Implement the given logical problems using programmable logic devices.

UNIT-I:

Fundamentals of Digital Systems and Logic Families: Digital signals, Digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, Examples of IC gates, Number systems-binary, Signed binary, Octal hexadecimal number, Binary arithmetic, One's and Two's complements arithmetic.

UNIT-II:

Combinational Circuits-I: Standard representation for logic functions, K-map representation and simplification of logic functions using K- map, Minimization of logical functions, Don't care conditions, Multiplexer, De-Multiplexer

UNIT-III:

Combinational Circuits-II: Adders, Subtractors, Carry look ahead adder, Digital comparator, Parity checker/generator, Code converters, Priority encoders, Decoders/Drivers for display devices, Q-M method of function realization.

UNIT-IV:

Sequential Circuits: Introduction to flip-flops, SR, JK, T and D type's flip-flops, Shift registers, Conversion of flip-flops, Ring counter, Ripple (Asynchronous) counters, Synchronous counters.

UNIT-V:

Semiconductor Memories and Programmable Logic Devices: Memory organization and operation,expanding memory size, classification and characteristics of memories, sequential memory, read-only memory (ROM), ROM types, Read and write memory (RAM) types, Programmable logic array, Programmable array logic, Field Programmable Gate Array (FPGA).

TEXT BOOKS:

1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

REFERENCE BOOKS:

1. R.S. Sedha, "A Textbook of Digital Electronics", S.Chand, 2005
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

VAAGDEVI COLLEGE OF ENGINEERING

UGC-Autonomous
POWER SYSTEMS - II

B.Tech. II Year II Sem. **L T P C**
3 0 0 3

Prerequisites: Power Systems –I & Electro Magnetic Fields

Course Objectives:

- To study the performance of transmission lines and travelling waves.
- To understand the concept of voltage control, compensation methods and per unitrepresentation of power systems.
- To know the methods of overvoltage protection, Insulation coordination, Symmetricalcomponents and fault calculation analysis.

Course Outcomes: After learning the contents of this paper the student must be able to

- Design of transmission lines and investigate the concepts of corona and its effects
- Apply load compensation techniques to control reactive power
- Acquire and apply the knowledge of per unit quantities in power systems.
- Investigate the concepts of over voltage protection, insulation coordination lighting surges and switching surges.
- Determine the fault currents for symmetrical and unbalanced faults

UNIT - I:

PERFORMANCE OF LINES: Representation of lines, short transmission lines, medium length lines, nominal T and PI- representations, long transmission lines. The equivalent circuit representation of a long Line, A, B, C, D constants, Ferranti Effect.

Corona: Introduction, disruptive critical voltage, corona loss, Factors affecting corona loss and methods of reducing corona loss, Disadvantages of corona, interference between power and Communication lines.

UNIT-II:

VOLTAGE CONTROL & POWER FACTOR IMPROVEMENT: Introduction – methods of voltage control, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers, power factor improvement methods.

COMPENSATION IN POWER SYSTEMS: Introduction - Concepts of Load compensation – Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrical line – Radial line with asynchronous load – Compensation of lines.

UNIT-III:

PER UNIT REPRESENTATION OF POWER SYSTEMS: The one-line diagram, impedance and reactance diagrams, per unit quantities, changing the base of per unit quantities, advantages of per unitsystem.

TRAVELLING WAVES ON TRANSMISSION LINES: Production of travelling waves, open circuited line, short-circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at T-junction line terminated through a capacitance, capacitor connection at a T-junction, Attenuation of travelling waves.

UNIT-IV:

OVERVOLTAGE PROTECTION AND INSULATION COORDINATION: Over voltage due to arcing ground and Peterson coil, lightning, horn gaps, surge diverters, rod gaps, expulsion type lightning arrester, valve type lightning arrester, ground wires, ground rods, counter poise, surge absorbers, insulation coordination, volt-time curves.

UNIT-V:

SYMMETRICAL COMPONENTS AND FAULT CALCULATIONS: Significance of positive, negative and zero sequence components, Average 3-phase power in terms of symmetrical components, sequence impedances and sequence networks, fault calculations, sequence network equations, singleline to ground fault, line to line fault, double line to ground fault, three phase fault, faults on power systems, faults with fault impedance, reactors and their location, short circuit capacity of a bus.

TEXT BOOKS:

1. C.L. Wadhwa, "Electrical Power Systems", New Age International Pub. Co, Third Edition, 2001.
2. D.P. Kothari and I.J. Nagrath, "Modern Power System Analysis", Tata Mc Graw Hill Pub. Co.,New Delhi, Fourth edition, 2011.

REFERENCE BOOKS:

1. A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Text book on Power System Engineering", Dhanpat Rai Publishing Company (P) Ltd, 2008.
2. John J. Grainger & W.D. Stevenson, "Power System Analysis", Mc Graw Hill International,1994.
3. Hadi Scadat, "Power System Analysis", Tata Mc Graw Hill Pub. Co. 2002.
4. W.D. Stevenson, "Elements of Power system Analysis", McGraw Hill International StudentEdition.

VAAGDEVI COLLEGE OF ENGINEERING

UGC-Autonomous

DIGITAL ELECTRONICS LAB

B.Tech. II Year II Sem. **L T P C**

0 0 2 1

Prerequisites: Analog Electronics & Digital Electronics

Course Objectives:

- To learn basic techniques for the design of digital circuits and number conversion systems.
- To implement simple logical operations using combinational logic circuits.
- To design combinational logic circuits, sequential logic circuits.

Course Outcomes: After learning the contents of this paper the student must be able to

- Understand the working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Analyze different types of semiconductor memories.

List of Experiments:

1. Realization of Boolean Expressions using Gates
2. Design and realization logic gates using universal gates
3. Generation of clock using NAND/NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization a 4 – bit gray to Binary and Binary to Gray Converter
6. Design and realization of a 4-bit pseudo random sequence generator using logic gates.
7. Design and realization of an 8-bit parallel load and serial out shift register using flip-flops.
8. Design and realization Asynchronous and Synchronous counters using flip-flops
9. Design and realization 8x1 using 2x1 mux
10. Design and realization 2-bit comparator
11. Verification of truth tables and excitation tables
12. Realization of logic gates using DTL, TTL, ECL, etc.,

TEXT BOOKS:

1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

REFERENCE BOOKS:

1. R.S. Sedha, “A Textbook of Digital Electronics”, S.Chand, 2005
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

VAAGDEVI COLLEGE OF ENGINEERING

UGC-Autonomous

MEASUREMENTS AND INSTRUMENTATION LABORATORY

B.Tech. II Year II Sem. **L T P C**

0 0 2 1

Prerequisites: Measurements and Instrumentation

Course Objectives:

- To calibrate Watt, Energy and PF Meter and determination of three phase active & reactivepowers.
- To determine unknown inductance, resistance, capacitance by performing experiments on D.CBridges & A. C Bridges.
- To determine the ratio and phase angle errors of Instrument transformers.

Course Outcomes: After learning the contents of this paper the student must be able to

- Choose and test any measuring instruments.
- Find the accuracy of any instrument by performing experiments.
- Calculate the various parameters using different types of measuring instruments.

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

1. Calibration and Testing of single-phase energy Meter.
2. Calibration of dynamometer power factor meter.
3. Measurement of parameters of choke coil using three voltmeter and three ammeter methods
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
5. Calibration LPF wattmeter – by Phantom testing.
6. Resistance strain gauge – strain measurements and Calibration.
7. Schering Bridge & Anderson Bridge.
8. Measurement of 3 - Phase reactive power with single-phase wattmeter.
9. Measurement of displacement with the help of LVDT
10. Measurement of 3-phase power with single wattmeter and two CTs

TEXT BOOKS:

1. A. K. Sawhney, "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co. Publications,2005.
2. Dr. Rajendra Prasad, "Electrical Measurements & Measuring Instruments", Khanna Publishers1989.

REFERENCE BOOKS:

1. G. K. Banerjee, "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition,2016.
2. R. K. Rajput, "Electrical & Electronic Measurement & Instrumentation", S. Chand andCompany Ltd.,2007.
3. S. C. Bhargava, "Electrical Measuring Instruments and Measurements", BS Publications, 2012.
4. Buckingham and Price, "Electrical Measurements", Prentice – Hall, 1988.
5. Reissland, M. U, "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1st Edition 2010.
6. E.W. Golding and F. C. Widdis, "Electrical Measurements and measuring Instruments",fifth Edition,Wheeler Publishing, 2011.

VAAGDEVI COLLEGE OF ENGINEERING

UGC-Autonomous

ELECTRICAL MACHINES LABORATORY – II

B.Tech. II Year II Sem. **L T P C**

0 0 2 1

Prerequisites: Electrical Machines-I & Electrical Machines-II

Course Objectives:

- To understand the operation of Induction, Synchronous machines and Transformers.
- To study the performance analysis of Induction and Synchronous Machines through varioustesting methods.
- To analyze the performance of single and 3-phase phase transformer with experiments.

Course Outcomes: After learning the contents of this paper the student must be able to

- Assess the performance of different types of AC machines using different testing methods.
- Analyze the suitability of AC machines and Transformers for real word applications.
- Design the machine models based on the application requirements.

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

1. OC and SC Test on single-phase transformer
2. Sumpner's test on a pair of single-phase transformers
3. Scott Connection of transformer
4. No-load & Blocked rotor tests on three phase Induction motor
5. Regulation of a three –phase alternator by synchronous impedance & m.m.f. methods.
6. 'V' and 'Inverted V' curves of a three—phase synchronous motor.
7. Equivalent Circuit of a single-phase induction motor
8. Determination of Xd and Xq of a salient pole synchronous machine
9. Load test on three phase Induction Motor
10. Efficiency of a three-phase alternator

TEXT BOOKS:

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. I.J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

REFERENCE BOOKS:

1. Prithwiraj Purkait, Indrayudh Bandyopadhyay, "Electrical Machines", Oxford, 2017.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
4. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers,2004.

LOGICAL REASONING & QUANTATIVE APTITUDE

B. TECH- VI SEM. (EEE) **L/ T /P/ C**
0/ 0/ 2 /1

Pre-requisites: NoneCourse Objectives: To learn

1. To improve logical thinking with general applications using mathematical concepts like sequences,series, number theory and probability.
2. It also features students to analyze data interpretation and able of improve their mathematical skills in various general aspects like coding and decoding, Time and Work puzzles solving blood relations etc.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO1: Apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.
CO2: Apply quantitative correctly arrive at meaningful conclusions regarding their answers and manipulate equations and formulas in order to solve for the desired variable.
CO3: Interpret given information correctly, determine which mathematical model best describes the data,and apply the model correctly.
CO4: Correctly apply mathematical language and notation to explain the reasoning underlying their conclusions when solving problems using mathematical or statistical techniques.
CO5: Improve their mathematical skills in various general aspects to solve real time problems.

Unit – I: Logical Reasoning

1. Distance and Directions
2. Classifications
3. Odd man out and series
4. Coding and Decoding
5. Clocks and Calendars etc.

Unit – II: Logical ability

1. Blood relations
2. Seating Arrangements
3. Figure Analysis
4. Puzzles etc.

Unit – III: Number systems

1. LCM and HCF
2. Ratio and proportion
3. Simple interest and compound interest
4. Profit and Loss etc.

Unit – IV: Arithmetic ability

1. Time and work
2. Partnerships
3. Time speed and distance
4. Problems on Trains etc.

Unit – V: Mathematical ability

1. Sequence and series
2. Permutations and combination
3. General probability etc.

REFERENCE BOOKS:

1. A modern approach to verbal and non-verbal reasoning by Dr. R.S. Aggarwal.
2. Quantitative Aptitude by AbhijitGuha Tata McGraw-Hill Company Limited.
3. Quantitative Aptitude by P.A. Anand (Wiley)
4. Quantitative Aptitude by Dr. R.S. Agarwal.
5. Objective Arithmetic by S.L. Gulati.

(B22EE21) POWER ELECTRONICS

III Year B.Tech. EEE I-Sem **L T P C**
3 1 0 4

Prerequisite: Analog Electronics, Digital Electronics

Course Objectives:

- To understand the various power semiconductor devices operations.
- To know the AC-DC, AC-AC power conversions.
- To know the DC-DC, DC-AC power conversions.

Course Outcomes: At the end of this course, students will be able to:

CO1 : Understand the differences between signal level and power level devices.
CO2 : Analyze controlled rectifier circuits.
CO3 : Analyze the operation of DC-DC choppers
CO4 : Analyze the voltage source inverters.
CO5 : Describe the behavior and applications of AC-AC converters.

UNIT-I:

Power Switching Devices: Concept of power electronics, scope and applications, types of power converters; Power semiconductor switches and their V-I characteristics - Power Diodes, Power BJT, SCR, Power MOSFET, Power IGBT; Thyristor ratings and protection, methods of SCR commutation, UJT as a trigger source, gate drive circuits for BJT and MOSFETs

UNIT-II:

AC-DC Converters (Phase Controlled Rectifiers): Principles of single-phase fully-controlled converter with R, RL, and RLE load, Principles of single-phase half-controlled converter with RL and RLE load, Principles of three-phase fully-controlled converter operation with RLE load, Effect of load and source inductances, General idea of gating circuits, Single phase and Three phase dual converters

UNIT-III:

DC-DC Converters (Chopper/SMPS): Introduction, elementary chopper with an active switch and diode, concepts of duty ratio, average inductor voltage, average capacitor current. Buck converter - Power circuit, analysis and waveforms at steady state, duty ratio control of output voltage. Boost converter - Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage. Buck-Boost converter - Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

UNIT-IV:

AC-DC Converters (Inverters): Introduction, principle of operation, performance parameters, single phase bridge inverters with R, RL loads, 3-phase bridge inverters - 120- and 180-degrees mode of operation, Voltage control of single-phase inverters –single pulse width modulation, multiple pulse width modulation, sinusoidal pulse width modulation.

UNIT-V:

AC-AC Converters: Phase Controller (AC Voltage Regulator)-Introduction, principle of operation of single-phase voltage controllers for R, R-L loads and its applications. Cyclo-converter-Principle of operation of single phase cyclo-converters, relevant waveforms, circulating current mode of operation, Advantages and disadvantages.

TEXT BOOKS:

1. M. H. Rashid, “Power electronics: circuits, devices, and applications”, Pearson Education India, 2009.
2. N. Mohan and T. M. Undeland, “Power Electronics: Converters, Applications and Design”, John Wiley & Sons, 2007.

REFERENCE BOOKS:

1. R. W. Erickson and D. Maksimovic, “Fundamentals of Power Electronics”, Springer Science & Business Media, 2007.
2. L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.

WEB RESOURCES:

1. https://nptel.ac.in/courses/108105066
2. https://archive.nptel.ac.in/courses/108/102/108102145/
3. https://onlinecourses.nptel.ac.in/noc21_ee01/preview
4. https://archive.nptel.ac.in/courses/117/103/117103148/

(B22EE22) CONTROL SYSTEMS

III Year B.Tech. EEE I-Sem **L T P C**

3 0 0 3

Prerequisite: Matrix Algebra and Calculus, Applied and Multivariable Calculus, Numerical Methods and Complex Variables, Fundamental physical laws

Course objectives:

- Understand the mathematical modeling of physical systems.
- Comprehend the representation of dynamical systems through input-output models, including transfer functions and state-space models.
- Understand the design of controllers and compensators to enhance the performance and stability of dynamical systems

Course Outcomes: At the end of this course, students will be able to:

CO1: Find the transfer function and state-space representation of linear time-invariant dynamical systems.
CO2: Estimate the time domain specifications, steady state error and Analyze the performance and Stability of linear time-invariant systems in the time domain.
CO3: Analyze the performance and stability of linear time-invariant systems in frequency domain.
CO4: Design classical controllers/compensators to improve the performance and stability of linear time-invariant systems.
CO5: Apply the state space representation to various systems and test the system for Controllability and Observability.

UNT-I:

Modeling of Physical Systems and Their Representations: Industrial and domestic Control examples. Mathematical modeling of physical systems: Mechanical and Electrical Systems, Concept of Control Systems Configurations: Open – loop and Closed loop Systems, Introduction to types of Systems: Linear, Non-Linear, Time Varying and Time Invariant. Representation of Linear time-invariant Systems through Input-output Models: Transfer function, Block-diagram Techniques, Signal flow graph. Concept of Feedback Control, Benefits of Feedback and Effects of feedback. Controller Components: DC Servo motors, AC Servomotors, Synchros.

UNT-II:

TIME – Domain Analysis with Input-Output Models: Time response of first and second order systems for standard test inputs. Analysis of standard Second order systems with step input, Types of System, Error Analysis for Linear time Invariant Systems, Design specifications for second-order systems based on the time-response.

Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

UNT-III:

Frequency Domain Analysis: Introduction to frequency response, Relationship between time and frequency response, Polar plots, Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Concept of Bode plots and construction. Closed-loop frequency response.

UNT-IV:

Introduction To Design Of Classical Controllers And Compensators: Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.

UNT-V:

State Variable Analysis And Design: Concept of State, State variables and State model. State – State Representation, Transformation of State variables, Solution of state equations and Complete response of the Systems. Stability Analysis of Linear Systems. Concept of controllability and observability. Design of State feedback Controllers through Pole-placement.

TEXT BOOKS:

1. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.
2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.

REFERENCE BOOKS:

1. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
2. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009.

WEB RESOURCES:

(B22EC06) SIGNALS AND SYSTEMS

III Year B.Tech. EEE I-Sem **L T P C**
3 1 0 4

Course Objectives: The objectives of this subject are to:

- Classify signals and systems and their analysis in time and frequency domains.
- Study the concepts of distortion less transmission through LTI systems, convolution and correlation properties.
- Understand Laplace and Z-transforms their properties for analysis of signals and systems.
- Identify the need for sampling of CT signals, types and merits and demerits of each type.

Course Outcomes: Upon completing this course the students able to:

CO1: Apply the knowledge of various signals, and systems.
CO2: Analyze the transform techniques in time and frequency domain.
CO3: Identify the conditions for transmission of signals through systems and conditions for physical realization of systems.
CO4: Analyze the concept of Region of Convergence for different Transformation techniques.
CO5: Use sampling theorem for baseband and band pass signals for various types of sampling and apply the correlation and PSD functions for various applications

UNIT - I

Signal Analysis: Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

UNIT – II

Fourier series: Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.

Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

UNIT - III

Signal Transmission through Linear Systems: Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

UNIT – IV

Laplace Transforms: Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.

Z–Transforms: Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

UNIT - V

Sampling theorem: Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

Correlation: Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parsevals Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution and Correlation, Detection of Periodic Signals in the presence of Noise by Correlation, Extraction of Signal from Noise by Filtering.

TEXT BOOKS

1. B.P. Lathi -Signals, Systems & Communications, BSP, 2013.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawabi -Signals and Systems, 2nd Ed., Prentice Hall

REFERENCE BOOKS

1. Simon Haykin and Van Veen, A. Rama Krishna Rao, -Signals and Systems, TMH, 2008.
2. Michel J. Robert - Fundamentals of Signals and Systems, MGH International Edition, 2008.
3. C. L. Philips, J. M. Parr and Eve A. Riskin -Signals, Systems and Transforms, 3rd Ed., PE, 2004.

(B22EE23) RENEWABLE ENERGY SOURCES
(Professional Elective-I)

III Year B.Tech. EEE I-Sem

L	T	P	C
3	0	0	3

Pre-requisites: None

Course Objectives:

- To recognize the awareness of energy conservation in students
- To identify the use of renewable energy sources for electrical power generation
- To collect different energy storage methods and detect about environmental effects of energy conversion

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

CO1: Understand the principles of wind power and solar photovoltaic power generation
CO2: Understand the working principle of fuel cells and different types of fuel cells
CO3: Assess the cost of generation for conventional and renewable energy plants
CO4: Design suitable power controller for wind and solar applications
CO5: Analyze the issues involved in the integration of renewable energy sources to the grid

UNIT-I:

Introduction: Renewable Sources of Energy-Grid-Supplied Electricity-Distributed Generation-Renewable Energy Economics-Calculation of Electricity Generation Costs –Demand side Management Options –Supply side Management Options-Modern Electronic Controls of Power Systems.

Wind Power Plants: Appropriate Location -Evaluation of Wind Intensity -Topography -Purpose of the Energy Generated - General Classification of Wind Turbines-Rotor Turbines-Multiple-Blade Turbines Drag Turbines - Lifting Turbines-Generators and Speed Control used in Wind Power Energy Analysis of Small Generating Systems.

UNIT-II:

Photovoltaic Power Plants: Solar Energy-Generation of Electricity by Photovoltaic Effect -Dependence of a PV Cell Characteristic on Temperature-Solar cell Output Characteristics-Equivalent Models and Parameters for Photovoltaic Panels-Photovoltaic Systems-Applications of Photovoltaic Solar Energy-Economical Analysis of Solar Energy.

Fuel Cells: The Fuel Cell-Low and High Temperature Fuel Cells-Commercial and Manufacturing Issues Constructional Features of Proton Exchange-Membrane Fuel Cells –Reformers-Electrolyzer Systems and Related Precautions-Advantages and Disadvantages of Fuel Cells-Fuel Cell Equivalent Circuit- Practical Determination of the Equivalent Model Parameters -Aspects of Hydrogen as Fuel.

UNIT-III:

Induction Generators: Principles of Operation-Representation of Steady-State Operation-Power and Losses Generated-Self- Excited Induction Generator-Magnetizing Curves and Self-Excitation Mathematical Description of the Self-Excitation Process-Interconnected and Stand-alone operation -Speed and Voltage Control - Economical Aspects.

UNIT-IV:

Storage Systems: Energy Storage Parameters-Lead–Acid Batteries-Ultra Capacitors-Flywheels –Superconducting Magnetic Storage System-Pumped Hydroelectric Energy Storage - Compressed Air Energy Storage - Storage Heat -Energy Storage as an Economic Resource.

UNIT-V:

Integration of Alternative Sources of Energy: Principles of Power Injection-Instantaneous Active and Reactive Power Control Approach Integration of Multiple Renewable Energy Sources-Islanding and Interconnection Control-DG Control and Power Injection.

Interconnection Of Alternative Energy Sources with the Grid:
Interconnection Technologies -Standards and Codes for Interconnection-Interconnection Considerations - Interconnection Examples for Alternative Energy Sources.

TEXT BOOKS:

1. Felix A. Farret, M. Godoy Simoes, "Integration of Alternative Sources of Energy", John Wiley& Sons, 2006.
2. Solanki: Renewable Energy Technologies: Practical Guide For Beginneers, PHI Learning Pvt. Ltd., 2008.

REFERENCE BOOKS:

1. D. Mukherjee: Fundamentals of Renewable Energy Systems, New Age International publishers, 2007.
2. Remus Teodorescu, Marco Liserre, Pedro Rodríguez: Grid Converters for Photovoltaic and Wind Power Systems, John Wiley & Sons, 2011.
3. Gilbert M. Masters: Renewable and Efficient Electric Power Systems, John Wiley & Sons, 2004.

(B22EE24) HIGH VOLTAGE ENGINEERING

(Professional Elective-I)

III Year B.Tech. EEE I-Sem

L	T	P	C
3	0	0	3

Prerequisite: Power Systems – I, Electro Magnetic Fields

Course Objectives:

- To deal with the detailed analysis of Breakdown occurring in gaseous, liquids and solid dielectrics
- To inform about generation and measurement of High voltage and current
- ·To introduce High voltage testing methods

Course outcomes: At the end of this course, students will be able to:

CO1: Understand the various breakdown processes in solid, liquid and gaseous insulating materials.
CO2: Explain the generation of high D. C., A.C., & Impulse voltage
CO3: Apply the suitable method to measure high D. C., A.C., & Impulse voltages.
CO4: Elaborate the lightning and switching over-voltage and protection against these over- voltages.
CO5: Discuss about high voltage testing of electrical apparatus and high voltage laboratories.

UNIT-I:

Breakdown in Gases: Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streamer mechanism, Corona discharge

Breakdown in Liquid and Solid Insulating Materials: Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.

UNIT-II:

Generation of High Voltages: Generation of high voltages, generation of high D. C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT-III:

Measurements of High Voltages and Currents: Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements.

UNIT-IV:

Lightning and Switching Over-Voltages: Charge formation in clouds, Stepped leader, Dart leader, Lightning Surges. Switching over voltage's, Protection against over-voltages, Surge diverters, Surge modifiers.

UNIT-V:

High Voltage Testing of Electrical Apparatus and High Voltage Laboratories Various standards for HV Testing of electrical apparatus, IS, IEC standards, testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformers and some high voltage equipment, High voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H. V. Labs.

TEXT BOOKS:

1. M. S. Naidu and V. Kamaraju, “High Voltage Engineering”, McGraw Hill Education, 2013.
2. C. L. Wadhwa, “High Voltage Engineering”, New Age International Publishers, 2007.

REFERENCE BOOKS:

1. D. V. Razevig (Translated by Dr. M. P. Chourasia), “High Voltage Engineering Fundamentals”, Khanna Publishers, 1993.
2. E. Kuffel, W. S. Zaengl and J. Kuffel, “High Voltage Engineering Fundamentals”, Newnes Publication, 2000.
3. R. Arora and W. Mosch “High Voltage and Electrical Insulation Engineering”, John Wiley & Sons, 2011.
4. Various IS standards for HV Laboratory Techniques and Testing.

WEB RESOURCES:

https://nptel.ac.in/courses/108104048
https://www.udemy.com/course/high-voltage-and-insulators-for-electrical-power-engineering/

(B22EE25) COMPUTER AIDED ELECTRICAL MACHINE DESIGN

(Professional Elective-I)

III Year B.Tech. EEE I-Sem **L T P C**
3 0 0 3

Prerequisite: Electrical Machines-I, Electrical Machines-II

Course Objectives:

- To know the major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings,
- To analyze the thermal considerations, heat flow, temperature rise, rating of machines.
- To understand the design of machines and CAD design concepts

Course Outcomes: At the end of this course, students will be able to:

CO1: Understand the concepts electrical, magnetic and thermal loading of electrical machines
CO2: Understand the design and operating characteristics of Transformers.
CO3: To analyze the varies factors in the design and operating characteristics of induction motors
CO4: To analyze the varies factors in the design of synchronous motors.
CO5: To understand the use of software tools in the design of electrical machines

UNIT-I:

Introduction: Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines.

UNIT-II:

Transformers: Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

UNIT-III:

Induction Motors: Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of poly-phase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

UNIT-IV:

Synchronous Machines: Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

UNIT-V:

Computer Aided Design (CAD): Limitations (assumptions) of traditional designs need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design. Introduction to **c**omplex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines.

TEXT BOOKS:

1. A. K. Sawhney, “A Course in Electrical Machine Design”, Dhanpat Rai and Sons, 1970.
2. M.G. Say, “Theory & Performance & Design of A.C. Machines”, ELBS London.

REFERENCE BOOKS:

1. S. K. Sen, “Principles of Electrical Machine Design with computer programmes”, Oxford and IBH Publishing, 2006.
2. K. L. Narang, “A Text Book of Electrical Engineering Drawings”, Satya Prakashan, 1969.
3. A. Shanmugasundaram, G. Gangadharan and R. Palani, “Electrical Machine Design Data Book”, New Age International, 1979.
4. M. V. Murthy, “Computer Aided Design of Electrical Machines”, B.S. Publications, 2008.
5. Electrical machines and equipment design exercise examples using Ansoft’s Maxwell 2D machine design package.

(B22EE26) ELECTRICAL ENGINEERING MATERIALS

(Professional Elective-I)

III Year B.Tech. EEE I-Sem **L/T/P/C**
3 / 0 /0 /3

Prerequisites: Physics

Course Objectives:

- To impart the knowledge on Electrical Engineering materials Classification and their applications
- To know the performance characteristics of various Semiconducting, Dielectric & Insulation Materials

Course Outcomes:

On successful completion of this course, students are able to:

CO1: Impart the knowledge on electrical engineering materials classification and their applications.

CO2: Study the performance characteristics of various semiconducting, dielectric and insulation materials and their applications in design of electrical and electronic devices.

CO3: Identify various magnetic materials and their classification.

CO4: Learn various special purpose of materials.

CO5: Design various electronic components.

UNIT-I:

Classification of Materials: Introduction, Atomic Theory, inter atomic Bonds Conducting Materials: Introduction, Resistivity and factors affecting resistivity, Classification of Conducting materials into low-resistivity and high resistivity materials, Low Resistivity Materials and their Applications, Resistivity Materials and their applications, Superconducting Materials.

UNIT-II:

Semiconducting Materials: Introduction, The Atom, Conductors and Insulators, Semiconductors, Electron Energy and Energy Band Theory, Excitation of atoms, Insulators, Semiconductors and Conductors, Semiconductor Materials, Covalent Bonds, Intrinsic Semiconductors-Type Materials, P Type Materials, Majority and Minority Carriers, Semiconductors Materials, Applications of Semiconductor Materials.

UNIT-III:

Dielectric Materials: Introduction, Dielectric constant of Permittivity, Polarization, Dielectric Losses, Electric Conductivity of Dielectrics and their Break Down, Properties of Dielectrics, Applications of Dielectrics.

UNIT-IV:

Insulating Materials: Introduction, General properties of insulating materials, Classification, Properties, Insulating Gasses. **Magnetic Materials:** Introduction, Classification, Magnetization curve, Hysteresis, Eddy Currents, Curie point, Magnetostriction, Soft and Hard Magnetic materials.

UNIT-V:

Materials for special purposes: Introduction, Structural materials, Protective materials, Other Materials.
Electronic Components: Resistors, Capacitors, Inductors, Transformers.

Text books:

1. Electrical Engineering Materials by S.K.Bhattacharya, S.K.Kataria& Sons 1st edition

References:

1. "Electrical Engineering Materials by A.J.Dekker,PHI, 1970.

WEB RESOURCES:

https://youtu.be/m9l1tVXyFp8?si=xq8G0LYdetrRiM80

(B22MB01) BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

III Year B.Tech. EEE I-Sem

L	T	P	C
3	0	0	3

Course Objective: To learn the basic business types, impact of the economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

Course Outcome: The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.

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 and 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 Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function and 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, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition. **Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, 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, Elements of Financial Statements, Preparation of Final Accounts (Simple Problems).

UNIT - V:

Financial Ratios Analysis: Concept of Ratio Analysis, Importance and Types of Ratios, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

TEXT BOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.

REFERENCE BOOKS:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

(B22EE27) POWER ELECTRONICS LAB

III Year B.Tech. EEE I-Sem **L T P C**

0 0 2 1

Prerequisite: Power Electronics

Course Objectives:

- To apply the concepts of power electronic converters for efficient conversion
- To control power converters power flow from source to load.
- To Design the power converter with suitable switches meeting a specific load requirement.

Course Outcomes: At the end of this course, students will be able to:

CO1: Study Characteristics of various Power Semiconductor devices.
CO2: Analyze AC/AC and AC/DC Converters.
CO3: Analyze the behavior of various DC/DC and DC/AC converters.
CO4: Know the Simulation tools for analysing power electronics converters

List of Experiments

1. Study of Characteristics of SCR, MOSFET & IGBT,
2. Gate firing circuits for SCR's
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase half controlled & fully controlled bridge converter with R and RL loads
5. Single Phase dual converter with R and RL loads
6. Single Phase Cyclo-converter with R and RL loads
7. MOSFET based Step-down and Step-up Chopper.
8. Single Phase Bridge inverter with R and RL loads
9. Simulation of three phase fully controlled converter with R and RL loads, with and without freewheeling diode.
10. Simulation of single-phase Inverter with PWM control

TEXT BOOKS:

1. M. H. Rashid, Simulation of Electric and Electronic circuits using PSPICE – by M/s PHI Publications.
2. User's manual of related software's

REFERENCE BOOKS:

1. Reference guides of related software's
2. Rashid, Spice for power electronics and electric power, CRC Press

(B22EE28) CONTROL SYSTEMS LAB

III Year B.Tech. EEE I-Sem **L T P C**

0 0 2 1

Prerequisite: Control Systems

Course Objectives:

- Understand system representations like transfer function and state space, and assess system dynamic response.
- Evaluate system performance using both time and frequency domain analyses, identifying methods to enhance performance.
- Design controllers and compensators to improve system performance based on the assessments from time and frequency domain analyses.

Course Outcomes: At the end of this course, students will be able to:

CO1: Analyze the time & Frequency response of control systems
CO2: Identify the Performance of servo motor and synchros
CO3: Evaluate the performance of feedback control systems
CO4: Analyze the Stability of Linear Time Invariant systems.

List of experiments:

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions, and application of speed control of motor.
4. Effect of P, PD, PI, PID Controller on a second order systems
5. Transfer function of DC motor
6. Transfer function of DC generator
7. Characteristics of AC servo motor
8. Lag and lead compensation – Magnitude and phase plot
9. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using suitable software
10. State space model for classical transfer function using suitable software -Verification.

TEXT BOOKS:

1. M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education, 1997.
2. B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.

REFERENCE BOOKS:

1. K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991.
2. I. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009.

ADVANCED ENGLISH COMMUNICATION SKILLS LAB

III Year B.Tech. EEE I-Sem **L T P C**

0 0 2 1

1. INTRODUCTION:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

2. OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

3. SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **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.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/Technical report writing/* – planning for writing – improving one's writing.
4. **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.
5. **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.

4. MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCE BOOKS:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.

(B22MB06) INTELLECTUAL PROPERTY RIGHTS

III Year B.Tech. EEE I-Sem **L T P C**

3 0 0 0

Course Objectives:

- Significance of intellectual property and its protection
- Introduce various forms of intellectual property

Course Outcomes:

CO1: Distinguish and explain various forms of IPRs.
CO2: Identify criteria to fit one's own intellectual work in particular form of IPRs.
CO3: Apply statutory provisions to protect particular form of IPRs.
CO4: Appraise new developments in IPR laws at national and international level

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III

Law of copyrights: Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law; copyright law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copyright law, international patent law, and international development in trade secrets law.

TEXT BOOK:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

REFERENCE BOOK:

1. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

(B22EE56) CONCEPTS OF CONTROL SYSTEMS

(Open Elective-I)

III Year B.Tech. EEE II-Sem **L/T/P/C**
3/0/0 /3

Pre-Requisites:

Electrical Circuits-I
Electrical Circuits-
II Control Systems

Course Objectives:

This course is gives a knowledge of various function analysis phase-plane analysis Stability Analysis. Provides knowledge on formulating optimal control problem

Course Outcomes:

On successful completion of this course, students are able to:

CO1: Understand different non linearities and their describing functions.
CO2: Describe the methods of Phase-plane trajectory of nonlinear control systems.
CO3: Apply various theorems for stability analysis of linear and nonlinear systems.
CO4: Implement modal control and calculus of variations.
CO5: Formulate and solve optimal control problems.

UNIT – I:

Describing Function Analysis: Introduction to nonlinear systems, Types of nonlinearities, describing functions, describing function analysis of nonlinear control systems.

UNIT-II:

Phase-Plane Analysis: Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase-plane analysis of nonlinear control systems.

UNIT-III:

Stability Analysis: Stability in the sense of Lyapunov, Lyapunov's stability and Lyapunov's instability theorems. Direct method of Lyapunov for the Linear and Nonlinear continuous time autonomous systems.

UNIT – IV:

Modal Control: Effect of state feedback on controllability and observability, Design of State Feedback Control through Pole placement. Full order observer and reduced order observer. Calculus of Variations Minimization of functionals of single function, constrained minimization. Minimum principle. Control variable inequality constraints. Control and state variable inequality constraints. Euler Lagrangine Equation.

UNIT –V:

Optimal Control: Formulation of optimal control problem. Minimum time, Minimum energy, minimum fuel problems. State regulator problem. Output regulator problem. Tracking problem, Continuous-Time Linear Regulators.

Text books:

1. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition, 1996
2. Modern Control Engineering – by K. Ogata, Prentice Hall of India, 3rd edition, 1998

References:

1. Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd.
2. Digital Control and State Variable Methods – by M. Gopal, Tata Mc Graw-Hill Companies, 1997.
3. Systems and Control by Stainslaw H. Zak, Oxford Press, 2003.

(B22EE57) FUNDAMENTAL OF ELECTRIC VEHICLES

(Open Elective-I)

III Year B.Tech. EEE II-Sem **L/T/P/C**
3/0/0 /3

Pre-requisites: None; Interest in electric Vehicles

Course Objectives: To understand the fundamentals of Electric Vehicles (EVs), especially in Indian Context

- To examine technology associated with each element of EV drive-train;
- To get into the economics of EVs in India vis-à-vis petrol vehicles.

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

- Understand the fundamentals of Electric Vehicles.
- Design of batteries, EV motors and Power electronic controllers for EV systems.
- Analyze the economics of EV market and EV data using Analytical tools.

UNIT-I:

Introduction Overview of Electric Vehicles in India, India's EV program, Charging and Swapping Infrastructure, brief introduction of batteries, Lithium for batteries, EV Subsystems.

UNIT-II:

Vehicle Dynamics: Forces acting when a vehicle move, Aerodynamic drag, Rolling Resistance and Uphill Resistance, Power and Torque to accelerate. Drive Cycle: Concept of Drive Cycle, Drive Cycles and Energy used per km.

UNIT-III:

EV Powertrain: Design of EV Drive Train, Introduction to Battery Parameters, Why Lithium Ion Battery? Batteries in Future, Li-Ion Battery Cells, SoH and SoC estimation and Self Discharge, Battery Pack Development, Computation of Effective cost of battery, Charging Batteries. Fundamentals of EV Battery Pack design: Mechanical, Thermal and Electrical Design, BMS Design of Electric Vehicle.

UNIT-IV:

EV Motors and Controllers: Fundamentals and Design, Understanding Flow of Electricity, Magnetism and Heat, Power and Efficiency, Torque Production, Speed and Back EMF, the d-q Equivalent circuit, Field-oriented Control, Understanding Three phase AC and DC to AC conversion systems, Understanding the thermal design of the motors, Engineering Considerations, Future Frontiers.

UNIT-V:

EV Charging: Introduction, Slow or Fast EV Chargers, Battery Swapping, Standardization and On board Chargers, Public Chargers, Bulk Chargers/Swap Stations, Economics of Public Chargers in context, Analytics and Tools for EV systems.

TEXT BOOKS:

1. Electric Powertrain - Energy Systems, Power electronics and drives for Hybrid, electric and fuel cell vehicles by John G. Hayes and A. Goodarzi, Wiley Publication

2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004

3. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003

REFERENCE BOOKS:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003 R22 B.Tech. EEE Syllabus JNTU Hyderabad Page 90 of 134

2. Chris Mi, M. Abul Masrur, David Wenzhong Gao, Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives, John Wiley & Sons Ltd., 2011

3. Fundamentals of Electric Vehicles: technology and economics https://onlinecourses.nptel.ac.in/noc20_ee99/preview https://archive.nptel.ac.in/courses/108/106/108106170/

4. Link to EV101 course – https://www.pupilfirst.school/courses/641/curriculum Link to EV201

course**: https://www.pupilfirst.school/courses/643/curriculum**

(B22EE29) FLEXIBLE AC TRANSMISSION SYSTEMS
(Professional Elective-II)

III Year B.Tech. EEE II-Sem **L/T/P/C 3/0/0 /3**

Prerequisites: Power Electronics

Course Objectives:

- To know the concepts and types of FACTS controllers.
- To learn the above types of converters.
- To study the various compensation techniques.

Course Outcomes:

CO1: Understand various power electronics based FACTS devices for the control of active and reactive Power in the system

CO2: Compare current source converters with voltage source converters

CO3: Classify the FACTS devices into Thyristor based and Converter based and Understanding the dynamics of stability of voltage regulation using Shunt compensation.

CO4: Understand the SVC and STATCOM

CO5: Analyse Transient Stability Enhancement, Power Oscillation Damping, Transient Stability Margin Using series compensation

UNIT-I:

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

UNIT-II:

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

UNIT-III:

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

UNIT-IV:

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

UNIT-V:

Static Series Compensators: Concept of series capacitive compensation, improvement of transient stability, power oscillation damping, and functional requirements of GTO thyristor controlled series capacitor (GSC), thyristor switched series capacitor (TSSC), and thyristor controlled series capacitor (TCSC) Control schemes for GSC TSSC and TCSC.

TEXT BOOKS:

1. "Understanding FACTS Devices" N.G. Hingorani and L. Guygi. IEEE Press Publications 2000
2. "Flexible AC Transmission Systems" Sang, Y.H. and John, A.T., IEEE Press 2006.

REFERENCES:

1. "Thyristor Based FACTS Controllers for Electrical Transmission Systems", Mathur, R.M. and Verma, R.K., IEEE Press 2002.

WEB RESOURCES: https://archive.nptel.ac.in/courses/108/107/108107114/

(B22EE30) POWER SEMICONDUCTOR DRIVES

(Professional Elective-II)

III Year B.Tech. EEE II-Sem

L	T	P	C
3	0	0	3

Prerequisite: Power Electronics, Electrical Machines – I, Electrical Machines – II

Course Objectives:

- To introduce the drive system and operating modes of drive and its characteristics
- To understand Speed – Torque characteristics of different motor drives by various power converter topologies
- To appreciate the motoring and braking operations of drive and differentiate DC and AC drives

Course Outcomes: After completion of this course the student is able to

CO1: Identify the drawbacks of speed control of the motor by conventional methods.
CO2: Differentiate Phase controlled and chopper-controlled DC drives speed-torque characteristics merits and demerits
CO3: Understand AC motor drive speed–torque and performance characteristics using different control strategies, its merits and demerits.
CO4: Describe the Slip power recovery schemes
CO5: Analyze the speed control schemes for synchronous motor drives

UNIT-I:

Control of DC Motors: 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: Introduction to Four quadrant operation – Motoring operations, Electric Braking – Plugging, Dynamic, and Regenerative Braking operations. Four quadrant operation of D.C motors by single phase and three phase dual converters – Closed loop operation of DC motor (Block Diagram Only)

Control of DC Motors by Choppers: Single quadrant, two quadrant and four quadrant chopper fed dc separately excited and series motors – Continuous current operation – Output voltage and current wave forms – Speed and torque expressions – speed-torque characteristics – Problems on Chopper fed D.C Motors – Closed Loop operation (Block Diagram Only)

UNIT-III:

Control of Induction Motor Variable voltage characteristics-Control of Induction Motor by Ac Voltage Controllers – Waveforms – speed torque characteristics. Variable frequency 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 drives (Block Diagram Only)

UNIT-IV:

Rotor Side Control of Induction Motor : 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 and self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI, CSI and Cyclo-converters. Load commutated CSI fed Synchronous Motor – Operation– 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 based VSI & CSI.

TEXT BOOKS:

1. "G K Dubey", Fundamentals of Electric Drives, CRC Press, 2002.
2. "Vedam Subramanyam", Thyristor Control of Electric drives, Tata McGraw Hill Publications, 1987.

REFERENCE BOOKS:

1. "S K Pillai", A First course on Electrical Drives, New Age International (P) Ltd. 2nd Edition. 1989
2. "P. C. Sen", Thyristor DC Drives, Wiley-Blackwell, 1981
3. "B. K. Bose", Modern Power Electronics, and AC Drives, Pearson 2015.
4. "R. Krishnan", Electric motor drives - modelling, Analysis and control, Prentice Hall PTR, 2001

WEB RESOURCES:

1. https://archive.nptel.ac.in/courses/108/104/108104140/
2. https://nptel.ac.in/courses/108108077

(B22EC30) DIGITAL SIGNAL PROCESSING
(Professional Elective-II)

III Year B.Tech. EEE II-Sem **L T P C**
3 0 0 3

Prerequisite: Signals and Systems

Course Objectives:

1. To provide background and fundamental material for the analysis and processing of digital signals.
2. To understand the fast computation of DFT and appreciate the FFT processing.
3. To study the designs and structures of digital (IIR and FIR) filters and analyze and synthesize for a given specifications.
4. To acquaint in Multi-rate signal processing techniques and finite word length effects**.**

Course Outcomes: Upon completing this course, the student will be able to

CO1: Outline the properties of systems and signals
CO2: Identify the various important characteristics of different transform techniques used in digital signal processing.
CO3: Design IIR filters based on the specifications given
CO4: Design FIR filters for given specifications
CO5: Demonstrate different realizations of digital filters

UNIT - I

Introduction: Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Linear Shift Invariant Systems,Stability, and Causality, Frequency Domain Representation of Discrete Time Signals and Systems

Multirate Digital Signal Processing: Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion.

UNIT - II

Discrete Fourier transform: Fourier Transform, Laplace Transform and Z-Transform relation**,** Discrete Fourier Transform: Properties of Discrete Fourier Transform, Computation of DFT, Relation between DTFT, DFT and Z- Transform, Linear Convolution of Sequences: Over-Lap Add Method, Over-Lap Save Method.

Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

UNIT - III

IIR Digital Filters: Analog filter approximations – Butterworth, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

UNIT - IV

FIR Digital Filters: Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

UNIT - V

Realization of Digital Filters: Applications of Z – Transforms, Solution of Difference Equations ofDigital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

TEXT BOOKS:

1. A. V. Oppenheim and R.W. Schaffer - Discrete Time Signal Processing, PHI, 2009
2. John G. Proakis, Dimitris G. Manolakis - Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education / PHI, 2007.

REFERENCE BOOKS:

1. Li Tan - Digital Signal Processing – Fundamentals and Applications, Elsevier, 2008
2. Robert J. Schilling, Sandra L. Harris - Fundamentals of Digital Signal Processing using MATLAB, Thomson, 2007
3. S. Salivahanan, A. Vallavaraj and C. Gnanapriya - Digital Signal Processing, TMH, 2009
4. Emmanuel C. Ifeachor and Barrie W. Jervis - Digital Signal Processing - A Practical approach, 2nd Edition, Pearson Education, 2009

(B22EE31) ADVANCED CONTROL SYSTEMS

(PROFESSIONAL ELECTIVE-II)

III Year B.Tech. EEE II-Sem **L/T/P/C**
3/0/0 /3

Pre-Requisites:

Electrical Circuits-I
Electrical Circuits- II
Control Systems

Course Objectives:

- This course is gives a knowledge of various function analysis phase-plane analysis Stability Analysis.
- Provides knowledge on formulating optimal control problem

Course Outcomes:

On successful completion of this course, students are able to:

CO1: Understand different non linearities and their describing functions.

CO2: Describe the methods of Phase-plane trajectory of nonlinear control systems.

CO3: Apply various theorems for stability analysis of linear and nonlinear systems.

CO4: Implement modal control and calculus of variations.

CO5: Formulate and solve optimal control problems.

UNIT – I:

Describing Function Analysis: Introduction to nonlinear systems, Types of nonlinearities, describing functions, describing function analysis of nonlinear control systems.

UNIT-II:

Phase-Plane Analysis: Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase-plane analysis of nonlinear control systems.

UNIT-III:

Stability Analysis: Stability in the sense of Lyapunov, Lyapunov's stability and Lyapunov's instability theorems. Direct method of Lyapunov for the Linear and Nonlinear continuous time autonomous systems.

UNIT – IV:

Modal Control: Effect of state feedback on controllability and observability, Design of State Feedback Control through Pole placement. Full order observer and reduced order observer. Calculus of Variations Minimization of functional of single function, constrained minimization. Minimum principle. Control variable inequality constraints. Control and state variable inequality constraints. Euler Lagrangine Equation.

UNIT –V:

Optimal Control: Formulation of optimal control problem. Minimum time, Minimum energy, minimum fuel problems. State regulator problem. Output regulator problem. Tracking problem, Continuous-Time Linear Regulators.

TEXT BOOKS:

1. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition, 1996
2. Modern Control Engineering – by K. Ogata, Prentice Hall of India, 3rd edition, 1998

REFERENCES:

1. Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd.
2. Digital Control and State Variable Methods – by M. Gopal, Tata Mc Graw-Hill Companies, 1997.
3. Systems and Control by Stainslaw H. Zak, Oxford Press, 2003.

(B22EC36) MICROPROCESSORS & MICROCONTROLLERS

III Year B.Tech. EEE II-Sem **L T P C**

3 0 0 3

Prerequisite: Programming, Digital Electronics

Course Objectives:

- To develop an understanding of the operations of microprocessors and micro controllers
- To understand machine language programming and interfacing techniques.
- To gain knowledge about input output and memory systems.

Course Outcomes: At the end of this course, students will be able to:

CO1: Understand the internal architecture and organization of 8086.
CO2: Understand the interfacing techniques to 8086 and 8051.
CO3: Understand the communication standards and interfacing with microcontroller.
CO4: Understand the internal architecture of 8051 microcontroller.
CO5: Develop assembly language programming to design microprocessor/ micro controller-Based systems.

UNIT-I:

8086 Architecture-Pin diagram, Register Organization, Memory Segmentation, Programming Model, Modes of operation, Timing diagrams, Memory addresses, Physical Memory Organization, interrupts of 8086.

Instruction Set And Assembly Language Programming Of 8086: Instruction formats, addressing modes, Instruction Set, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations, Software Debugging tools, MDS.

UNIT-II:

I/O Interface: 8255 PPI, Various modes of operations and interface of I/O devices to 8086, A/D, D/A Converter Interfacing.

Interfacing With Advanced Devices: 8086 System bus structure, Memory and I/O Interfacing with 8086, Interfacing through various IC Peripheral Chips, 8257 (DMA Controller), 8259 (Interrupt Priority Control).

UNIT-III:

Communication Interface: Serial Communication Standards, USART Interfacing RS-232, IEEE-488, 20mA Current Loop, Prototyping and Troubleshooting,

UNIT-IV:

Introduction To Micro Controllers: Overview of 8051 Micro Controller, Architecture, I/O ports and Memory Organization, addressing modes and Instruction set of 8051, Simple Programs using Stack Pointer, Assembly language programming of 8051

Interrupts Communication: Interrupts - Timer/Counter and Serial Communication, Interrupt Priority in the 8051, Programming of 8051- Timers, Counters and Interrupts.

UNIT-V:

Interfacing And Industrial Applications: Applications of Micro Controllers, Interfacing 8051 to LED's, Keyboard Interfacing, Interfacing Seven Segment Display, ADC and DAC Interfacing, Stepper Motor Interfacing.

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, MHE, 2nd Edition 2006.
2. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed.

REFERENCE BOOKS:

1. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012
2. Microprocessors and Interfacing, D. V. Hall, MGH, 2nd Edition 2006.
3. Introduction to Embedded Systems, Shibu K.V, MHE, 2009
4. The 8051 Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.

(B22EE32) POWER SYSTEM PROTECTION

III Year B.Tech. EEE II-Sem **L T P C**

3 0 0 3

Pre-requisites: Power Systems-I, Power Systems-II

Course Objectives:

- To introduce all kinds of circuit breakers and relays for protection of generators, transformers, and feeder bus bars from overvoltages and other hazards.
- To describe neutral grounding for overall protection.
- To understand the phenomenon of overvoltages and their classification.

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

CO1: Ability to comprehend the fundamental requirements for power system protection, the consequences of faults, and the workings of a basic relay.
CO2: Be able to sketch performance characteristics and prevent faults with distance relays and over-current protective schemes.
CO3: Capable of implementing bus zone protection, AC machines, and pilot relay schemes.
CO4: Competent in controlling both microprocessors and static relays for transmission systems.
CO5: Possessing knowledge of the quenching processes utilized in vacuum, oil, and air circuit breakers.

UNTI-I:

Protective Relays: Introduction, Need for power system protection, effects of faults, evolution of protective relays, zones of protection, primary and backup protection, essential qualities of protection, classification of protective relays and schemes, current transformers, potential transformers, basic relay terminology.
Operating Principles and Relay Construction: Electromagnetic relays, thermal relays, static relays, microprocessor based protective relays.

UNTI-II:

Over-Current Protection: Time-current characteristics, current setting, over current protective schemes, directional relay, protection of parallel feeders, protection of ring mains, Phase fault and earth fault protection, Combined earth fault and phase fault protective scheme, Directional earth fault relay.
Distance Protection: Impedance relay, reactance relay, MHO relay, input quantities for various types of distance relays, Effect of arc resistance, Effect of power swings, effect of line length and source impedance on the performance of distance relays, selection of distance relays, MHO relay with blinders, Reduction of measuring units, switched distance schemes, auto re-closing.

UNTI-III:

Pilot Relaying Schemes: Wire Pilot protection, Carrier current protection. AC Machines and Bus Zone Protection: Protection of Generators, Protection of transformers, Bus- zone protection, frame leakage protection.

UNTI-IV:

Static Relays: Amplitude and Phase comparators, Duality between AC and PC, Static amplitude comparator, integrating and instantaneous comparators, static phase comparators, coincidence type of phase comparator, static over current relays, static directional relay, static differential relay, static distance relays, Multi input comparators, concept of Quadrilateral and Elliptical relay characteristics.
Microprocessor Based Relays: Advantages, over current relays, directional relays, distance relays.

UNTI-V:

Circuit Breakers: Introduction, arcing in circuit breakers, arc interruption theories, re-striking and recovery voltage, resistance switching, current chopping, interruption of capacitive current, oil circuit breaker, air blast circuit breakers, SF6 circuit breaker, operating mechanism, selection of circuit breakers, high voltage DC breakers, ratings of circuit breakers, testing of circuit breakers.
Fuses: Introduction, fuse characteristics, types of fuses, application of HRC fuses, discrimination.

TEXT BOOKS:

1. Badriram and D.N. Vishwakarma, Power System Protection and Switchgear, TMH 2001.
2. U. A. Bakshi, M. V. Bakshi: Switchgear and Protection, Technical Publications, 2009.

REFERENCE BOOKS:

1. C. Russel Mason – "The art and science of protective relaying, Wiley Eastern, 1995
2. L. P. Singh "Protective relaying from Electromechanical to Microprocessors", New Age International

WEBLINKS:

1. https://nptel.ac.in/courses/108/105/108105167/
2. https://nptel.ac.in/courses/108/107/108107167/
3. https://nptel.ac.in/courses/117/107/117107148/

(B22EE33) POWER SYSTEM OPERATION AND CONTROL

III Year B.Tech. EEE II-Sem

L	T	P	C
3	0	0	3

Pre-requisites: Power System-I, Power System-II

Course Objectives:

- Understand the principles and significance of real power control, emphasizing the importance of frequency control in power systems.
- Analyze various methods for effective reactive power control in power systems.
- Grasp the concepts of unit commitment, economic load dispatch, and real-time control, highlighting their importance in power system operation.

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

CO1: Calculate various parameters at different buses using load flow studies.
CO2: Analyse economic operation of the power system.
CO3: Analyse load frequency control of Single area and Two area power systems.
CO4: Understand the Stability of the power system and Apply different techniques to maintain the stability of power system
CO5: interpret the factors involved in load dispatch

UNIT-I:
Load Flow Studies: Introduction, Bus classification -Nodal admittance matrix - Load flow equations - Iterative methods - Gauss and Gauss Seidel Methods, Newton-Raphson Method-Fast Decoupled Method-Merits and demerits of the above methods-System data for load flow study

UNIT-II: Economic Operation Of Power Systems: Distribution of load between units within a plant-Transmission loss as a function of plant generation, Calculation of loss coefficients-Distribution of load between plants.

UNIT-III:
PF Control: Introduction, load frequency problem-Megawatt frequency (or P-f) control channel, MVAR voltages (or Q-V) control channel-Dynamic interaction between P-f and Q-V loops. Mathematical model of speed-governing system-Turbine models, division of power system into control areas, P-f control of single control area (the uncontrolled and controlled cases)-P-f control of two area systems (the uncontrolled cases and controlled cases).

UNIT-IV:
Power System Stability: The stability problem-Steady state stability, transient stability and Dynamic Stability-Swing equation. Equal area criterion of stability-Applications of Equal area criterion, Step by step solution of swing equation-Factors affecting transient stability, Methods to improve steady state and Transient stability, Introduction to voltage stability

UNIT-V:
Computer Control of Power Systems: Need of computer control of power systems. Concept of energy control centre (or) load dispatch centre and the functions - system monitoring - data acquisition and control. System hardware configuration – SCADA and EMS functions. Network topology – Importance of Load Forecasting and simple techniques of forecasting.

TEXT BOOKS:

1. C. L. Wadhwa, Electrical Power Systems, 3rd Edn, New Age International Publishing Co., 2001.
2. D. P. Kothari and I. J. Nagrath, Modern Power System Analysis, 4th Edn, Tata McGraw Hill Education Private Limited 2011.

REFERENCE BOOKS:

1. D. P. Kothari: Modern Power System Analysis-Tata Mc Graw Hill Pub. Co. 2003.
2. Hadi Sadat: Power System Analysis –Tata Mc Graw Hill Pub. Co. 2002.

Web Resources

https://archive.nptel.ac.in/courses/108/101/108101040/
https://onlinecourses.nptel.ac.in/noc23_ee128/preview
https://archive.nptel.ac.in/courses/108/104/108104052/#

(B22EE34) POWER SYSTEM LAB

III Year B.Tech. EEE II-Sem **L T P C**

0 0 2 1

Prerequisite: Power System-I, Power System-II, Power System Protection, Power System Operation and Control, Electrical Machines

Course Objectives:

- To perform testing of CT, PT's and Insulator strings
- To find sequence impedances of 3-Φ synchronous machine and Transformer
- To perform fault analysis on Transmission line models and Generators.

Course Outcomes: At the end of this course, students will be able to

CO1: Capable of understanding the basic transmission line parameters and protection schemes.
CO2: Be able to find the different relay characteristics for the transmission system.
CO3: Capable of understanding the effects of faults in power systems.
CO4: Capable of simulating the YBUS and ZBUS and performing the load flow analysis.

List of experiments:

1. Performance and testing of Transmission Line Model
2. Performance and testing of Feeder protection system
3. Finding the sequence impedances of 3-Φ Transformer.
4. Differential protection of 1-Φ transformer.
5. Characteristics of Static Negative Sequence Relay
6. Characteristics of IDMT Over-Current Relay
7. Characteristics of Microprocessor based Over Voltage/Under Voltage relay.
8. Fault analysis of an Alternator- Line to Ground Fault and Line to Line Fault.
9. Formation of Y_{BUS} & Z_{BUS} using any open source simulation tool.
10. Load Flow Analysis using Gauss Seidel (GS) Method using any open source simulation tool.

TEXT BOOKS:

1. C.L. Wadhwa: Electrical Power Systems –Third Edition, New Age International Pub. Co., 2001.
2. Hadi Sadat: Power System Analysis –Tata Mc Graw Hill Pub. Co. 2002.

REFERENCE BOOK:

1. D. P. Kothari: Modern Power System Analysis-Tata Mc Graw Hill Pub. Co. 2003.

(B22EC37) MICROPROCESSORS & MICROCONTROLLERS LAB

III Year B.Tech. EEE II-Sem **L T P C**

0 0 2 1

Prerequisites: Digital Electronics, Microprocessors and Microcontrollers

Course Objectives:

- To develop an understanding of the operations of microprocessors and micro controllers;
- To develop assembly language programming to perform various applications.
- To understand the interfacing of various external devices to the processor and controllers.

Course Outcomes: At the end of this course, students will be able to:

CO1: Understands the internal architecture and organization of 8086, 8051 and ARM processors/controllers.
CO2: Understands the interfacing techniques of 8086 and 8051.
CO3: Develop assembly language programming to design microprocessor/ micro controller-based systems.
CO4: Develop programs for interfacing various external devices.

The following programs/experiments are to be written for assembler and to be executed the same with 8086 and 8051 kits.

List of Experiments:

1. Programs for 16-bit arithmetic operations 8086(using various addressing modes)
2. Programs for sorting an array for 8086.
3. Programs for searching for a number of characters in a string for 8086.
4. Programs for string manipulation for 8086.
5. Programs for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessor kits using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
10. Programming using arithmetic, logical and bit manipulation instructions of 8051.
11. Program and verify Timer/Counter in 8051.
12. Program and verify interrupt handling in 8051.
13. UART operation in 8051.
14. Communication between 8051 kit and PC
15. Interfacing LCD to 8051
16. Interfacing Matrix/Keyboard to 8051
17. Data transfer from peripheral to memory through DMA controller 8237/8257

(B22EE35) ELECTRONICS DESIGN LAB

III Year B.Tech. EEE II-Sem **L T P C**

0 0 2 1

Prerequisites: Electrical Circuits, Power Electronics.

Course Objectives:

- Design of linear regulated power supplies
- Development of analog control boards for power converter applications

Course Outcomes: On successful completion of this course, students are able to:

CO1: Design the various regulated power supplies for control boards.

CO2: Gain knowledge on designing various triggering circuits for semiconductor devices.

CO3: Develop timer circuits for power switching devices

CO4: Develop PWM control and gate driver circuits for various power electronic converter applications.

CO5: Develop the zero-crossing detector.

List of Experiments:

1. Design of fixed unipolar linear regulated power supply.
2. Design of adjustable unipolar linear regulated power supply.
3. Design of fixed bipolar linear regulated power supply.
4. Design of Resistance-Capacitance triggering circuit for SCR.
5. Design of UJT triggering circuit for SCR.
6. Design of pulse generation for buck/boost converter by using 555 TIMER.
7. Design of an Astable Multivibrator using IC555.
8. Design of isolated driver circuit for MOSFET/IGBT triggering.
9. Generation of sinusoidal pulse width modulation with linear ICs.
10. Design of Zero crossing Detector.

(B22EE36) Industry Oriented Mini Project/Internship

(B22CH03) ENVIRONMENTAL SCIENCE

III Year B.Tech. EEE II-Sem **L T P C**
3 0 0 0

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations.

Course Outcomes: Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT - I

Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT - III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).
Towards Sustainable Future: Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

(B22EE37) POWER ELECTRONIC APPLICATIONS TO RENEWABLE ENERGY SYSTEMS

IV Year B.Tech. EEE I-Sem

L	T	P	C
3	1	0	4

Prerequisite: Power Electronics, Renewable Energy Sources

Course Objectives:

- To impart knowledge on different types of renewable energy systems.
- To analyze the operation of electrical generators used for the wind energy conversion Systems.
- To know the operation of power converters and PV systems operation.

Course Outcomes: At the end of this course, students will be able to:

CO1: Proficiently demonstrate various renewable energy technologies utilized for electrical power generation.
CO2: Identify suitable converters (AC-DC, DC-DC, AC-AC) for renewable energy systems.
CO3: Analyze the operating principles of different types of wind generators
CO4: Model and control of a PMSM, Doubly fed Induction Generator, WECS
CO4: Interpret and analyze various wind and photovoltaic (PV) systems, including stand-alone, grid- connected, and hybrid configurations.

UNIT- I:

Solar cell characteristics and their measurement, PV Module, PV array, Partial shading of a solar cell and a module, the diode, Power conditioning unit, maximum power point tracker, Implementation of Perturb and Observe Method, Incremental Conductance Method, Battery charger/discharge controller.

UNIT- II:

Centralized Inverters, String Inverters, Multi-string Inverters, Module Integrated Inverter/Micro-inverters, Inverter Topology, Model of Inverter, Sizing Batteries and Inverters for a Solar PV System.
Types of PV Systems: Grid-Connected Solar PV System, Stand-Alone Solar PV System.

UNIT- III:

Introduction to wind: Characteristics, Wind Turbine, Fixed and Variable-Speed Wind Turbines, Components of WECS, Description of Components, Types of Wind Turbine Generators, Economics of Wind Energy Conversion Systems, Linking Wind Turbines onto the Grid, Power Converter Topologies for Wind Turbine Generators.

UNIT- IV:

Modeling of Permanent Magnet Synchronous Generators, Doubly Fed Induction Generators, Squirrel cage Induction Generators wind turbine, Control of Power converters for WECS.

UNIT - V:

Hybrid Energy Systems, Need for Hybrid Energy Systems, Range and types of Hybrid systems, Hybrid Solar PV/Wind Energy System, Architecture of Solar-Wind Hybrid System and Grid connected issues.

TEXTBOOKS:

1. S. N. Bhadra, D. Kastha, S. Banerjee, “Wind Electrical Systems”, Oxford University Press, 2005.
2. S. N. Bhadra, D. Kastha, & S. Banerjee “Wind Electrical Systems”, Oxford University Press, 2009.
3. Rashid. M. H, “Power Electronics Hand book”, Academic Press, 2001.

REFERENCE BOOKS:

1. Rai. G. D, “Non- conventional energy sources”, Khanna Publishers, 1993.
2. Rai. G.D,” Solar energy utilization”, Khanna Publishes, 1993.
3. Gray, L. Johnson, “Wind energy system”, Prentice Hall of India, 1995.
4. B.H.Khan "Non-conventional Energy sources", Mc Graw-hill, 2nd Edition, 2009

(B22EE58) ELECTRIC POWER UTILIZATION & SAFETY

(Open Elective-II)

IV Year B.Tech. EEE I-Sem **L/T/P/C**
3/ 0/ 0/ 3

Prerequisites: None

Course Objectives:

- To provide information of importance various parameters in electrical system.
- To analyze and design illumination scheme, electrification, earthing system and protection systemfor an application.

Course outcomes: On successful completion of this course, students are able to:

CO1: Know about the electric heating and welding
CO2: Gain the knowledge on illumination system.
CO3: Understand the electrical installation, estimation and costing.
CO4: Understand the importance of power factor.
CO5: Gain the knowledge on safety and protection.

UNIT-I:

Electric Heating and Welding Advantages of electric heating, resistance heating, types of furnaces,induction heating, types of induction furnaces, dielectric heating, types of welding- arc and resistance

UNIT-II:

Illumination Scheme Basic terms used in illumination scheme, Electric lamps, Recommended levels of illumination, types of lighting schemes, design of lighting schemes, factory lighting, street lighting, flood lighting

UNIT-III:

Electrical Installation, Estimating and Costing Types of loads, Load assessment, Electrical supply systems, wiring systems, Permissible voltage drops and conductor size calculations, Estimating and costing for residential and commercial service connections (single phase and three phase)

UNIT-IV:

Power Factor Effects of power factor, causes of low power factor, disadvantages of low power factor, methods of improving power factor, most economical power factor.

UNIT-V:

Electrical Safety, Earthing System and Protective Devices Electrical shock mechanisms, factors influencing the electric shock, body current thresholds (tolerable body current limit), thevenin's concepts and accidental equivalent circuits (step and touch potentials), protection against electric shock, purpose of earthing, IS rules for earthing of electrical installations, factors governing the resistance of earth electrode, methods of earthing, measurement of earth resistance, methods of reducing earth resistance, fuse, miniature circuit breakers (MCB) and earth leakage circuit breakers (ELCB).

Text Books:

1. E. Openshaw Taylor, Utilisation of Electrical Energy, Universities Press.
2. H. Partab, Art and Science of Utilisation of Electrical Energy, Dhanpat Rai & Co.
3. J. B. Gupta, Utilization of Electric Power and Electric Traction, S. K. Kataria & Sons, New Delhi.
4. G. C. Garg, Utilization of Electric Power and Electric Traction, Khanna Publishers, Delhi.
5. R. K. Rajput, Utilisation of Electrical Power, Laxmi Publications (P) Ltd., New Delhi.

References:

1. N. V. Suyranarayana, Utilisation of Electric Power Including Electric Drives and ElectricTraction,NewAge Publishers, New Delhi.
2. J. B. Gupta, A Course in Electrical Installation Estimating and Costing, S. K. Kataria & Sons, NewDelhi.
3. Dr. J. G. Jamnani, Elements of Electrical Design, Mahajan Publishing House

(B22EE59) ENERGY STORAGE SYSTEMS

(Open Elective-II)

IV Year B.Tech. EEE I-Sem **L T P C**
3 0 0 3

Course Objectives: to prepare the students to

- To introduce generalized storage techniques and analyze the different features of storage
- systems To know the management and applications of energy storage technologies
- To know about electrical energy storage market potential by different forecasting methods

Course Outcomes:

At the end of this course, students will be able to:

- Understand the role of electrical energy storage technologies in electricity usage
- Know the behavior and features and applications of energy storage system
- Understand the hierarchy, demand for energy storage and valuation techniques.

UNIT- I:

The Roles Of Electrical Energy Storage Technologies In Electricity Use: Characteristics of electricity, Electricity and the roles of EES, 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 cable, Emerging needs for EES, More renewable energy, less fossil fuel, Smart Grid uses, The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

UNIT- II:

Types And Features Of Energy Storage Systems: Classification of EES systems, Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES), Electrochemical storage systems, Secondary batteries, Lead-Acid Batteries, Lithium-Ion Batteries, Flow batteries, Other Batteries in Development, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG), Electrical storage systems, Double-layer capacitors (DLC), Superconducting magnetic energy storage (SMES),Thermal storage systems, Standards for EES, Technical comparison of EES technologies.

UNIT- III:

Applications Of EES: Present status of applications, Utility use (conventional power generation, grid operation & service), Consumer use (uninterruptable power supply for large consumers), EES installed capacity worldwide, new trends in applications, Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles,

UNIT- IV:

Management And Control Hierarchy Of EES: 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. Demand For Energy Storage: Growth in Variable Energy Resources, Relationship between balancing services and variable energy resources, Energy Storage Alternatives, Variable Generator Control, Demand Management, Market Mechanisms, and Longer-Term Outlook. Valuation Techniques: Overview, Energy Storage Operational Optimization, Market Price Method, Power System Dispatch Model Method, Ancillary Service Representation, Energy Storage Representation, Survey of Valuation Results.

UNIT-V:

Forecast Of EES Market Potential By 2030: EES market potential for overall applications, EES market estimation by Sandia National Laboratory (SNL), EES market estimation by the Boston Consulting Group (BCG), EES market estimation for Li-ion batteries by the Panasonic Group, EES market potential estimation for broad introduction of renewable energies, EES market potential estimation for Germany by Fraunhofer, Storage of large amounts of energy in gas grids, EES market potential estimation for Europe by Siemens, EES market potential estimation by the IEA, Vehicle to grid concept, EES market potential in the future.

TEXT BOOKS:

1. Power System Energy Storage Technologies, 1st Edition by Paul Breeze, Academic Press
2. Energy Storage: Systems and Components, by Alfred Rufer, CRC Press, 2017

REFERENCE BOOKS:

1. Energy Storage Fundamentals, Materials and Applications, by Huggins and Robert, Springer.
2. www.ecofys.com/com/publications

(B22EE38) ADVANCED POWER ELECTRONICS

(Professional Elective-III)

IV Year B.Tech. EEE I-Sem **L T P C**
3 0 0 3

Prerequisites: Power Electronics

Course Objectives:

- To introduce advanced power semiconductor switching devices.
- To study the resonant converters and multilevel converters.

Course Outcomes:

On successful completion of this course, students are able to:

CO1: Classify driver circuits for various power semiconductor devices.

CO2: Analyze the operation of multi-pulse converters.

CO3: Understand the operation of resonant converters.

CO4: Know the differences between VSI and CSI.

CO5: Gain knowledge on the operation of multilevel inverters.

UNIT-I:

Gate Driver circuits for power semiconductor devices: IGBT, MOSFET, IGCT, GTO and their driver circuits

UNIT-II:

Multi-Pulse Converters: Three-phase converters, effect of load and source impedances; Dual converter, multi-pulse converters, transformer utilization; Multi-pulse converters using delta/ zigzag/ Polygon transformers, analysis.

UNIT-III:

Resonant Converters: Need of resonant converters, Classification of resonant converters, load resonant converters, Resonant switch converters, zero voltage switching dc-dc converters, zero current switching dc-dc converters.

UNIT-IV:

DC-AC Converters: Review of three-phase voltage source inverters, voltage and frequency control. Harmonic reduction techniques, PWM inverters, Space Vector Modulation. Current source inverters.

UNIT-V:

Multilevel Inverters: Multi-level inverters, advantages, configurations: Diode clamped, flying capacitor and cascade multilevel inverters, applications.

TEXT BOOKS:

1. M. H. Rashid, “Power electronics: circuits, devices, and applications”, Pearson Education India,2009.
2. N. Mohan and T. M. Undeland, “Power Electronics: Converters, Applications and Design”, John Wiley & Sons, 2007.

REFERENCES:

1. R. W. Erickson and D. Maksimovic, “Fundamentals of Power Electronics”, Springer Science & Business Media, 2007
2. Daniel W. Hart “Power Electronics”, Tata McGraw-Hill Education, 2011.
3. Bin Wu “High-Power Converters and AC Drives”, Wiley IEEE-Press,2005
4. L.Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.
5. M.D. Singh & K.B. Kanchandhani “Power Electronics”, Tata Mc Graw Hill, 2017.

(B22EE39) HVDC TRANSMISSION
(Professional Elective-III)

IV Year B.Tech. EEE I-Sem

L	T	P	C
3	0	0	3

Prerequisite: Power System-I, Power System-II, Power System Protection, Power System Operation and Control, Power Electronics

Course Objectives:

- To compare EHV AC and HVDC and understand Graetz circuit with 6 and 12 pulse operation
- To control HVDC systems with various methods and to perform power flow analysis in AC/DC systems
- To describe various protection methods for HVDC systems and Harmonics

Course Outcomes: At the end of this course, students will be able to:

CO1: Compare EHV AC and HVDC systems and to describe various types of DC links
CO2: Analyze various control methodologies and characteristics of converters.
CO3: Perform power flow analysis in ac/dc systems
CO4: Study and understand the nature of faults happening on both the AC and DC sides of the converters and Formulate protection schemes for the same.
CO5: Design the harmonics reduction filters for HVDC transmission

UNIT- I

Basic Concepts Necessity of HVDC systems, Economics and Terminal equipment of HVDC transmission systems, Types of HVDC Links, Apparatus required for HVDC Systems, Comparison of AC and DC Transmission, Application of DC Transmission System, Planning and Modern trends in D.C. Transmission.

Analysis of HVDC Converters: Choice of Converter Configuration, Analysis of Graetz circuit, Characteristics of 6 Pulse and 12 Pulse converters, Cases of two 3 phase converters in Y/Y mode – their performance.

UNIT- II

Converter and HVDC System Control: Principle of DC Link Control, Converters Control Characteristics, Firing angle control, Current and extinction angle control, Effect of source inductance on the system, Starting and stopping of DC link, Power Control.

Reactive Power Control in HVDC: Introduction, Reactive Power Requirements in steady state, sources of reactive power- Static VAR Compensators, Reactive power control during transients.

UNIT- III

Power Flow Analysis in AC/DC Systems: Modelling of DC Links, DC Network, DC Converter, Controller Equations, Solution of DC load flow, P.U. System for DC quantities, solution of AC-DC Power flow-Simultaneous Method-Sequential method.

UNIT- IV

Converter Faults and Protection: Converter faults, protection against over current and over voltage in converter station, surge arresters, smoothing reactors, DC breakers, Audible noise, space charge field, corona effects on DC lines, Radio interference.

UNIT-V:

Harmonics: Generation of Harmonics, Characteristics harmonics, calculation of AC Harmonics, Non-Characteristics harmonics, adverse effects of harmonics, Calculation of voltage and Current harmonics, Effect of Pulse number on harmonics

Filters: Types of AC filters, Design of Single tuned filters –Design of High pass filters.

TEXT BOOKS:

1. "K. R. Padiyar", HVDC Power Transmission Systems: Technology and system Interactions, New Age International (P) Limited, and Publishers, 1990.
2. "S K Kamakshaiah, V Kamaraju", HVDC Transmission, TMH Publishers, 2011

REFERENCE BOOKS:

1. "S. Rao", EHVAC and HVDC Transmission Engineering and Practice, Khanna publications, 3rd Edition 1999.
2. "Jos Arrillaga", HVDC Transmission, The institution of electrical engineers, IEE power & energy series 29, 2nd edition 1998.
3. "E. W. Kimbark", Direct Current Transmission, John Wiley and Sons, volume 1, 1971.
4. "E. Uhlmann", Power Transmission by Direct Current, B. S. Publications, 2009

WEB RESOURCES:

https://nptel.ac.in/courses/108104013
https://archive.nptel.ac.in/courses/108/106/108106160/

(B22EE40) ELECTRIC AND HYBRID VEHICLES
(Professional Elective-III)

IV Year B.Tech. EEE I-Sem **L T P C**
3 0 0 3

Prerequisite: Power Semiconductor Drives, Electrical Drives and Control, Utilization of Electric Energy

Course Objectives:

- To understand the fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
- To know the various aspects of hybrid and electric drive train such as their configuration
- To have a knowledge on types of electric machines that can be used energy storage devices, etc.

Course Outcomes: At the end of this course, students will be able to :

CO1: Understand the models to describe hybrid vehicles and their performance.
CO2: Understand the social and environmental importance of electric and hybrid vehicles.
CO3: Understand the various configurations of Electric Drive Trains.
CO4: Understand the different strategies related to energy storage systems.
CO5: Understand the different strategies of energy management systems and case studies.

UNIT- I:

Introduction: Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

UNIT- II:

Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

Hybrid Electric Drive-Trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT- III:

Electric Trains: Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

Electric Propulsion Unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT- IV:

Energy Storage: Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems

UNIT- V:

Energy Management Strategies: Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

TEXT BOOKS:

1. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.

REFERENCE BOOKS:

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
2. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.

WEB RESOURCES:

1. **https://archive.nptel.ac.in/courses/108/103/108103009/**
2. **https://nptel.ac.in/courses/108106170**

(B22EE41) UTILIZATION OF ELECTRICAL ENERGY

(Professional Elective-III)

III Year B.Tech. EEE II-Sem

L	T	P	C
3	0	0	3

Pre-requisites: Electrical Machines-I and Electrical Machines-II

Course Objectives: Objectives of this course are

- To understand the fundamentals of illumination and good lighting practices
- To understand the methods of electric heating and welding.
- To understand the concepts of electric drives and their application to electrical traction systems.

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

CO1: Understand basic principles of electric heating
CO2: Understand basic principles of electric welding
CO3: Determine the lighting requirements for flood lighting, household and industrial needs.
CO4: Calculate heat developed in induction furnace and evaluate speed time curves for traction
CO5: Analyze the coach wiring

UNIT-I:

Electrical Heating: Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating.

UNIT-II:

Electric Welding: Electric welding equipment, resistance welding and arc welding, comparison between AC and DC welding. Electrolysis process: principle of electrolysis, electroplating, metal extraction and metal processing, electromagnetic stirs.

UNIT-III:

Illumination: Terminology, Laws of illumination, coefficient of Utilization and depreciation, Polar curves, Photometry, integrating sphere, sources of light, fluorescent lamps, compact fluorescent lamps, LED lamps discharge lamps, mercury vapor lamps, sodium vapor lamps and neon lamps, comparison between tungsten filament lamps and fluorescent tubes. Basic principles of light control, Types and design of lighting scheme, lighting calculations, factory lighting, street lighting and flood lighting.

UNIT-IV:

Electric Traction: Systems of electric traction and track electrification- DC system, single phase and 3-phase low frequency and high frequency system, composite system, kando system, comparison between AC and DC systems, problems of single-phase traction with current unbalance and voltage unbalance. Mechanics of traction movement, speed – time curves for different services, trapezoidal and quadrilateral speed – time curves, tractive effort, power, specific energy consumption, effect of varying acceleration and braking, retardation, adhesive weight and braking retardation, coefficient of adhesion.

UNIT-V:

Systems of Train Lighting: special requirements of train lighting, methods of obtaining unidirectional polarity constant output- single battery system, Double battery parallel block system, coach wiring, lighting by making use of 25KV AC supply.

TEXT BOOKS:

1. H. Partab: Modern Electric Traction, Dhanpat Rai & Co, 2007.
2. E. Openshaw Taylor: Utilisation of Electric Energy, Orient Longman, 2010.

REFERENCE BOOKS:

1. H. Partab: Art & Science of Utilization of Electric Energy, Dhanpat Rai & Sons, 1998.
2. N.V. Suryanarayana: Utilization of Electrical power including Electric drives and Electric Traction, New Age Publishers, 1997.

(B22EE42) ADVANCED ELECTRICAL DRIVES

(Professional Elective-IV)

IV Year B.Tech. EEE I-Sem **L/T/P/C 3/0/0 /3**

Prerequisite:

Electrical Machines-I, II & III, Power Electronics

Course Objectives:

- To introduce three phase converter fed DC motor drives.
- To provide knowledge on scalar and vector control of induction motor, PMSM and BLDC drives.

Course Outcomes:

On successful completion of this course, students are able to:

CO1: Analyse the operation of three phase converter fed dc motors.

CO2: Describe the VSI and CSI fed induction motor operation.

CO3: Know the concept of vector control of induction motor drive.

CO4: Understand the concept of direct torque control for three phase induction motor.

CO5: Gain knowledge on vector control of PMSM drives and introduction to BLDC drives

UNIT-I:

Three Phase Converter Fed DC Motor Drives: Three-phase half and fully controlled converter fed separately excited and series DC motor drive – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics (Continuous conduction mode only).

UNIT-II:

VSI and CSI Fed Induction Motor Control: AC voltage controller fed induction machine operation– Energy conservation issues – V/f operation theory – requirement for slip and stator voltage compensation. CSI fed induction machine – Operation and characteristics - PWM controls.

UNIT-III:

Vector Control of Induction Motor drives: Field oriented control of induction machines – Theory – DC drive analogy – Direct or Feedback vector control - Indirect or Feed forward vector control – Flux vector estimation - Space Vector Modulation control.

UNIT-IV:

Direct Torque Control of Induction Motor drives: Direct torque control of Induction Machines – Torque expression with stator and rotor fluxes, DTC control strategy – optimum switching vector selection – reduction of torque ripple methods.

UNIT-V:

Vector control of PMSM drives: Types of PM Synchronous motors - Torque developed by PMSM - Implementation of vector control for PMSM – introduction to BLDC drives

Text Books:

1. G. K. Dubey, “Power Semiconductor Controlled Drives”, Prentice Hall, 1989.
2. R. Krishnan, “Electric Motor Drives: Modeling, Analysis and Control”, Prentice Hall, 2001.

References:

1. Vedam Subramanyam, “Electric Drives – Concepts and Applications”, Tata McGraw Hill, 2000.
2. W. Leonhard, “Control of Electric Drives”, Springer Science & Business Media, 2001.
3. Austin Hughes, “Electric Motors and Drives – Fundamentals, Types and Applications”, Elsevier, 2006.
4. B. K. Bose, “Modern Power Electronics and AC Drives”, Prentice Hall,2001.

(B22EE43) SOFT COMPUTING TECHNIQUES

(Professional Elective-IV)

IV Year B.Tech. EEE I-Sem **L/T/P/C 3/0/0 /3**

Prerequisites: AI Techniques in Electrical Engineering

Course Objectives:

- Its deals with various soft computing techniques, importance of optimization techniques and multi-objective optimization
- It deals with hybrid soft computing techniques like Neuro-Fuzzy technique.

Course Outcomes:

On successful completion of this course, students are able to:

CO1: To know basic idea of modern engineering techniques which are useful for solving non-linear and complex functions that may come across dissertation/research work

CO2: To understand optimization problem

CO3: Understand the concept of multi-objective optimization problems (MOOPs) and issues of solving it.

CO4: Knowing Adaptive Neuro-Fuzzy Inference Systems

CO5: Evaluate and compare solutions by soft computing techniques for a given problem in matlab Simulink

UNIT-I:

Introduction of SOFT computing: Concept of computing systems, " Soft" computing versus "Hard" computing, Characteristics of Soft computing, some applications of Soft computing techniques.

UNIT II:

Introduction to optimization algorithms: Applications for optimisation algorithms- local and global optimisation - methods based on derivatives - direct search methods – Particle Swarm optimization technique.

UNIT III:

Multi-objective optimization problem solving : Concept of multi-objective optimization problems (MOOPs) and issues of solving them, Multi-Objective Evolutionary Algorithm (MOEA), Non-Pareto approaches to solve MOOPs, Pareto based approaches to solve MOOPs, Some applications with MOEAs

UNIT-IV:

Neuro-Fuzzy Modelling: Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT-V:

Applications of soft computing techniques: Load forecasting using Neuro-Fuzzy – Economic load dispatch using PSO and Study of Neuro-Fuzzy Inference tool box and optimization toolbox in Matlab Simulink.

Text books:

1. Fletcher, R, "Practical Methods of Optimization" John Wiley & Sons, Incorporated, 2000.
2. S.N.Sivanandam And S.N.Deepa, "Principles Of Soft Computing", Wiley India Pvt Ltd, 2011.

References:

1. Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence by Jyh-Shing Roger Jang Pearson.
2. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S. Rajasekaran, G. A. Vijayalakshami, PHI.

(B22EC60) VLSI DESIGN

(Professional Elective-IV)

IV Year B.Tech. EEE I-Sem **L/T/P/C 3/0/0 /3**

Pre Requisites: Electronic Devices and Circuits & Linear & Digital IC Applications

Course Objectives

- Give exposure to different steps involved in the fabrication of ICs using MOS transistor, CMOS/BICMOS transistors and passive components.
- Explain electrical properties of MOS and BICMOS devices to analyze the behavior of inverters designed with various loads.
- Give exposure to the design rules to be followed to draw the layout of any logic circuit.
- Provide concept to design different types of logic gates using CMOS inverter and analyze their transfer characteristics. Provide design concepts to design building blocks of data path of any system using gates.
- Understand basic programmable logic devices and testing of CMOS circuits.

Course Outcomes: Upon successfully completing the Course, the student should be able to:

CO1: Understand IC technology and basic electrical properties of MOS and BiCMOS.
CO2: Design the layout circuits using various design rules.
CO3: Develop and design the gate level circuits
CO4: Gain the knowledge to design data path subsystems like Adders, Shifters, ALUs etc.
CO5: Illustrate different programmable logic devices and CMOS testing.

UNIT –I:

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS
Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, Figure of merit ω_o; Pass transistor, NMOS Inverter,Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT -II:

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

UNIT –III:

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out, Choice of layers.

UNIT -IV:
Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

UNIT -V:
Programmable Logic Devices: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

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

TEXT BOOKS:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.
3. VLSI Design – M. Michael Vai, 2001, CRC Press.

REFERENCE BOOKS

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
4. VLSI Design- K .Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.
5. Introduction to VLSI – Mead & Convey, BS Publications, 2010.

(B22EE44) IOT APPLICATIONS IN ELECTRICAL ENGINEERING

(Professional Elective-IV)

IV Year B.Tech. EEE I-Sem **L T P C**
3 0 0 3

Prerequisite: Programming, Digital Electronics

Course Objectives:

- To learn about a few applications of Internet of Things and distinguish between motion less and motion detectors as IoT applications
- To know about Micro Electro Mechanical Systems (MEMS) fundamentals in design and fabrication process
- To understand about applications of IoT in smart grid and new concept of IoE for various applications

Course Outcomes: At the end of this course, students will be able to:

CO1: Select suitable sensors for electrical engineering applications.
CO2: Understand about usage of various types of motionless sensors and motion detectors.
CO3: Utilize MEMS in developing electrical engineering applications.
CO4: Apply IoT in a smart grid.
CO5: Discuss the future working environment with Energy internet.

UNIT-I:

Sensors: Definitions, Terminology, Classification, Temperature sensors, Thermoresistive, Resistance, temperature detectors, Silicon resistive thermistors, Semiconductor, Piezoelectric, Humidity and moisture sensors. Capacitive, Electrical conductivity, Thermal conductivity, time domain reflectometer, Pressure and Force sensors: Piezoresistive, Capacitive, force, strain and tactile sensors, Strain gauge, Piezoelectric.

UNIT-II:

Occupancy and Motion detectors: Capacitive occupancy, Inductive and magnetic, potentiometric - Position, displacement and level sensors, Potentiometric, Capacitive, Inductive, magnetic velocity and acceleration sensors, Capacitive, Piezoresistive, piezoelectric cables, Flow sensors, Electromagnetic, Acoustic sensors -Resistive microphones, Piezoelectric, Photo resistors.

UNIT-III:

MEMS: Basic concepts of MEMS design, Beam/diaphragm mechanics, electrostatic actuation and fabrication, Process design of MEMS based sensors and actuators, Touch sensor, Pressure sensor, RF MEMS switches, Electric and Magnetic field sensors.

UNIT-IV:

IoT for Smart grid: Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home.

UNIT-V:

Internet of Energy: Concept of Internet of Energy, Evaluation of IoE concept, Vision and motivation of IoE, Architecture, Energy routines, information sensing and processing issues, Energy internet as smart grid.

TEXT BOOKS:

1. 1.Jon S. Wilson, “Sensor Technology Hand book”, Newnes Publisher, 2004
2. Tai Ran Hsu, “MEMS and Microsystems: Design and manufacture”, 1st Edition, McGraw hill Education, 2017
3. Ersan Kabalci and Yasin Kabalci, “From Smart grid to Internet of Energy”, 1st Edition, Academic Press, 2019.

REFERENCE BOOKS:

1. Raj Kumar Buyya and Amir Vahid Dastjerdi, "Internet of Things: Principles and Paradigms", Kindle Edition, Morgan Kaufmann Publisher, 2016
2. Yen Kheng Tan and Mark Wong, "Energy Harvesting Systems for IoT Applications": Generation, Storage and Power Management, 1st Edition, CRC Press, 2019
3. RMD Sundaram Shriram, K. Vasudevan and Abhishek S. Nagarajan, "Internet of Things", Wiley, 2019.

WEB RESOURCES:

https://nptel.ac.in/courses/108108147
https://nptel.ac.in/courses/108106193
https://nptel.ac.in/courses/108108179
https://www.udemy.com/course/internet-of-things-iot-fundamentals/
https://www.edx.org/masters/micromasters/curtinx-internet-of-things-iot?

(B22MB02) MANAGEMENT AND ORGANIZATIONAL BEHAVIOR

IV Year B.Tech. EEE I-Sem

L	T	P	C
2	0	0	2

Course Objective:

- To enable students to understand the Evolution, Functions and Theories of Management
- To orient on the aspects of planning and decision-making using relevant management processes
- To impart knowledge on the processes of Organizing and Controlling with the help of various Types of Organization Structures
- To describe the various aspects of individual and group behaviours in an organizational setting
- To elaborate on the impact of leadership and motivation for employee high performance

Course Outcome:

CO1: Gain understanding of the Concepts of Management, its Evolution, Functions and the Theories contributed by various Management Thinkers.

CO2: Learn the process of planning, goal setting and the process of decision making with the help of various models.

CO3: Learn the processes of Organizing and Controlling with the help of various Organizational Structures.

CO4: Appreciate the relevance of Individual and group behaviour in an organization and the role of Culture and dynamics

CO5: Identify different Leadership Styles, Skills and the Theories of Motivation

UNIT-I

Introduction to Management: The Management Process, Management Functions, Kinds of Managers, Managerial Roles and Skills. Evolution of Management, Theories of Management: Classical, Scientific, Administrative and Behavioral. Management Sciences Theories: Systems and Contingency Theory.

UNIT –II:

Planning and Decision Making: Planning and Goal Setting, Organizational Planning, Vision, Mission and Goals, Types of Plans, Steps in Planning Process, Approaches to Planning, Planning in Dynamic Environment. Decision-making Process, Types of Decisions, Decision Making Styles, Vroom's Participative Decision-making Model.

UNIT- III:

Organizing and Controlling: Organizational Structure, Principles of Organizing, Authority, Power and Influence, Designing Organizational Structure. Mechanistic and Organic Structures, Contemporary Organizational Design and its Challenges. Controlling: The Control Process, Controlling for Organizational Performance, Types of Control, Financial Controls, Balanced Scorecard, Bench Marking, Contemporary issues in Controlling.

UNIT – IV:

Organizational Behavior: Individual and Group Behavior: Importance of Organizational Behavior, Culture and Dynamics of Diversity, Personality Theories, Perception, Formation of Group Behavior, Classification of Groups, Group Properties, Group Cohesiveness, Building Teams.

UNIT- V:

Leadership and Motivation: Leadership Traits, Leadership Styles, Leadership Theories, Power and Politics. Motivation: Approaches to Motivation, Maslow's Needs Hierarchy Theory, Two-factor Theory of Motivation, McGregor's Theory, ERG theory, McClelland's Needs Theory, Valance Theory.

TEXT BOOKS:

1. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

REFERENCE BOOKS:

1. Essentials of Management, Koontz Kleihrich, Tata Mc - Graw Hill.
2. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
3. Industrial Engineering and Management: Including Production Management, T. R. Banga, S.C Sharma, Khanna Publishers.

(B22EE45) SIMULATION OF RENEWABLE ENERGY SYSTEMS LAB

IV Year B.Tech. EEE I-Sem **L T P C**
0 0 4 2

Prerequisite: Renewable Energy Systems, Power Electronics

Course Objectives:

- Develop proficiency in modeling the steady-state and dynamic characteristics of photovoltaic (PV), fuel cell, and wind energy sources.
- Understand and analyze power converter topologies for stand-alone and grid-connected PV, fuel cell, and wind energy systems.
- Explore advanced topics in power electronics, including maximum power point tracking, power factor correction, switched capacitor DC-DC converters, ZVS/ZCS configurations, compensation schemes, and new power converter topologies.

Course Outcomes: At the end of this course, students will be able to:

CO1: Model and analyze the steady-state and dynamic characteristics of PV, fuel cell, and wind energy sources.
CO2: Understand the power converter topologies for both stand-alone and grid-connected PV, fuel cell, and wind energy systems.
CO3: Design, and analyze power converter topologies for both stand-alone and grid-connected PV, fuel cell, and wind energy systems.
CO4: Acquire advanced expertise in power electronics, covering topics such as maximum power point tracking, power factor correction, switched capacitor converters, compensation schemes.

List of experiments:

1. Modeling the steady state and dynamic characteristics of the following
   (i) PV,
   (ii) Fuel cell and
   (iii) Wind energy sources
2. Power converter topologies for stand –alone and grid connected
   (i) PV,
   (ii) Fuel cell and
   (iii) Wind energy sources
3. Maximum Power Point Tracking Schemes
4. Power factor correction techniques for AC to DC systems
5. Compensation Schemes for VAR, harmonics and phase imbalance Power conversion and Electric Drives
6. Simulation on “Shadowing effect & diode based solution in1kWp Solar PV system”.
7. Simulation on Performance assessment of Grid connected and Standalone 1kWp Solar Power System.
8. Simulation study on Hybrid (Solar-Wind) Power System.
9. Simulation on Performance Assessment of 100W Fuel
10. Synchronization of solar PV inverter and its performance analysis .

***Note:** Perform the simulation of the above list of experiments with MATLAB/any Simulation software

TEXTBOOKS:

1. S. N. Bhadra, D.Kastha, S.Banerjee, “Wind Electrical Systems”, Oxford University Press, 2005.
2. S.N.Bhadra, D. Kastha, & S. Banerjee “Wind Electrical Systems”, Oxford University Press, 2009.
3. Rashid.M. H, “Power Electronics Hand book”, Academic Press, 2001.

REFERENCE BOOKS:

1. Rai. G.D, “Non-conventional energy sources”, Khanna Publishers, 1993.
2. Rai. G.D,” Solar energy utilization”, Khanna Publishes, 1993.
3. Gray, L. Johnson, “Wind energy system”, Prentice Hall of India, 1995.
4. B.H.Khan "Non-conventional Energy sources", Mc Graw-hill, 2nd Edition, 2009

(B22EE46) PROJECT STAGE-I

(B22EE60) CHARGING INFRASTRUCTURE FOR ELECTRIC VEHICLES

(Open Elective-III)

IV Year B.Tech. EEE II-Sem **L T P C**

3 0 0 3

Prerequisite: None, Interest in Electric Vehicles.

Course Objectives:

- Gain understanding of the various components involved in an electric vehicle charging system.
- Comprehend the different types of electric vehicle chargers, along with the applicable standards
- Governing their design and operation. Interpret the diverse communication protocols utilized in electric vehicle charging systems and
- Stay familiar with the latest trends in this evolving field.

Course Outcomes:

At the end of this course, students will be able to:

- Understand the various components of Electric vehicle charging system
- Comprehend the different types of Electric vehicle chargers and their standards
- Interpret the various communication protocols and recent trends in Electric vehicle charging

UNIT-I:

Introduction to EV charging: Electric Vehicle Charging; Charging Modes; Electric Vehicle Supply Equipment (EVSE): Types, Components of EV Battery Chargers; Challenges in Electric Vehicle Charging.

UNIT-II:

Charger sizing and standards: Charger Classification; Slow Charging and Fast Charging; DC Charging and AC Charging; Selection and Sizing of Chargers: Charger Connectors and Cables; Charging Standards: Connectors, Supply Equipment; EMI/EMC; Testing Methods for Chargers and EVSE

UNIT-III:

EV charger communications protocols: Open Charge Point Protocol (OCPP); Open System Interconnection Layer Model (OSI); Adapted PWM Signal based Low-level Communication; PLC based High-level Communication; CAN Communication; Billing and Authentication

UNIT-IV:

Public charging infrastructure: Location, Planning and Implementation of Public Charging Stations; Components; Selection and Sizing - HT/LT Equipment & Cables; Protection; Safety Standards: Policy and Regulatory Aspects; EV Charging Station and their Business Models; Economic Aspects; Major Challenges

UNIT-V:

Future frontiers in EV charging: Bulk Charging; Battery Swapping; Wireless Charging; EVs as Distributed Storage Resources: Grid to Vehicle (G2V) and Vehicle to Grid (V2G), V2X Concept, Integration of Charging Station with Renewable Sources and its Impact on the Grid

TEXT BOOKS:

1. Iqbal Husain, “Electric and Hybrid Vehicles: Design Fundamentals”, 3rd Edition, CRC Press, 2021
2. Code of Practice for Electric Vehicle Charging Equipment Installation, 4th Edition, IET, 2020.

REFERENCE BOOKS:

1. Sheldon S. Williamson, “Energy Management Strategies for Electric and Plug-in Hybrid
2. Electric Vehicles”, 1st Edition, Springer, 2013.
3. Tom Denton, “Automotive Electrical and Electronic Systems”, 5th Edition, Routledge, 2018.
4. Wolfhard Lawrenz, “CAN System Engineering: From Theory to Practical Applications”, Springer, 2nd Edition, 2013.

Web link: https://www.udemy.com/course/charging-infrastructure-for-electric-vehicles/

(B22EE61) RELIABILITY ENGINEERING

(Open Elective-III)

IV Year B.Tech. EEE II-Sem **L T P C**

3 0 0 3

Prerequisite: Mathematics-III (Laplace Transforms, Numerical Methods and Complex variables)

Course Objectives: To introduce the basic concepts of reliability, various models of reliability

- To analyze reliability of various systems
- To introduce techniques of frequency and duration for reliability evaluation of repairable• systems

Course Outcomes:

- At the end of this course, students will be able to: model various systems applying reliability networks and evaluation of the same estimate the limiting state probabilities of repairable systems
- apply various mathematical models for evaluating reliability of irreparable systems

UNIT-I:

Basic Probability Theory: Elements of probability, probability distributions, Random variables, Density and Distribution functions- Mathematical expected – variance and standard deviation – BINOMIAL DISTRIBUTION: Concepts, properties, engineering applications.

UNIT-II:

Network Modeling And Evaluation Of Simple Systems: Basic concepts- Evaluation of network Reliability / Unreliability - Series systems, Parallel systems - Series-Parallel systems- Partially redundant systems- Examples. Network Modeling And Evaluation of Complex Systems: Conditional probability method- tie set, Cut-set approach- Event tree and reduced event tree methods- Relationships between tie and cut-sets Examples.

UNIT-III:

Probability Distributions In Reliability Evaluation: Distribution concepts, Terminology of distributions, General reliability functions, Evaluation of the reliability functions, shape of reliability functions –Poisson distribution – normal distribution, exponential distribution, Weibull distribution. Network Reliability Evaluation Using Probability Distributions: Reliability Evaluation of Series systems, Parallel systems – Partially redundant systems- determination of reliability measure- MTTF for series and parallel systems – Examples.

UNIT-IV:

Discrete Markov Chains: Basic concepts- Stochastic transitional probability matrix- time dependent probability evaluation- Limiting State Probability evaluation- Absorbing states – Application. Continuous Markov Processes: Modeling concepts- State space diagrams- Unreliability evaluation of single and two component repairable systems

UNIT-V:

Frequency And Duration Techniques: Frequency and duration concepts, application to multi state problems, Frequency balance approach. Approximate System Reliability Evaluation: Series systems – Parallel systems- Network reduction techniques- Cut set approach- Common mode failures modeling and evaluation techniques- Examples.

TEXT BOOKS:

1. Roy Billinton and Ronald N Allan, Reliability Evaluation of Engineering Systems, Plenum Press.

2. E. Balagurusamy, Reliability Engineering by Tata McGraw-Hill Publishing Company Limited

REFERENCE BOOKS:

1. Reliability Engineering: Theory and Practice by Alessandro Birolini, Springer Publications.
2. An Introduction to Reliability and Maintainability Engineering by Charles Ebeling, TMH Publications.
3. Reliability Engineering by Elsayed A. Elsayed, Prentice Hall Publications.

(B22EE47) POWER QUALITY
(Professional Elective-V)

IV Year B.Tech. EEE II-Sem

L	T	P	C
3	0	0	3

Prerequisite: Power Electronics, Power System Operation and Control, HVDC Transmission

Course Objectives:

- Define power quality and explore various terms associated with it. Study voltage-related power quality issues, focusing on short and long interruptions.
- Conduct a detailed study on characterizing voltage sags, with a specific emphasis on magnitude and three-phase unbalanced voltage sags. Understand how power quality issues affect the behaviour of power electronics loads and rotating machinery.
- Gain an understanding of FACTS controllers, their controllable parameters, and types. Explore the importance of shunt and series compensation, focusing on the control and comparison of STATCOM and SVC, and the functioning and regulation of other FACTS devices like GCSC, TSSC, and TCSC.

Course Outcomes: At the end of this course, students will be able to:

- Develop an awareness of the severity of power quality issues in distribution systems, focusing on their impact and challenges.
- Understand the concept of transforming voltage sags from upstream (higher voltages) to downstream (lower voltage) in the distribution system.
- Demonstrate competence in selecting controllers based on specific applications and system requirements. Thoroughly understand various systems and their requirements, including the control circuits of shunt controllers (SVC & STATCOM) and series controllers (GCSC, TSSC, and TCSC) for enhancing transient stability, preventing voltage instability, and damping power oscillations.

UNIT-I:

Power Quality Problems In Distribution Systems: Power Quality problems in distribution systems: Transient and Steady state variations in voltage and frequency. Unbalance, Sags, Swells, Interruptions, Wave-form Distortions: harmonics, noise, notching, dc-offsets, fluctuations. Flicker and its measurement.

UNIT-II:

Transmission Lines And Series/Shunt Reactive Power Compensation: Basics of AC Transmission. Analysis of uncompensated AC transmission lines. Passive Reactive Power Compensation. Shunt and series compensation at the mid-point of an AC line. Comparison of Series and Shunt Compensation.

UNIT-III:

Static Shunt Compensators: Objectives of shunt compensation, Methods of controllable VAR generation, Static Var Compensator, its characteristics, TCR, TSC, FC-TCR configurations, STATCOM, basic operating principle, control approaches and characteristics

UNIT-IV:

Static Series Compensators: Objectives of series compensator, variable impedance type of series compensators, TCSC, TSSC-operating principles and control schemes, SSSC, Power Angle characteristics, Control range and VAR rating, Capability to provide reactive power compensation, external control

UNIT-V:

Combined Compensators: Introduction to Unified Power Flow Controller, Basic operating principles, Conventional control capabilities, independent control of real and reactive power.

TEXT BOOKS:

1. Electrical Power Systems Quality, Dugan Roger C, Santoso Surya, Mc Granaghan, Marks F. Beaty and H. Wayre, Mc Graw Hill
2. Power Systems Quality Assessment, J. Arillaga, N.R. Watson, S.Clon, John Wiley.

REFERENCE BOOKS:

1. Power Quality, C.Sankaran, CRC Press 4. Understanding power quality problems, Math H. Bollen, IEEE press.
2. "Understanding FACTS –Concepts and Technology of Flexible AC Transmission Systems" Narain G. Honorani, Laszlo Gyugyi

(B22EE48) SOLAR POWER BATTERIES
(Professional Elective-V)

IV Year B.Tech. EEE II-Sem

L	T	P	C
3	0	0	3

Prerequisite: Renewable Energy Sources, Energy Storage Systems

Course Objectives:
- To understand the PV systems and the solar power batteries operation
- To analyze the solar PV system storage with batteries.
- To understand Grid Tie vs. Off-Grid Solar Battery System

Course Outcomes: At the end of this course, students will be able to:

- Know operating principes of different types of solar power batteries
- Use the batteries for effective storage of solar PV.
- Gain the knowledge on environmental impacts of solar power batteries.

UNIT-I:

Introduction to solar PV systems, basics of Storage for solar PV systems, Storage for solar PV systems: the batteries, Introduction to Solar Power Batteries, terminology associated, understanding Solar Battery Specifications, working principle, Series Vs. Parallel, Charging parameters, cycle life, Temperature effects, Battery Design and Construction, Important components in battery construction.

UNIT-II:

Primary and Secondary batteries, Classification of Secondary batteries, i.e Lead-Acid, Lead-Antimony, Lead-Calcium, Lead-Acid Battery Chemistry, Nickel-Cadmium Batteries and their types.

UNIT-III:

AC Coupled Storage vs. DC Coupled Storage, working of Solar Batteries with a Solar Power System and Hybrid Inverter, Main Degradation mechanisms of Solar Batteries, Battery Strengths and Weaknesses, Battery System Design and Selection Criteria, Life Expectancy, Battery standards, Safety precautions,

UNIT-IV:

Solar Battery Costs, Declining Cost, factors contribute to the performance of solar battery, selection of suitable batteries based on the application, Grid Tie vs. Off-Grid Solar Battery System, Benefits and disadvantages of using solar batteries,

UNIT-V:

The environmental impacts of batteries: Introduction, Service life of the components, Energy requirements for production and transport of the PV-battery system components, Contributing components, Influence of different user conditions, Uncertainties, Future research, Energy return factor, The overall battery efficiency, Different efficiency measures and battery design, The Future of Solar Battery Storage.

TEXT BOOKS:

1. S. Sumathi and L. Ashok Kumar, Solar PV and Wind Energy Conversion Systems: An Introduction to Theory, Modeling with MATLAB/SIMULINK, and the Role of Soft Computing Techniques, Springer 2011
2. H.A. Kiehne, "Battery Technology Handbook" by *Publisher:* CRC Press 2003
3. https://core.ac.uk/download/pdf/30044842.pdf
4. Handbook on Battery Energy Storage System
5. https://www.adb.org/sites/default/files/publication/479891/handbook-battery-energy-storage-system.pdf

REFERENCE BOOKS:

1. Cristina Archer and S. Lovejoy, Battery Technology for Electric Vehicles: Public Science and Private Innovation, Springer 2015
2. Soteris A. Kalogirou, "Solar Energy Engineering: Processes and Systems" by, Academic Press, *Year:* 2009
3. https://files.bregroup.com/bre-co-uk-file-library-copy/filelibrary/nsc/Documents%20Library/NSC%20Publications/88031-BRE_Solar-Consumer- Guide-A4-12pp.pdf
4. https://www.sunwize.com/tech-notes/solar-battery-basics/
5. https://palmetto.com/learning-center/blog/how-does-a-solar-battery-work
6. https://www.letsgosolar.com/faq/what-is-a-solar-battery/
7. https://www.purevolt.ie/domestic-solar/equipment/solar-storage-batteries.php

(B22EE49) AI TECHNIQUES IN ELECTRICAL ENGINEERING
(Professional Elective-V)

IV Year B.Tech. EEE II-Sem **L T P C**
3 0 0 3

Pre-requisites: Power Systems Operation and Control

Course Objectives:
- To locate soft commanding methodologies, such as artificial neural networks, Fuzzy logic and genetic Algorithms.
- To observe the concepts of FFN and concept of fuzziness involved in various systems and comprehensive knowledge of fuzzy logic control and to design the fuzzy control
- To analyze genetic algorithms, genetic operations and genetic mutations.

Course Outcomes: At the end of this course, students will be able to:

CO1: Compare artificial neural networks learning techniques.
CO2: Discuss ANN paradigms.
CO3: Develop fuzzy logic control for electrical engineering applications.
CO4: Utilize genetic algorithm concepts for applications in electrical engineering.
CO5: Apply AI techniques in electrical engineering applications.

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-Boltzmann 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:
Fuzzy Logic: Introduction –Fuzzy versus crisp, Fuzzy Sets-Membership function –Basic Fuzzy set operations, Properties of Fuzzy sets –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 points cross over –Multi point cross over Uniform cross over, Matrix cross over-Cross over 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 two area system, Reactive power control, Speed control of DC and AC Motors.

TEXT BOOKS:
1. S. Rajasekaran and G.A.V.Pai Neural Networks, Fuzzy Logic & Genetic Algorithms,PHI, New Delhi, 2003.
2. Rober J. Schalkoff, Artificial Neural Networks, Tata McGraw Hill Edition, 2011.

REFERENCE BOOKS:

1. P. D. Wasserman; Neural Computing Theory & Practice, Van Nostrand Reinhold, New York, 1989.
2. Bart Kosko; Neural Network & Fuzzy System, Prentice Hall, 1992
3. D. E. Goldberg, Genetic Algorithms, Addison-Wesley 1999.

WEB RESOURCES:

https://nptel.ac.in/courses/108104049

https://nptel.ac.in/courses/108104157

https://www.coursera.org/learn/introduction-to-ai

(B22EC61) EMBEDDED SYSTEMS APPLICATIONS

(Professional Elective-V)

IV Year B.Tech. EEE II-Sem

L	T	P	C
3	0	0	3

Prerequisite: C Language, I/O, Analog and Digital interfacing, and peripherals.

Course Objectives:

- To equip with the basic concepts of embedded system, applications in which they are used,
- To describe tools and methodologies needed for embedded system design.
- To know RTOS concepts and familiar with the characteristics of latency in real-time systems.

Course Outcomes: At the end of this course, students will be able to:

CO1: Understand the microprocessor architecture and its components used in embedded systems
CO2: Understand the architecture of 8051
CO3: Write the 8051-assembly language code and Embedded 'C' code for interfacing various devices.
CO4: Understand the required RTOS for Embedded Systems
CO5: Develop simple embedded systems for real time operations

UNIT-I:

Embedded Systems Basics: Introduction to Embedded systems, Examples of embedded systems, Typical Hardware, Gates, Timing Diagrams, Memory, Microprocessors, Buses, Direct Memory Access, Interrupts, Microprocessor Architecture, and Interrupt Basics.

UNIT-II:

The 8051 Architecture: Introduction, 8051 Micro controller Hardware, Input/output Pin Ports and Circuits, External Memory, Serial data Input/output, Interrupts.

UNIT-III:

Embedded C Programming: Overview of the C standard library, Embedded System Oriented Topics, MISRA C — Designing Safer C Programs, Basics of event driven programming.

Basic Assembly Language Programming Concepts: The Assembly Language Programming Process, Programming Tools and Techniques, Programming the 8051.

UNIT-IV:

Moving Data: Introduction, Addressing Modes, External Data Moves, Code Memory ReadOnly Data Moves, Push and Pop Opcodes, Data Exchanges.

Basic Design Using a Real-Time Operating System: Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment

UNIT-V:

Applications: Introduction, keyboards, Human Factor, Key Switch Factors, Keyboard Configurations, Displays, Seven-Segment Numeric Display, D/A and A/D Conversions.

Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System; Debugging Techniques: Testing on Host Machine, Using Laboratory Tools, An Example System.

TEXT BOOKS:

1. An Embedded Software Primer, David E. Simon, Pearson Education.
2. The 8051 Microcontroller, Third Edition, Kenneth J.Ayala, Thomson.

REFERENCE BOOKS:

1. Embedded Microcomputer Systems Real Time Interfacing, Jonathan W.Valvano, Cengage Learning.
2. 8051 Microcontrollers, Satish Shah, Oxford Higher Education.
3. Micro Controllers, Ajay V Deshmukhi, TMH.
4. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley.
5. Microcontrollers, Raj kamal, Pearson Education. a. http://nptel.ac.in/courses.php b. http://jntuk- coeerd.in/

(B22EE50) SMART GRID TECHNOLOGIES
(Professional Elective-VI)

IV Year B.Tech. EEE II-Sem

L	T	P	C
3	0	0	3

Pre-requisites: None

Course Objectives:
- To defend smart grid design to meet the needs of a utility
- To select issues and challenges that remain to be solved
- To analyze basics of electricity, electricity generation, economics of supply and demand, and the various aspects of electricity market operations in both regulated and deregulated environment.

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

CO1: Get the knowledge to locate the power grid's elements throughout the context of the Indian grid system.
CO2: Prepared to recognize how important automation is to distribution and transmission.
CO3: Capable of utilizing evolutionary algorithms in smart grid applications.
CO4: Possess an understanding of how WAMs, PDCs, PMUs, and voltage and frequency control work in smart grids.
CO5: Able to manage power and voltage for micro and smart grids.

UNIT-I:
Introduction To Smart Grid: What is 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. The fundamental components of Smart Grid designs – Transmission Automation – Distribution Automation –Renewable Integration

UNIT- III:
Tools And Techniques For Smart Grid: Computational Techniques –Static and Dynamic Optimization Techniques –Computational Intelligence Techniques –Evolutionary Algorithms –Artificial Intelligence techniques.

UNIT-IV:
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.
Communication Technologies And Smart Grid: Introduction to Communication Technology – Synchro-Phasor Measurement Units (PMUs) –Wide Area Measurement Systems (WAMS).

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. Stuart Borlase, Smart Grids, Infrastructure, Technology and Solutions, CRC Press, 2013
2. Gil Masters, Renewable and Efficient Electric Power System, Wiley-IEEE Press, 2004.

REFERENCE BOOKS:

1. A.G. Phadke and J.S. Thorp, “Synchronized Phasor Measurements and their Applications”, Springer Edition, 2010.
2. T. Ackermann, Wind Power in Power Systems, Hoboken, NJ, USA, John Wiley, 2005.

(B22EE51) ELECTRICAL DISTRIBUTION SYSTEMS
(Professional Elective-VI)

IV Year B.Tech. EEE II-Sem

L	T	P	C
3	0	0	3

Prerequisites: Power System – I, Power System - II

Course Objectives:
- To understand design considerations of feeders
- To compute voltage, drop and power loss in feeders
- To understand protection, PF improvement and voltage control

Course Outcomes: At the end of this course, students will be able to:

CO1: Identify various Electrical loads and their characteristics & Design Distribution feeders and Identify Substation location
CO2: Interpret voltage drop and power loss calculations for the given Distribution System
CO3: Determine the optimal location of a capacitor in distribution system and improve voltage profile
CO4: Analyse the different types of PF improvement
CO5: Analyse the different types of voltage control

UNIT-I:

General Concepts: Introduction to distribution system, Distribution system planning, Factors effecting the Distribution system planning, Load modelling and characteristics. Coincidence factor - contribution factor - Loss factor - Relationship between the load factor and loss factor. Load growth, Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

UNIT-II:

Distribution Feeders: Design Considerations of Distribution Feeders: Radial, loop and network types of primary feeders, Introduction to low voltage distribution systems (LVDS) and High voltage distribution systems (HVDS), voltage levels, Factors effecting the feeder voltage level, feeder loading, Application of general circuit constants (A, B, C, D) to radial feeders, basic design practice of the secondary distribution system, secondary banking, secondary network types, secondary mains**.**

UNIT-II:

Substations: Location of Substations: Rating of distribution substation, service area with 'n' primary feeders. Benefits derived through optimal location of substations. Optimal location of Substations (Perpendicular bisector rule and X, Y co-ordinate method).

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, analysis of non-three phase systems, method to analyze the distribution feeder cost.

UNIT-III:

Protection: Objectives of distribution system protection, types of common faults and procedure for fault calculations, over current Protective Devices: Principle of operation of Fuses, Auto-Circuit Recloser - and Auto-line sectionalizes, and circuit breakers.

Coordination: Coordination of Protective Devices: Objectives of protection co-ordination, general coordination procedure, Types of protection coordination: Fuse to Fuse, Auto-Recloser to Fuse, Circuit breaker to Fuse, Circuit breaker to Auto-Recloser.

UNIT-IV:

Compensation For Power Factor Improvement: Capacitive compensation for power-factor control - Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), effect of series capacitors, difference between shunt and series capacitors, Calculation of Power factor correction, capacitor allocation - Economic justification of capacitors - Procedure to determine the best capacitor location.

UNIT-V:

Voltage Control: Voltage Control: Importance of voltage control, methods of voltage control, Equipment for voltage control, effect of shunt capacitors, effect of series capacitors, effect of AVB/AVR on voltage control, line drop compensation, voltage fluctuations.

TEXT BOOKS:

1. Turan Gonen, Electric Power Distribution System Engineering, CRC Press, 3rd Edition 2014.
2. V. Kamaraju, Electrical Power Distribution Systems, Tata Mc Graw Hill Publishing Company, 2nd edition, 2010.

REFERENCE BOOKS:

1. G. Ram Murthy, Electrical Power Distribution hand book, 2nd edition, University press 2004.
2. A.S. Pabla, Electric Power Distribution, Tata McGraw Hill Publishing company, 6th edition, 2013.

(B22EE52) DIGITAL CONTROL SYSTEMS
(Professional Elective-VI)

IV Year B.Tech. EEE II-Sem **L/T/P/C**
3/0/0 /3

Pre-Requisites: Control Systems

Course Objectives:

- To equip the students with the basic knowledge of A/D and D/A conversion
- To understand the basics of Z- Transform
- To study the stability analysis of digital control system
- Analyze digital control systems using state-space methods.
- Analyze digital control systems using transform techniques (frequency response) and state-space methods (pole-assignment).

Course Outcomes:

On successful completion of this course, students are able to:

CO1: Acquire a strong foundation in sampling and reconstruction Z-transforms.
CO2: Apply knowledge of Mathematics, Z-plane analysis to discrete time control systems.
CO3: Replace the conventional control system with Digital control system.
CO4: Evaluate and apply Z-plane analysis of discrete time control systems
CO5: Apply state feedback controllers and observers

UNIT I:

Introduction to Digital Control Systems And Z-Transforms Introduction - Merits and Demerits of Digital Control Systems - Practical aspects of the choice of sampling rate and Multirate sampling - Basic discrete time signals - Quantization – Sampling Theorem - Data Conversions and Quantization - Sampling process - Mathematical Modeling - Data Reconstruction and Filtering of sampled signals – Zero - Order Hold (ZOH). z- Transform and Inverse z-Transform, Relationship between s - plane and z - plane - Difference equation - Solution by recursion and z-Transform - Pulse Transfer Functions of the ZOH and relationship between G(s) and G(z)– Bilinear Transformation.

UNIT II:

Input/output Analysis of Digital Control Systems: Pulse transfer function - z transform analysis of open loop, closed loop systems - Modified z Transform - transfer function - Stability of linear digital control systems - Stability tests – Jury Stability test. Root loci - Frequency domain analysis - Bode plots- Gain margin and phase margin.

UNIT III:

Design of Controllers For I/O Model Digital Control Systems Cascade and Feedback Compensation by continuous data controllers - Digital controllers - Design using Bilinear Transformation - Realization of Digital PID controllers, Design of Digital Control Systems based on Root Locus Technique.

UNIT IV:

State Space Analysis and State Feedback Control Design of Digital Control Systems State Equations of discrete data systems, solution of discrete state equations, State Transition Matrix: Computation methods for State Transition Matrix: z - transform method. Relation between State Equations and Pulse Transfer Functions. Concepts on Controllability and Observability - Pole placement design by state feedback.

UNIT V:

Digital State Observer and Stability Analysis Design of the full order and reduced order state observer, Design of Dead-beat Controller - some case studies - Stability analysis of discrete time systems based on Lyapunov approach.

TEXT BOOKS:

1. K. Ogata, Discrete Time Control Systems, PHI/Addison - Wesley Longman Pvt. Ltd., 1995.
2. B.C Kuo, Digital Control Systems, 2nd Edition, Oxford Univ Press, Inc., 1992.

REFERENCES:

1. F. Franklin, J.D. Powell, and M.L. Workman, Digital control of Dynamic Systems, Addison Wesley Longman, Inc., Menlo Park, CA, 1998.
2. M. Gopal, Digital Control and State Variable Methods, Tata McGraw Hill, India, 1997.
3. C. H. Houpis and G.B. Lamont, Digital Control Systems, McGraw Hill, 1985.
4. John S. Baey, Fundamentals of Linear State Space Systems, Mc. Graw – Hill, 1st edition.
5. Bernard Fried Land, Control System Design, Mc. Graw – Hill, 1st edition.
6. Dorsay, Continuous and Discrete Control Systems, McGraw - Hill.

(B22EE53) MACHINE LEARNING APPLICATIONS TO ELECTRICAL ENGINEERING
(Professional Elective-VI)

IV Year B.Tech. EEE II-Sem **L T P C**
3 0 0 3

Prerequisites: Mathematics, Python

Course Objectives:
- To develop a foundational understanding of machine learning principles and techniques.
- To explore and understand how machine learning can be integrated into various electrical engineering applications.
- To gain hands-on experience in implementing machine learning algorithms to solve real-world electrical engineering problems.

Course Outcomes: At the end of this course, students will be able to:

CO1: Discuss the types of machine learning.
CO2: Demonstrate the fundamentals of electrical engineering relevant to ML.
CO3: Explain the data processing concepts.
CO4: Apply machine learning algorithms to solve real-world problems in electrical engineering.
CO5: Analyze the electrical engineering case studies through machine learning.

UNIT-I:
Introduction to Machine Learning: Definition and types of machine learning, Historical perspective, Basic concepts: supervised learning, unsupervised learning, reinforcement learning.

UNIT-II:
Fundamentals of Electrical Engineering Relevant to ML: Overview of electrical circuits and systems, Signal processing basics, Introduction to control systems.

UNIT-III:
Data Preprocessing and Feature Engineering: Data cleaning and handling missing values, Feature scaling and normalization, Feature extraction and selection.

UNIT-IV:
Machine Learning Algorithms for Electrical Engineering Applications: Regression and classification algorithms, Decision trees and ensemble methods, Neural networks and deep learning, Support vector machines, Clustering algorithms for pattern recognition.

UNIT-V: Case Studies and Applications in Electrical Engineering
Power system optimization using ML, Fault detection and diagnostics in electrical systems, Smart grid applications, Signal processing with ML, Control system optimization and adaptive control using ML.

TEXT BOOKS:
1. C. Aldrin Renold and Sumathi S., Pattern Recognition and Machine Learning, Wiley India, 2015.
2. S. Rajasekaran and G. Aghila, Machine Learning: An Algorithmic Perspective, Chapman and Hall/CRC,2018
3. Chandra Shekhar Yadav, S. Ramakrishnan, and U. Rajendra Acharya, Machine Learning: Concepts, Methodologies, Tools and Applications, Springer 2018.

REFERENCE BOOKS:

1. Ethem Alpaydin, Introduction to Machine Learning, MIT Press 2010
2. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
3. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press 2012.

WEB RESOURCES:

https://nptel.ac.in/courses/108103192

https://nptel.ac.in/courses/106106139

(B22EE54) Project Stage-II

(B22EE55) TECHNICAL SEMINAR