SREE VAHINI

2023

ENGINEERING CURRICULUM

II B.Tech. EEE SYLLABUS
V23 REGULATION

SREE VAHINI INSTITUTE OF SCIENCE AND TECHNOLOGY
(AN AUTONOMOUS INSTITUTION)
An ISO 9001 : 2015 Certified Institution
Diploma / B.Tech / M.Tech / MBA
Sai Vahini Nagar, NH-30, Tiruvuru-NTR Dist. A.P
Approved by AICET new Delhi
Permanently Affiliated to JNTU, kakinada
NAAC A GRADE

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

(V23-COURSE STRUCTURE & SYLLABUS)

B.Tech. II Year-I Semester

S. No.	Category	Subject Name	Subject Code	L	T	P	Credits
1	BS&H	Complex Variables & Numerical Methods	V231210221	3	0	0	3
2	HSMC	Universal Human Values – understanding harmony and Ethical human conduct	V23121CC11	2	1	0	3
3	Engineering Science	Electromagnetic Field Theory	V2312102L1	3	0	0	3
4	Professional Core	Electrical Circuit Analysis - II	V231210231	3	0	0	3
5	Professional Core	DC Machines & Transformers	V231210232	3	0	0	3
6	Professional Core	Electrical Circuit Analysis – II Lab	V231210261	0	0	3	1.5
7	Professional Core	DC Machines & Transformers Lab	V231210262	0	0	3	1.5
8	Skill Enhancement course	Data Structures Lab	V231210263	0	1	2	2
9	Audit Course	Environmental Science	V23121CCC1	2	0	0	-
Total				15	2	10	20

B.Tech. II Year-II Semester

S. No.	Category	Subject Name	Subject Code	L	T	P	Credits
1	Management Course-I	Managerial Economics & Financial Analysis	V23122C4M1	2	0	0	2
2	Engineering Science	Analog Circuits	V2312202L1	3	0	0	3
3	Professional Core	Power Systems – I	V231220231	3	0	0	3
4	Professional Core	Induction Motors and Synchronous Machines	V231220232	3	0	0	3
5	Professional Core	Control Systems	V231220233	3	0	0	3
6	Professional Core	Induction Motors and Synchronous Machines Lab	V231220261	0	0	3	1.5
7	Professional Core	Control Systems Lab	V231220262	0	0	3	1.5
8	Skill Enhancement course	Python Programming Lab	V231220263	0	1	2	2
9	Engineering Science	Design Thinking & Innovation Lab	V23122CC64	1	0	2	2
Total				15	1	10	21
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation							

II Year – I SEMESTER	ELECTROMAGNETIC FIELD THEORY (V23 12102L1)	L	T	P	C
		3	0	0	3

Course Objectives: The objective of this course is to introduce general concepts of electric and magnetic fields. This course also covers Maxwell's equations in different forms and Maxwell's fourth equation for the induced EMF.

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

CO1: Compute electric fields and potentials using Gauss law/ solve Laplace's or Poisson's equations for various electric charge distributions.

CO2: Analyse the behaviour of conductors in electric fields, electric dipole and the capacitance and energy stored in dielectrics.

CO3: Calculate the magnetic field intensity due to current carrying conductor and Understanding the application of Ampere's law, Maxwell's second and third law.

CO4: Estimate self and mutual inductances and the energy stored in the magnetic field.

CO5: Understand the concepts of Faraday's laws, Displacement current, Poynting theorem and Poynting vector.

UNIT – I: Electrostatics:

Introduction to Vector Algebra, Coordinate Systems, Coulomb's law and Electric field intensity (EFI) – EFI due to Continuous charge distributions (line and surface charge), Electric flux density, Gauss's law (Maxwell's first equation, $\nabla.\vec{D} = \rho_v$), Applications of Gauss's law, Electric Potential, Work done in moving a point charge in an electrostatic field (second Maxwell's equation for static electric fields,$\nabla \times \vec{E} = 0$), Potential gradient, Laplace's and Poison's equations.

UNIT – II: Conductors – Dielectrics and Capacitance:

Behaviour of conductor in Electric field, Electric dipole and dipole moment – Potential and EFI due to an electric dipole, Torque on an Electric dipole placed in an electric field, Current density-conduction and convection current densities, Ohm's law in point form, Behaviour of conductors in an electric field, Polarization, dielectric constant and strength, Continuity equation and relaxation time, Boundary conditions between conductor to dielectric, dielectric to dielectric and conductor to free space, Capacitance of parallel plate, coaxial and spherical capacitors, Energy stored and density in a static electric field.

UNIT - III: Magneto statics, Ampere's Law and Force in magnetic fields:

Biot-Savart's law and its applications viz. Straight current carrying filament, circular, square, rectangle and solenoid current carrying wire – Magnetic flux density and Maxwell's second Equation ($\nabla.\vec{B} = 0$), Ampere's circuital law and its applications viz. MFI due to an infinite sheet, long filament, solenoid, toroidal current carrying conductor, point form of Ampere's circuital law, Maxwell's third equation ($\nabla \times \vec{H} = \vec{J}$).

Magnetic force, moving charges in a magnetic field – Lorentz force equation, force on a current element in a magnetic field, force on a straight and a long current carrying conductor in a magnetic field, force between two straight long and parallel current carrying conductors, Magnetic dipole, Magnetic torque, and moment.

UNIT - IV : Self and mutual inductance:

Self and mutual inductance – determination of self-inductance of a solenoid, torpid, coaxial cable and mutual inductance between a straight long wire and a square loop wire in the same plane – Energy stored and energy density in a magnetic field.

UNIT - V : Time Varying Fields:

Faraday's laws of electromagnetic induction, Maxwell's fourth equation $\left(\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}\right)$, integral and point forms ofMaxwell's equations, statically and dynamically induced EMF, Displacement current, Modification of Maxwell's equations for time varying fields, Poynting theorem and Poynting vector.

Textbooks:

1. "Elements of Electromagnetics" by Matthew N O Sadiku, Oxford Publications, 7th edition, 2018.
2. "Engineering Electromagnetics" by William H. Hayt& John. A. Buck Mc. Graw-Hill, 7th Editon.2006.

Reference Books:

1. "Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt. Ltd, 2nd edition.
2. "Electromagnetic Field Theory" by Yaduvir Singh, Pearson India, 1st edition, 2011.
3. "Fundamentals of Engineering Electromagnetics" by Sunil Bhooshan, Oxford University
   Press, 2012.
4. Schaum's Outline of Electromagnetic by Joseph A. Edminister, MahamoodNavi,4th Edition,2014.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/108/106/108106073/
2. https://nptel.ac.in/courses/117103065

II Year – I SEMESTER	UNIVERSAL HUMAN VALUES-UNDERSTANDING HARMONY ETHICAL HUMAN CONDUCT (V23 121CC11)	L	T	P	C
		2	1	0	3

Course Objectives:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

Course Outcomes:

CO1: Students are expected to become more aware of themselves, and their surroundings (Family, society, nature)

CO2: They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO3: They would have better critical ability.

CO4: They would also become sensitive to their commitment towards what they have Understood (human values, human relationship and human society).

CO5: It is hoped that they would be able to apply what they have learnt to their own self in Different day-to-day settings in real life, at least a beginning would be made in this direction.

UNIT - I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Purpose and motivation for the course, recapitulation from Universal Human Values-I.

Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration.

Continuous Happiness and Prosperity- A look at basic Human Aspirations.

Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority.

Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT – II Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'

Understanding the needs of Self ('I') and 'Body'-happiness and physical facility

Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of 'I' and harmony in 'I'.

Understanding the harmony of 'I' with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT - III

Understanding Harmony in the Family and Society-Harmony in Human-Human Relationship

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.

Understanding the meaning of Trust; Difference between intention and competence.

Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.

Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals.

Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT - IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexisten
Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self- regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all- pervasive space Holistic perception of harmony at all levels of existence.
Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.
UNIT - V

Implications of the above Holistic Understanding of Harmony on Professional Ethics
Natural acceptance of human values Definitiveness of Ethical Human Conduct.
Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.
Competence in professional ethics: (a) Ability to utilize the professional competence for augmenting universal human order (b) Ability to identify the scope and characteristics of

people friendly and eco- friendly production systems, (c) Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
b. At the level of society: as mutually enriching institutions and organizations Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Textbooks:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004. The Story of Stuff (Book).
3. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
4. E. FSchumacher. "Small is Beautiful" Slow is Beautiful –Cecile Andrews
5. J C Kumarappa "Economy of Permanence" Pandit Sunderlal "Bharat Mein Angreji Raj" Dharampal, "Rediscovering India"
6. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule" India Wins Freedom - Maulana Abdul Kalam Azad Vivekananda - Romain Rolland(English)
7. Gandhi - Romain Rolland (English)

MODE OF CONDUCT

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up “ordinary” situations rather than” extra-ordinary” situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

II Year – I SEMESTER	ELECTRICAL CIRCUIT ANALYSIS-II (V23 1210231)	L	T	P	C
		3	0	0	3

Course Objectives:

The objective of this course is to study the concepts of three phase circuits, transient analysis and Fourier analysis of electrical systems. This course also introduces the concept of filters.

Course Outcomes:

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

CO1: Analyse the balanced and unbalanced 3 phase circuits for power calculations.

CO2: Analyse the transient behaviour of electrical networks in different domains.

CO3: Estimate various Network parameters.

CO4: Apply the concept of Fourier series to electrical systems.

CO5: Design filters circuit for electrical circuits.

UNIT – I Three phase Balanced and Unbalanced circuits

Analysis of three phase balanced circuits: Phase sequence, star and delta connection of sources and loads, relation between line and phase quantities, analysis of balanced three phase circuits, measurement of active and reactive power.

Analysis of three phase unbalanced circuits: Loop method, Star-Delta transformation technique, two-wattmeter method for measurement of three phase power.

UNIT – II

Laplace transforms – Definition and Laplace transforms of standard functions– Shifting theorem – Transforms of derivatives and integrals, Inverse Laplace transforms and applications.

Transient Analysis: Transient response of R-L, R-C and R-L-C circuits (Series and parallel combinations) for D.C. and sinusoidal excitations – Initial conditions - Solution using differential equation approach and Laplace transform approach.

UNIT - III

Network Parameters: Impedance parameters, Admittance parameters, Hybrid parameters, Transmission (ABCD) parameters, conversion of Parameters from one form to other, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations- problems.

UNIT - IV

Analysis of Electric Circuits with Periodic Excitation: Fourier series and evaluation of Fourier coefficients, Trigonometric and complex Fourier series for periodic waveforms, Application to Electrical Systems – Effective value and average value of non-sinusoidal periodic waveforms, power factor, effect of harmonics

UNIT - V

Filters: Classification of filters-Low pass, High pass, Band pass and Band Elimination filters, Constant-k filters -Low pass and High Pass, Design of Filters.

Textbooks:

1. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, 8th Edition McGraw-Hill, 2013
2. Fundamentals of Electric Circuits, Charles K. Alexander, Mathew N. O. Sadiku, 3rd Edition, Tata McGraw-Hill, 2019

Reference Books:

1. Network Analysis, M. E. Van Valkenburg, 3rd Edition, PHI, 2019.
2. Network Theory, N. C. Jagan and C. Lakshminarayana, 1st Edition, B. S. Publications, 2012.
3. Circuits and Networks Analysis and Synthesis, A. Sudhakar, Shyam Mohan S. Palli, 5th Edition, Tata McGraw-Hill, 2017.
4. Engineering Network Analysis and Filter Design (Including Synthesis of One Port Networks)- Durgesh C. Kulshreshtha Gopal G. Bhise, Prem R. Chadha ,Umesh Publications 2012.
5. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai & Co., 2018, 7th Revised Edition.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/117/106/117106108/
2. https://archive.nptel.ac.in/courses/108/105/108105159/

II Year – I SEMESTER	DC MACHINES & TRANSFORMERS (V23 1210232)	L	T	P	C
		3	0	0	3

Course Objectives: This course enables the student to learn the principle, construction and performance characteristics of DC Machines and Transformers. This course also covers the various methods of speed control of DC motor and different connections of poly-phase transformers.

Course Outcomes:

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

CO1: Understand the process of voltage build-up in DC generators and characteristics.

CO2: Analyze the process of torque production, starting and speed control of DC motors and illustrate their characteristics.

CO3: Evaluate the equivalent circuit of single-phase transformer and determine its efficiency & regulation.

CO4: Analyse various configurations of three-phase transformers.

UNIT – I: DC Generators:

Construction and principle of operation of DC machines – EMF equation for generator – Excitation techniques – characteristics of DC generators –applications of DC Generators, Back-e.m.f and torque equations of DC motor – Armature reaction and commutation.

UNIT – II: DC Motors

Characteristics of DC motors – losses and efficiency – applications of DC motors. Necessity of a starter – starting by 3-point and 4-point starters – speed control by armature voltage and field current control – testing of DC machines – brake test, Swinburne's test –Hopkinson's test–Field Test.

UNIT – III: Single-phase Transformers

Introduction to single-phase Transformers (Construction and principle of operation)–e.m.f equation – operation on no-load and on load –lagging, leading and unity power factors loads –phasor diagrams– equivalent circuit –regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency.

UNIT –IV: Testing of Transformers

Open Circuit and Short Circuit tests – Sumpner's test – separation of losses— Parallel operation with equal and unequal voltage ratios– auto transformer – equivalent circuit – comparison with two winding transformers.

UNIT – V: Three-Phase Transformers:

Polyphone connections- Y/Y, Y/Δ, Δ/Y, Δ/Δ, open Δ and Vector groups – third harmonics in phase voltages– Parallel operation–three winding transformers- transients in switching –off load and on load tap changers–Scott connection.

Textbooks:

1. Electrical Machinery by Dr. P S Bimbhra, Fully Revised Edition, Khanna Publishers, New Delhi, 2021.
2. The Performance and Design of AC machines by M.G. Say,3rd Edition, CBS, 2017.

Reference Books:

1. Electrical Machines by D. P.Kothari, I .J .Nagarth, McGraw Hill Publications, 5th edition
2. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education 2011.
3. Generalized Theory of Electrical Machines by Dr. P S Bimbhra, 7th Edition, Khanna Publishers, 2021.
4. Theory & Performance of Electrical Machines by J.B.Gupta, S.K.Kataria& Sons,2007.
5. Electric Machinery by Fitzgerald, A.E.,Kingsley, Jr.,C.,& Umans, S. D, 7th edition, McGraw-Hill Education, 2014.

Online Learning Resources:

1. nptel.ac.in/courses/108/105/108105112
2. nptel.ac.in/courses/108/105/108105155

II Year – I SEMESTER	ELECTRICAL CIRCUIT ANALYSIS-II LAB (V23 1210261)	L	T	P	C
		0	0	3	1.5

Course Objectives:

The objective of this lab is to impart hands on experience in verification of circuit laws and theorems, circuit characteristics and time response of electrical circuits using simulation tools. It also provides practical exposure to the usage of CRO, power sources and function generator.

Course Outcomes:

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

CO1: Understand the power calculations in three phase circuits.

CO2: Evaluate the time response of given network.

CO3: Evaluate two port network parameters.

CO4: Simulate and analyse electrical circuits using suitable software.

List of Experiments

Any 10 of the following experiments are to be conducted:

1. Measurement of Active Power and Reactive Power for balanced loads.
2. Measurement of Active Power and Reactive Power for unbalanced loads.
3. Determination of Z and Y parameters.
4. Determination of ABCD and hybrid parameters
5. Verification of Kirchhoff's current law and voltage law using simulation tools.
6. Verification of mesh and nodal analysis using simulation tools.
7. Verification of super position and maximum power transfer theorems using simulation tools.
8. Verification of Reciprocity and Compensation theorems using simulation tools.
9. Verification of Thevenin's and Norton's theorems using simulation tools.
10. Verification of series and parallel resonance using simulation tools.
11. Simulation and analysis of transient response of RL, RC and RLC circuits.
12. Verification of self inductance and mutual inductance by using simulation tools.

II Year – I SEMESTER	DC MACHINES & TRANSFORMERS LAB (V23 1210262)	L	T	P	C
		0	0	3	1.5

Course Objectives:

This course enables the student to analyze the operation of dc machines and transformers, give practical exposure on the performance of dc machines and transformers.

Course Outcomes:

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

CO1: Demonstrate starting and speed control methods of DC Machines.
CO2: Apply theoretical concepts in analyzing the performance characteristics of DC Machines.
CO3: Examine the performance characteristics of DC machines using different testing methods.
CO4: Analyse the performance parameters of single-phase transformer.

List of Experiments

Any 10 of the following experiments are to be conducted:

1. Speed control of DC shunt motor by Field Current and Armature Voltage Control.
2. Brake test on DC shunt motor- Determination of performance curves.
3. Swinburne's test - Predetermination of efficiencies as DC Generator and Motor.
4. Hopkinson's test on DC shunts Machines.
5. Load test on DC compound generator-Determination of characteristics.
6. Load test on DC shunt generator-Determination of characteristics.
7. Fields test on DC series machines-Determination of efficiency.
8. Brake test on DC compound motor-Determination of performance curves.
9. OC & SC tests on single phase transformer.
10. Sumpner's test on single phase transformer.
11. Scott connection of transformers.
12. Parallel operation of Single-phase Transformers.
13. Separation of core losses of a single-phase transformer.

Online Learning Resources:

1. https://ems-iitr.vlabs.ac.in/List%20of%20experiments.html

II Year – I SEMESTER	SKILL ENHANCEMENT COURSE: DATA STRUCTURES LAB (V23 1210263)	L	T	P	C
		0	1	2	2

Course Objectives:

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

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

CO1: Identify the role of data structures in organizing and accessing data.
CO2: Design, implement, and apply linked lists for dynamic data storage.
CO3: Develop applications using stacks and queues.
CO4: Design and implement algorithms for operations on binary trees and binary search trees.
CO5: Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.

UNIT I

Introduction to Data Structures: Definition and importance of Data structures, Abstract data types (ADTs) and its specifications, **Arrays**: Introduction, 1-D, 2-D Arrays, accessing elements of array, Row Major and Column Major storage of Arrays, **Searching Techniques**: Linear & Binary Search, **Sorting Techniques**: Bubble sort, Selection sort, Quick sort.

Sample experiments:

1. Program to find min & max element in an array.
2. Program to implement matrix multiplication.
3. Find an element in given list of sorted elements in an array using Binary search.
4. Implement Selection and Quick sort techniques.

UNIT II

Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

Sample experiments:

1. Write a program to implement the following operations.
   a. Insert b. Deletion c. Traversal
2. Write a program to store name, roll no, and marks of students in a class using circular double linked list.
3. Write a program to perform addition of given two polynomial expressions using linked list.

UNIT III

Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

Sample experiments:

1. Implement stack operations using
   a. Arrays b. Linked list
2. Convert given infix expression into post fix expression using stacks.
3. Evaluate given post fix expression using stack.
4. Write a program to reverse given linked list using stack.

UNIT IV

Queues: Introduction to queues: properties and operations, Circular queues, implementing queues using arrays and linked lists, Applications of queues scheduling, etc.

Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.

Sample experiments:

1. Implement Queue operations using
   a. Arrays b. Linked list
2. Implement Circular Queue using
   a. Arrays b. Linked list
3. Implement Dequeue using linked list.

UNIT V

Trees: Introduction to Trees, Binary trees and traversals, Binary Search Tree – Insertion, Deletion & Traversal

Sample experiments:

1. Implement binary tree traversals using linked list.
2. Write program to create binary search tree for given list of integers. Perform in-order traversal of the tree. Implement insertion and deletion operations.

Textbooks:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

Reference Books:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders.

2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft.
3. Problem Solving with Algorithms and Data Structures by Brad Miller and David Ranum.
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein.
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick.

II Year – I SEMESTER	ENVIRONMENTAL SCIENCE (V23 121CCC1)	L	T	P	C
		2	0	0	--

Course Objectives:

- To make the students to get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers.

Course Outcomes:

After the completion of the course the student should be able to,

CO1: Grasp multi disciplinary nature of environmental studies and various renewable and Non-renewable resources.
CO2: Understand flow and bio-geo-chemical cycles and ecological pyramids.
CO3: Understand various causes of pollution and solid waste management and related Preventive measures.
CO4: About the rainwater harvesting, watershed management, ozone layer depletion and Waste land reclamation.
CO5: Casus of population explosion, value education and welfare programmes.

UNIT - I

Multidisciplinary Nature Of Environmental Studies:- Definition, Scope and Importance - Need for Public Awareness.

Natural Resources: Renewable and non-renewable resources - Natural resources and associated problems - Forest resources - Use and over - exploitation, deforestation, case studies - Timber extraction - Mining, dams and other effects on forest and tribal people - Water resources - Use and over utilization of surface and ground water - Floods, drought, conflicts over water, dams - benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources.

UNIT - II

Ecosystems: Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity And Its Conservation: Introduction 0 Definition: genetic, species and ecosystem diversity - Bio-geographical classification of India - Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels - India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT - III

Environmental Pollution: Definition, Cause, effects and control measures of:

a. Air Pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: floods, earthquake, cyclone and landslides.

Learning outcomes:

UNIT - IV

Social Issues and the Environment: From Unsustainable to Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people; its problems and concerns. Case studies - Environmental ethics: Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies - Wasteland reclamation - Consumerism and waste products - Environment Protection Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act - Issues involved in enforcement of environmental legislation - Public awareness.

UNIT - V

Human Population And The Environment: Population growth, variation among nations. Population explosion - Family Welfare Programmes- Environment and human health - Human Rights - Value Education - HIV/AIDS - Women and Child Welfare - Role of information Technology in Environment and human health - Case studies.

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

Textbooks:

1. Text book of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, "Environmental Studies", Pearson education
3. S.Azeem Unnisa, "Environmental Studies" Academic Publishing Company
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd.

Reference Books:

1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M. Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication.
3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice Hall of India Private limited
5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice Hall of India Private limited.

Online Learning Resources:

1. https://nptel.ac.in/courses/103107084

II Year – II SEMESTER	MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS (V23 122C4M1)	L	T	P	C
		3	0	0	3

Course Objectives:

- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

Course Outcomes:

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

CO1: Define the concepts related to Managerial Economics, financial accounting and management.
CO2: Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets
CO3: Apply the Concept of Production cost and revenues for effective Business decision
CO4: Analyze how to invest their capital and maximize returns
CO5: Evaluate the capital budgeting techniques
CO6: Develop the accounting statements and evaluate the financial performance of business entity.

UNIT – I Managerial Economics

Introduction - Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand-Demand Elasticity- Types - Measurement. Demand Forecasting-Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

UNIT – II Production and Cost Analysis

Introduction - Nature, meaning, significance, functions and advantages. Production Function – Least- cost combination - Short run and long run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

UNIT – III Business Organizations and Markets

Introduction - Nature, meaning, significance, functions and advantages. Forms of Business Organizations-Sole Proprietary - Partnership - Joint Stock Companies - Public Sector

Enterprises. Types of Markets -Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition - Oligopoly-Price-Output Determination - Pricing Methods and Strategies.

UNIT – IV Capital Budgeting

Introduction - Nature, meaning, significance, functions and advantages. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting - Features, Proposals, Methods and Evaluation. Projects - Pay Back Method, Accounting Rate of Return (ARR), Net Present Value (NPV), Internal Rate Return (IRR) Method (sample problems).

UNIT – V Financial Accounting and Analysis

Introduction - Nature, meaning, significance, functions and advantages. Concepts and Conventions-Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019.

Reference Books:

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

Online Learning Resources:

1. https://www.slideshare.net/123ps/managerial-economics-ppt
2. https://www.slideshare.net/rossanz/production-and-cost-45827016
3. https://www.slideshare.net/darkyla/business-organizations-19917607
4. https://www.slideshare.net/balarajbl/market-and-classification-of-market
5. https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
6. https://www.slideshare.net/ashu1983/financial-accounting

II Year – II SEMESTER	ANALOG CIRCUITS (V23 12202L1)	L	T	P	C
		3	0	0	3

Course Objectives:

- To acquire the basic knowledge on clippers, clampers & biasing circuits.
- To determine the h-parameters of a transistor circuit & understand the concepts of feedback amplifiers.
- To know the operation of oscillators and operational amplifier.
- To understand the applications of operational amplifier.
- To acquire the knowledge on IC 555 timer and their applications.
- To know the operation of Analog to Digital Converters and Digital to Analog Converters.

Course Outcomes:

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

CO1**:** Analyze diode clipping and clamping circuits. Understand different types of biasing circuits of a transistor.

CO2**:** Use small signal modeling for transistor circuit analysis and illustrate the operation of feedback amplifiers.

CO3**:** Understand operation of oscillators, operational amplifier and their applications.

CO4**:** Use 555 timers in multi-vibrators, Schmitt Trigger and PLL applications.

CO5**:** Describe the operation of different ADC's and DAC's.

Unit – 1:

Diode clipping and clamping circuits: Diode clippers, clipping at two independent levels, Transfer characteristics of clippers, clamping circuit operation.

DC biasing of BJTs: Load lines, Operating Point, Bias Stability, Collector-to-Base Bias, Self-Bias, Stabilization against Variations in V_{BE} and β for the Self-Bias Circuit, Bias Compensation, Thermal Runaway, Thermal Stability.

Unit – II:

Small Signals Modelling of BJT: Analysis of a Transistor Amplifier Circuit using h-parameters, Simplified CE Hybrid Model, Analysis of CE, CC, CB Configuration using Approximate Model, Frequency Response of CE and CC amplifiers.

Feedback Amplifiers: Classification of Amplifiers, the Feedback Concept, General Characteristics of Negative-Feedback Amplifiers, Effect of Negative Feedback upon Output and Input Resistances, Voltage-Series Feedback, Current-Series Feedback, Current-Shunt Feedback, Voltage-Shunt Feedback.

Unit – III: Oscillator Circuits: Barkhausen Criterion of oscillation, Oscillator operation, R-C phase shift oscillator, Wien bridge Oscillator, Crystal Oscillator.

Operational Amplifiers: Introduction, Basic information of Op-Amp, Ideal Operational Amplifier, Block Diagram Representation of Typical Op-Amp, OP-Amps Characteristics: Introduction, DC and AC characteristics, 741 op-amp & its features.

Unit – IV: OP-AMPS Applications: Introduction, Basic Op-Amp Applications, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converter, Sample and Hold Circuit, Log and Antilog Amplifier, Multiplier and Divider, Differentiator, integrator.

Comparators and Waveform Generators: Introduction, Comparator, Square Wave Generator, Monostable Multivibrator, Triangular Wave Generator, Sine Wave Generators.

Unit – V: Timers and Phase Locked Loop: Introduction to 555 timer, functional diagram, Monostable and A stable operations and applications, Schmitt Trigger, PLL block schematic, principles and description of individual blocks, 565 PLL, Applications of VCO (566).

Digital to Analog And Analog to Digital Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A-D Converters – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

Textbooks:

1. Electronic Devices and Circuits- J. Millman, C.Halkias, Tata Mc-Graw Hill, 2nd Edition, 2010.
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition, 2003.

Reference Books:

1. Electronic Devices and Circuit Theory – Robert L.Boylestad and Lowis Nashelsky, Pearson Edition, 2021.
2. Electronic Devices and Circuits–G.K. Mithal, Khanna Publisher, 23rd Edition, 2017.
3. Electronic Devices and Circuits – David Bell, Oxford, 5thEdition, 2008.
4. Electronic Principles–Malvino, Albert Paul, and David J. Bates, McGraw-Hill/Higher Education, 2007.
5. Operational Amplifiers and Linear Integrated Circuits– Gayakwad R.A, Prentice Hall India, 2002.
6. Operational Amplifiers and Linear Integrated Circuits –Sanjay Sharma, Kataria& Sons, 2ndEdition, 2010.

Online Learning Resources:

1. https://nptel.ac.in/courses/122106025.
2. https://nptel.ac.in/courses/108102112.

II Year – II SEMESTER	POWER SYSTEMS-I (V23 1220231)	L	T	P	C
		3	0	0	3

Pre-requisite: Electrical Circuit Analysis

Course Objectives:

The course aims to provide a comprehensive understanding of the principles of operation and major components of hydro, thermal, nuclear, and renewable power plants, as well as the construction and operational aspects of air and gas insulated substations. It also covers the various types of cables and distribution systems, along with an analysis of different load curves and tariff structures applicable to consumers.

Course Outcomes:

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

CO1: Understand the different types of power plants, operation of Hydroelectric & Thermal power plants.
CO2: Understand the Nuclear and renewable power plants
CO3: Understand the different components of air and gas insulated substations
CO4: Analyse different economic factors of power generation and tariffs.

Unit I: Hydroelectric & Thermal Power Stations:

Hydroelectric Power Station: Selection of site, general layout of a hydroelectric power plant with brief description of major components and principle of operation

Thermal Power Stations: Selection of site, general layout of a thermal power plant. Brief description of components: boilers, super heaters, economizers and electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.

Unit II: Nuclear Power Stations:

Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants, types of nuclear reactors and brief description of PWR, BWR and FBR. Radiation: radiation hazards and shielding, nuclear waste disposal.

Unit III: Renewable Power Station (Wind and Solar)

Solar Energy: Introduction –Measurement of Solar radiation, Types of collectors, Classification of solar energy storage system-Solar Power Plants-Classification of Solar Cells.

Wind Energy: Introduction - basic Components of Wind Energy Conversion system (WECS), Wind energy pattern factor (EPF) - Variation of power output with wind speed-Design of wind turbine rotor-Wind electric generating Power plant.

Unit IV: Substations:

Air Insulated Substations – indoor & outdoor substations, substations layouts of 33/11 kV 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, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams.

Gas Insulated Substations (GIS) – advantages of gas insulated substations, constructional aspects of GIS, comparison of air insulated substations and gas insulated substations.

UNIT V: Economic Aspects & Tariff:

Economic Aspects – load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor and plant use factor, base and peak load plants.

Tariff Methods– Costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two-part, three–part, and power factor tariff methods.

Text Books:

1. S. N. Singh, Electric Power Generation, Transmission and Distribution, PHI Learning Pvt Ltd, New Delhi, 2nd Edition, 2010
2. J.B.Gupta, Transmission and Distribution of Electrical Power, S.K.Kataria and sons, 10th Edition, 2012.
3. R.K Rajput, Non-Conventional Energy Sources and Utilisation, S. Chand,2012

Reference Books:

1. I.J. Nagarath & D.P. Kothari, Power System Engineering, McGraw-Hill Education, 3rd Edition, 2019.
2. C.L.Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International Publishers, 6th Edition, 2018.
3. V. K. Mehta and Rohit Mehta, Principles of Power System, S. Chand, 4th Edition, 2005.
4. Turan Gonen, Electric Power Distribution System Engineering, McGraw-Hill, 1985.
5. Handbook of switchgear, BHEL, McGraw-Hill Education, 2007.

Online Learning Resources:

1. https://nptel.ac.in/courses/108102047

II Year – II SEMESTER	INDUCTION MOTORS AND SYNCHRONOUS MACHINES (V23 1220232)	L	T	P	C
		3	0	0	3

Pre-requisite: Principles of Electromechanical Energy Conversion, Electromagnetic fields and Electrical Circuit Analysis.

Course Objectives: Students will get exposure to understand the concepts of

This course enables the student to understand the analysis and performance of single phase and poly phase Induction motors which are the major part of domestic appliances, control systems, drives and agricultural pump sets. It also deals with detailed analysis of synchronous generators and motors which are the prime sources of electrical power generation.

Course Outcomes:

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

CO1: Explain the construction and operation of three-phase induction motor.
CO2: Analyse the performance of three-phase induction motor.
CO3: Examine the working of single-phase induction motors.
CO4: Analyse the performance of Synchronous generators and motors.

UNIT-I: 3-phase induction motors:

Construction of Squirrel cage and Slipring induction motors– production of rotating magnetic field – principle of operation – rotor e.m.f and rotor frequency – rotor current and power factor at standstill and during running conditions– rotor power input, rotor copper loss and mechanical power developed and their inter-relationship –equivalent circuit – phasor diagram

UNIT-II: Performance of 3-Phase induction motors:

Torque equation – expressions for maximum torque and starting torque – torque-slip characteristics – double cage and deep bar rotors –No load, Brake test and Blocked rotor tests – circle diagram for predetermination of performance- methods of starting –starting current and torque calculations -speed control of induction motor with V/f control method, rotor resistance control and rotor e.m.f injection technique –crawling and cogging.

UNIT – III: Single Phase Motors:

Single phase induction motors – constructional features – double revolving field theory, Cross field theory – equivalent circuit- starting methods: capacitor start capacitor run, capacitor start induction run, split phase & shaded pole, AC series motor.

UNIT–IV: Synchronous Generator:

Constructional features of non-salient and salient pole type alternators- armature windings – distributed and concentrated windings – distribution& pitch factors – E.M.F equation – armature reaction – voltage regulation by synchronous impedance method – MMF method

and Potier triangle method –two reaction analysis of salient pole machines -methods of synchronization- Slip test – Parallel operation of alternators.

UNIT–V: Synchronous Motor:

Synchronous motor principle and theory of operation – Effect of excitation on current and power factor– synchronous condenser –expression for power developed –hunting and its suppression – methods of starting.

Text Books:

1. Electrical Machinery, Dr. P.S. Bhimbra, Khanna Publishing, 2021,First Edition.
2. The Performance and Design of AC machines by M.G. Say,3rd Edition, CBS, 2017.

Reference Books:

1. Electrical machines, D.P. Kothari and I.J. Nagrath, McGraw Hill Education, 2017, Fifth Edition.
2. Theory & Performance of Electrical Machines by J.B.Gupta, S.K.Kataria& Sons, 2007.
3. Electric Machinery, A.E.Fitzgerald, Charles kingsley, Stephen D.Umans, McGraw-Hill, 2020, Seventh edition.

Online Learning Resources:

1. nptel.ac.in/courses/108/105/108105131
2. https://nptel.ac.in/courses/108106072

II Year –II SEMESTER	CONTROL SYSTEMS (V23 1220233)	L	T	P	C
		3	0	0	3

Pre-requisite: Basic Engineering Mathematics

Course Objectives:

The objective of this course is to introduce the concepts of open loop and closed loop systems and to study the characteristics of the given system in terms of the transfer function and state variable approach. It also provides the concepts of the system response in time-domain and frequency domain in terms of various performance indices.

Course Outcomes:

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

CO1: Derive the transfer function of physical systems and determine overall transfer function using block diagram algebra and signal flow graphs.

CO2: Obtain the time response of first and specifications of second order systems and determine error constants. Analyze the absolute and relative stability of LTI systems using Routh's stability criterion and root locus method.

CO3: Analyze the stability of LTI systems using frequency response methods.

CO4: Design Lag, Lead, Lag-Lead compensators to improve system performance using Bode Diagrams.

CO5: Apply state space analysis concepts to represent physical systems as state models, derive transfer function and determine the response. Understand the concepts of controllability and observability

UNIT – 1 Mathematical Modelling Of Control Systems

Classification of control systems - open loop and closed loop control systems and their differences - Feedback characteristics - transfer function of linear system, differential equations of electrical networks- translational and rotational mechanical systems - transfer function of Armature voltage controlled DC servo motor - block diagram algebra – representation by signal flow graph – reduction using Mason's gain formula.

UNIT – 2 Time Response Analysis

Standard test signals – time response of first and second order systems – time domain specifications - steady state errors and error constants - effects of proportional (P) - proportional integral (PI) - proportional derivative (PD) proportional integral derivative (PID) systems.

Stability And Root Locus Technique

The concept of stability – Routh's stability criterion – limitations of Routh's stability, root locus concept – construction of root loci (simple problems) - Effect of addition of Poles and Zeros to the transfer function.

UNIT – 3 Frequency Response Analysis

Introduction to frequency domain specifications – Bode diagrams – transfer function from the Bode diagram –Polar plots, Nyquist stability criterion- stability analysis using Bode plots (phase margin and gain margin).

UNIT – 4 Classical Control Design Techniques

Lag, lead, lag-lead compensators - physical realisation - design of compensators using Bode plots.

UNIT – 5 State Space Analysis of LTI Systems

Concepts of state - state variables and state model - state space representation of transfer function: Controllable Canonical Form - Observable Canonical Form - Diagonal Canonical Form - diagonalization using linear transformation - solving the time invariant state equations State Transition Matrix and its properties- concepts of controllability and observability.

Text Books:

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India, 2010.
2. Automatic control systems by Benjamin C.Kuo, Prentice Hall of India, 2nd Edition.

Reference Books:

1. Control Systems principles and design by M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th Edition.
2. Control Systems Engineering by Norman S. Nise, Wiley Publications, 7th edition
3. Control Systems by Manik Dhanesh N, Cengage publications.
4. Control Systems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition.
5. Control Systems Engineering by S.Palani, Tata Mc Graw Hill Publications.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/107/106/107106081/
2. https://archive.nptel.ac.in/courses/108/106/108106098/
3. https://nptelvideos.com/video.php?id=1423&c=14

II Year – II SEMESTER	INDUCTION MOTORS AND SYNCHRONOUS MACHINES LAB (V23 1220261)	L	T	P	C
		0	0	3	1.5

Course Objectives: The objectives of this course is

This course enables the student to know the operation of various ac machines and give practical exposure on the performance of various AC machines like induction motors and synchronous machines.

Course Outcomes:

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

CO1: Aanalyse the speed control methods on 3-phase Induction Motor.
CO2: Evaluate the performance of 3-phase Induction Motor by obtaining the locus diagram and equivalent circuit of 3-phase Induction Motor
CO3: Aanalyse the power factor improvement methods for single phase Induction Motor
CO4: Evaluate the regulation of 3-phase alternator
CO5: Examine the synchronous machine reactance of 3-phase alternator

List of Experiments

Any 10 experiments of the following are required to be conducted

1. Brake test on three phase Induction Motor.
2. Circle diagram of three phase induction motor.
3. Speed control of three phase induction motor by V/f method.
4. Equivalent circuit of single-phase induction motor.
5. Power factor improvement of single-phase induction motor by using capacitors.
6. Load test on single phase induction motor.
7. Regulation of a three -phase alternator by synchronous impedance &MMF methods.
8. Regulation of three-phase alternator by Potier triangle method.
9. V and Inverted V curves of a three-phase synchronous motor.
10. Determination of X_d, X_q& Regulation of a salient pole synchronous generator.
11. Determination of efficiency of three phase alternator by loading with three phase induction motor.
12. Parallel operation of three-phase alternator under no-load and load conditions.
13. Determination of efficiency of a single-phase AC series Motor by conducting Brake test.

Online Learning Resources:

1. https://em-coep.vlabs.ac.in/List%20of%20experiments.html

II Year – II SEMESTER	CONTROL SYSTEMS LAB (V23 1220262)	L	T	P	C
		0	0	3	1.5

Course Objectives:

The objective of this course is to impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers, D.C. servo motors. It also provides knowledge on time and frequency responses of control system with and without controllers and compensators and on different logic gates and Boolean expressions using PLC.

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

CO1: Analyze the performance of Magnetic amplifier, D.C and A.C. servo motors and synchros.

CO2: Design of PID controllers and compensators.

CO3: Evaluate temperature control of an oven using PID controller

CO4: Determine the transfer function of D.C Motor and examine the truth table of logic gates using PLC.

CO5: Judge the stability in time and frequency domain and Kalman's test for controllability and observability.

List of Experiments

Any 10 of the following experiments are to be conducted:

1. Analysis of Second order system in time domain
2. Characteristics of Synchrons
3. Effect of P, PD, PI, PID Controller on a second order systems
4. Design of Lag and lead compensation – Magnitude and phase plot
5. Transfer function of DC motor
6. Root locus, Bode Plot and Nyquist Plot for the transfer function of systems up to 5^{th} order using MATLAB.
7. Kalman's test of Controllability and Observability using MAT LAB.
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor
11. Characteristics of DC servo motor
12. Study and verify the truth table of logic gates and simple Boolean expressions using PLC.

II Year – II SEMESTER	SKILL ENHANCEMENT COURSE: PYTHON PROGRAMMING LAB (V23 1220263)	L	T	P	C
		0	1	2	2

Course Objectives:

The main objectives of the course are to

- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

UNTI-I:

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
   i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

UNIT-II:

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. Write a program to find the length of the string without using any library functions.
4. Write a program to check if the substring is present in a given string or not.
5. Write a program to perform the given operations on a list:
   i. addition ii. insertion iii. slicing
6. Write a program to perform any 5 built-in functions by taking any list.

UNIT-III:

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Experiments:

7. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
8. Write a program to count the number of vowels in a string (No control flow allowed).
9. Write a program to check if a given key exists in a dictionary or not.
10. Write a program to add a new key-value pair to an existing dictionary.
11. Write a program to sum all the items in a given dictionary.

UNIT-IV:

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.

2. Python program to print each line of a file in reverse order.
3. Python program to compute the number of characters, words and lines in a file.
4. Write a program to create, display, append, insert and reverse the order of the items in the array.
5. Write a program to add, transpose and multiply two matrices.
6. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V:

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

1. Python program to check whether a JSON string contains complex object or not.
2. Python Program to demonstrate NumPy arrays creation using array () function.
3. Python program to demonstrate use of ndim, shape, size, dtype.
4. Python program to demonstrate basic slicing, integer and Boolean indexing.
5. Python program to find min, max, sum, cumulative sum of array
6. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
    a) Apply head () function to the pandas data frame
    b) Perform various data selection operations on Data Frame
7. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

Reference Books:

1. Gowri shankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Online Learning Resources/Virtual Labs:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai

https://www.coursera.org/learn/python?specialization=python#syllabus

II Year – II SEMESTER	DESIGN THINKING & INNOVATION LBA (V23 122CC64)	L	T	P	C
		1	0	2	2

Course Objectives:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcomes:

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

CO1: Define the concepts related to design thinking.
CO2: Explain the fundamentals of Design Thinking and innovation
CO3: Apply the design thinking techniques for solving problems in various sectors.
CO4: Analyse to work in a multidisciplinary environment
CO5: Evaluate the value of creativity
CO6: Formulate specific problem statements of real time issues

UNIT – I : Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT – II : Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development.

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT – III : Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT – IV : Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

UNIT – V: Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Activity: How to market our own product, About maintenance, Reliability and plan for startup.

Textbooks:

1. Change by design, Tim Brown, Harper Bollins (2009)
2. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Sons.

Reference Books:

1. Design Thinking in the Classroom by David Lee, Ulysses press
2. Design the Future, by Shrrutin N Shetty, Norton Press
3. Universal principles of design- William lidwell, kritinaholden, Jill butter.
4. The era of open innovation – chesbrough.H

Online Learning Resources:

1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/preview

II Year – II SEMESTER	COMPLEX VARIABLES & NUMERICAL METHODS (V23 1210221)	L	T	P	C
		3	0	0	3

Course Objectives:

- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To familiarize the complex variables.
- To equip the students to solve application problems in their disciplines.

Course Outcomes:

1. Evaluate the approximate roots of polynomial and transcendental equations by different algorithms. Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals

2. Apply numerical integral techniques to different Engineering problems. Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations

3. Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic

4. Evaluate the Taylor and Laurent expansions of simple functions, determining the nature of the singularities and calculating residues. Make use of the Cauchy residue theorem to evaluate certain integrals

5. Explain properties of various types of conformal mappings

UNIT – I: Iterative Methods:

Introduction – Solutions of algebraic and transcendental equations: Bisection method – Secant method – Method of false position – General Iteration method – Newton-Raphson method (One variable &Simultaneous Equations)

Interpolation: Newton's forward and backward formulae for interpolation – with unequal intervals – Lagrange's interpolation formula Interpolation

UNIT – II: Numerical integration, Solution of ordinary differential equations with initial conditions: Trapezoidal rule– Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations
Single step method– Euler's method –Modified Euler's method-Runge- Kutta method (second and fourth order)
Multi step method – Milne's Predictor and Corrector Method.

UNIT – III: Functions of a complex variable and Complex integration:

Introduction – Continuity – Differentiability – Analyticity –Cauchy-Riemann equations in Cartesian and polar coordinates – Harmonic and conjugate harmonic functions – Milne – Thompson method.
Complex integration: Line integral – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (all without proofs) and problems on above theorems.

UNIT – IV: Series expansions and Residue Theorem:

Radius of convergence – Expansion of function in Taylor's series, Maclaurin's series andLaurent series.
Types of Singularities: Isolated – Removable Singularities-Essential singularities –Pole of order m– Residues – Residue theorem (without proof)

– Evaluation of real integral of the types $\int_0^{2\pi} f(cos\theta, sin\theta)d\theta$ $\int_{-\infty}^{\infty} f(x)dx$ and

UNIT – V: Conformal mapping:
Transformation by e^z, lnz, z^2, z^n (n positive integer), Sin z, cos z, z + a/z. Translation, rotation, inversion and bilinear transformation – fixed point – cross ratio – properties – invariance of circles and cross ratio – determination of bilinear transformation mapping 3 given points .

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 44^{th} Edition, Khanna Publishers.
2. **Micheael Greenberg,** Advanced Engineering Mathematics, 2^{nd} edition, Pearson edition.

Reference Books:

1. **Erwin Kreyszig,**Advanced Engineering Mathematics, 10^{th} Edition, Wiley-India.
2. **B. V. Ramana,**Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. **Steven C. Chapra,** Applied Numerical Methods with MATLAB for Engineering and Science,Tata Mc. Graw Hill Education.
4. **M. K. Jain, S.R.K. Iyengar and R.K. Jain,** Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
5. **J. W. Brown and R. V. Churchill**, Complex Variables and Applications, 9^{th}edition,Mc-Graw Hill, 2013.