Scheme of Instruction & Examination
B.E. SECOND YEAR, IV SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING
Semester - IV

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			Hours per week				Maximum Marks		
			L	T	P/D	Duration in Hrs	CIE	SEE	
Theory Courses									
1	4HS403BM	Managerial Economics & Financial Accounts	3	-	-	3	40	60	3
2	4PC404EE	Power Systems-I	3	-	-	3	40	60	3
3	4PC405EE	Electrical Machines-I	3	-	-	3	40	60	3
4	4PC406EE	Control Systems	3	-	-	3	40	60	3
5	4PC407EE	Electrical Circuits-II	3	1	-	4	40	60	4
6	4ES405CS	Python Programming	3	-	-	3	40	60	3
7	4MC403HS	Indian Constitution	2	-	-	2	40	60	-
Laboratories									
8	4PC452EE	Electrical Circuits Lab	-	-	2	2	40	60	1
9	4PC453EE	Control Systems Lab	-	-	2	2	40	60	1
10	4ES455CS	Python Programming Lab	-	-	2	2	40	60	1
Total			**20**	**1**	**6**	**27**	**400**	**600**	**22**

HS: Humanities and Social Sciences BS: Basic Science ES: Engineering Science
MC: Mandatory Course PC: Professional Core
L:Lecture T:Tutorial P:Practical D:Drawing
CIE: Continuous Internal Evaluation
SEE: Semester End Evaluation (Univ. Exam) EE: Electrical Engg.

Note:
1. Each contact hour is a clock hour.
2. The duration of the practical class is two hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

Course Code	Course Title	Core/Elective					
4HS403BM	MANAGERIAL ECONOMICS & FINANCIAL ACCOUNTS	Core					
		L	T	P/D	Credits	CIE	SEE
		3	-	-	3	40	60

Prerequisite : Basics of Managerial Economics & Financial Accountancy.

COURSE OBJECTIVES :

To understand responsibilities of a manager of a business undertaking

1. To analyze various determinants influencing demand and price
2. To understand the principles of accounting and prepare Journal, Ledger, Trial Balance & Final accounts
3. To understand Financial statement Analysis
4. To evaluate &analyze the long term investments

COURSE OUTCOMES :

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

1. Determine the responsibilities & decision making in the Organization
2. Understand various factors influencing demand & market structure
3. Understand the principles of Accounting & solve the problems
4. Analyze the Financial performance
5. Understand the capital structure& to take decision on selection of projects

UNIT - I

Introduction to Managerial Economics its Scope, Importance and relation to other sciences, its usefulness to Engineers- Basic concepts of Managerial Economics - Theory of firm.

UNIT-II

Demand Analysis: Introduction to demand, determinants, law of demand, its assumptions, Elasticity of demand-price, income and cross elasticity, demand forecasting, Market competitive structure, price & output determination under perfect competition and Monopoly.

UNIT - III

Basics of Accounting: Financial Accounting–Definition- Accounting Cycle - Journal - Ledger and Cash book - Trial Balance Book- Preparation of final accounts with simple adjustments (including Problems)

UNIT - IV

Financial statement Analysis: Importance-Users-Ratio Analysis-liquidity, solvency, turnover and profitability ratios.

UNIT - V

Capital management : Significance determinates and estimation of fixed and working capital requirements, sources of capital. Introduction to capital budgeting, **Time Value of money - Methods :** Non-Discounted cash flow methods (pay back, ARR), Discounted (NPV, PI, IRR) with problems.

TEXT BOOKS :

1. Mehta P.L., Managerial Economics, Sultan Chand & Sons Publishers.
2. Managerial Economics - A Problem Solving Approach , by Luke M Froeb.
3. I.M.Panday Financial Management, Vikas Publishing House.
4. Maheswari S.N. Introduction to Accountancy. Vikas Publishing House.

REFERENCES/SUGGESTED READING :

1. C .L.Varshney, K.L.Maheshwari, Managerial Economics, Sultan Publishers
2. D.M.Mithani, Managerial Economics, Himalaya Publishing House
3. Mukherjee, Hanif, Financial Accounting, Tata McGraw Hill
4. Ramachandran , Kakani, Financial Accounting for Management , Tata McGraw Hill

Course Code	Course Title	Core/Elective					
4PC404EE	POWER SYSTEMS-I	Core					
		L	T	P/D	Credits	CIE	SEE
		3	-	-	3	40	60

Prerequisite: Thermal, Hydel, Nuclear and Gas, Insulators, and Distribution Systems.

COURSE OBJECTIVES :

The objective of this course is to make the student

1. Have a fair knowledge about the fundamentals of various conventional power plants like Thermal, Hydel, Nuclear and Gas.
2. Acquire the knowledge of different types of Non conventional energy generation methods like Solar, Wind, Ocean Thermal Energy Conversion (OTEC), Tidal and Geo thermal.
3. Understand the Economics of Power Generation, Types of costs, Depreciation, methods of P.f. improvement, Tariffs
4. Have the knowledge of construction of Over head lines, materials, Supports, insulators and Underground cables.
5. General aspects of AC & DC distribution systems.

COURSE OUTCOMES :

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

1. Analyze economic aspects of power generation.
2. Demonstrate the Layout and operation of Hydel and Thermal power plants.
3. Explain the layout, operation and importance of renewable energy sources and Nuclear power plants.
4. Understand the different types of DC and AC distribution and its calculations.
5. Analyze the mechanical design of transmission lines and concept of underground cables Analyze the Inductance and Capacitance calculations of Transmission lines.

UNIT-I :

Steam Power Stations: Selection of site, operation, Layout & various parts of station: Economizer, super heater, Air pre-heater, Electrostatic precipitator, turbine, cooling towers, Coal handling and ash handling, Types of Boilers. Advantages and disadvantages of Steam power generation.

Hydro-Electric Power plants: Selection of site, Types of hydro-electric plants and layouts, Hydrograph, Flow duration curve, Mass curve. Advantages and disadvantages of Hydro electric power generation.

UNIT - II :

Alternate Power sources: Nuclear power: Fissile materials, Nuclear Fission and Chain reaction Layout and types of nuclear reactors, Advantages and disadvantages, **Solar power:** selection of site, working principle, types of solar collectors. **Wind power:** selection of site, working principle and layout. Gas power plants: working principle and layout, waste to energy.

UNIT - III :

Economics of Power Generation: Load Curve, Load Duration curve, Average load, Load factor, Demand factor, Diversified factors, plant capacity factor and plant use factor - Numerical problems. Base Load and Peak load operation, Types of costs and types of tariffs, Methods of power factor improvement, Most economical p.f. for constant KW load and constant KVA type loads.

Distribution: General aspects of AC and DC distribution systems.

DC Systems: ring main, Radial, Voltage drop calculations, Distributor fed at one end, Distributor fed at both ends. Numerical problems.

UNIT - IV:

Inductance and Capacitance of Transmission Lines: Calculation of resistance, inductance and capacitance of transmission lines, single phase and 3-phase lines with symmetrical and asymmetrical spacing, composite conductors, GMR and GMD Spacing, transposition, bundled conductors, Numerical problems

UNIT - V:

Over-Head Lines: Construction of Overhead lines - Overhead line materials, Equation of Sag for equal and unequal supports, sag and tension calculations, Effect of wind and ice on sag - Numerical problems.

Insulators: Types of insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, Testing of insulators. Numerical problems

Underground Cables: Conductors for cables, Insulating materials, Mechanical protection, LV, HV and EHV cables, Grading of cables, Capacitance of three-core cables.

TEXT BOOKS :

1. .L. Wadhwa, Electrical Power Systems, Wiley Eastern Ltd. 5thEdition, 2005.(Unit 1-4)
2. C.L.Wadhwa, Generation, Distribution and Utilizationof Electrical Energy, Wiley Eastern Ltd., 5th Edition, 2005. (Unit 1,2)
3. S.N.Singh - Electrical Power Generation, Transmission and Distribution-Prentice Hall pvt.ltd.New-2003.(Unit1-5)
4. Principles of Power Systems - V.K Mehta and Rohit Mehta S. Chand& Company Ltd, New Delhi 2004. (Unit 1-5)

REFERENCES/SUGGESTED READING:

1. Power System Engineering - R. K. Rajput
2. Power System Engineering - Kothari & Nagrath

Course Code	Course Title	Core/Elective					
4PC405EE	ELECTRICAL MACHINES-I	Core					
		L	T	P/D	Credits	CIE	SEE
		3	-	-	3	40	60

Prerequisite : Elements of Electrical and Electronics Engineering, Electro Magnetic Fields, Electrical Circuits.

COURSE OBJECTIVES :

The objective of this course is to make the student

1. To introduce the concepts of magnetic circuits.
2. To impart knowledge on working and applications of DC machines.
3. To gain an understanding on analysis and performance of DC Machines and Transformers.

COURSE OUTCOMES :

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

1. Analyze the concepts of energy conversion principles.
2. Analyze the operation and control of DC machines.
3. Analyze single phase transformers circuits.
4. Identify proper type of motors suitable for given application.
5. Understand the configurations of auto transformers and 3-phase transformers.

UNIT-I

Electromechanical Energy Conversion Principles: Principles of energy conversion, single excited and doubly excited magnetic systems, singly excited electric field systems, Faraday's law, Lenz's law

UNIT-II

DC Machines: Constructional features and principle of operation of DC machines as Generator and Motor , Simplex and multiplex lap and wave windings; Separately excited, series and shunt, cumulatively and differentially compound excited motoring and generating mode of operation and their characteristics, applications of DC machines; Armature reaction, demagnetizing and cross magnetizing ampere-turns, compensating windings, commutation process and methods of commutation, role of inter poles and compensating winding. Problems on emf equation, torque equation and armature reaction.

UNIT-III

Speed Control of DC Motors: Speed control of shunt & series motors, losses in DC

machines and calculation of efficiency. Need for starters and Starters for DC series shunt and compound motors. Testing of DC Motors: No-load test, load tests and regenerative tests such as Swinburne's Test, Direct load test, Hopkinson's test, Field's test and Retardation test. Calculation of efficiency based on all the above tests.

UNIT-IV

Single-Phase Two Winding Transformers: Construction, principle of operation, E.M.F. equation, phasor diagrams; Equivalent circuit, determination of equivalent circuit parameters, Predetermination of performance equivalent circuit parameters and Sumpner's test. Losses, separation of no-load losses, calculation of efficiency and regulation by direct and indirect methods, conditions for maximum efficiency. Concept of all-day efficiency. Parallel operation of transformers and Load sharing.

UNIT -V

Auto Transformers and 3-Phase Transformers: Principle of operation of Auto Transformers, saving of copper compared to two-winding transformer and its application. Three-Phase Transformers: Merits of three phase Transformers over three phase transformer bank Type of connections such as Delta-Delta, Delta-Star, Star-Delta, Delta-Star, V-V connection and T-T Connections.

TEXT BOOKS :

1. Electrical Machinery, Theory: Performance & Applications, Dr. P. S. Bimbhra, Khanna Publishers, 2021.
2. Fitzgerald and Kingsley's electric machinery by Stephen D. Umans–TMH Publishers, 7th Edition, 2020.
3. Nagarath & D.P.Kothari: ElectricalMachines,TMH Publishers,5th edition 2017.
4. Theory& Performance of Electrical Machines by J.B. Gupta, S.K. Kataria & Sons, 5th Edition, 2013.
5. The Performance and Design of Direct Current Machines, A.E .Clayton & NN Hancock, CBS Publishers, 2004. 3. Electric Machines, P. S Bimbhra- 2nd Edition, Khanna Publishers,2017.

REFERENCES/SUGGESTED READING:

1. A. E. Fitzgerald and C. Kingsley, Electric Machinery, McGraw HillEducation, 6th Edition, 2005.
2. M. G. Say, Performance and design of AC machines, CBS Publishers, 2002.
3. A. S. Langsdorf, Theory of Alternating current machinery, 2nd Edition, McGraw Hill Education, 1984.

Course Code	Course Title	Core/Elective					
4PC406EE	CONTROL SYSTEMS	Core					
		L	T	P/D	Credits	CIE	SEE
		3	-	-	3	40	60

Prerequisite : Basics of circuits, Laplace transform, Inverse Laplace transform and partial fractions.

COURSE OBJECTIVES :

The objective of this course is to make the student

1. Efficient in modeling of electrical and mechanical systems, using differential equations, transfer functions, block diagrams, and state variables.
2. Analyze of properties of control systems, such as sensitivity, stability, controllability, tracking, in time and frequency domains.
3. Design of feedback controllers, such as PID, lead and lag compensation.
4. Understand and develop the state space representation of control systems.

COURSE OUTCOMES :

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

1. Analyze the concept of control systems, feedback, Mathematical modeling of Electrical and Mechanical systems.
2. Analyze the time domain and frequency response analysis of control systems
3. Apply the knowledge of various analytical techniques used to determine the stability of control systems and Analyze the stability of systems and understand the importance of compensators.
4. Demonstrate controllability and observability of modern control systems.

UNIT-I

Introduction to Control Systems: Classification of control systems, Feed-Back Characteristics, Effects of feedback, Error sensing devices -Transfer function-Potentiometers, F-I and F-V analogous systems, synchros, AC-DC servo motors-Block diagram reduction technique, Transfer function and impulse response, Signal flow graph, Mason's gain formula.

UNIT-II

Time Response Analysis: Standard test signals - Time response of first order systems - Transient response of second order system for unit step input, Time domain

specifications- Types of system- Order of a system-Steady state response –Steady state errors and error constants – PID controllers

UNIT-III

Stability Analysis in S-Domain: The concept of stability - Routh's stability Criterion, Absolute stability and relative stability, Limitations of Routh's stability, Nyquist stability criterion, Principle of argument.

Root Locus Technique: The root locus concept, Construction of root loci, Effects of adding poles and zeros on the root loci.

UNIT-IV:

Frequency Response Analysis: Introduction to frequency response - Frequency domain specifications - Bode plot - Stability analysis from Bode plots - Determination of transfer function from the Bode Diagram - Polar Plots, Gain margin and phase margin, Compensation: Lead, Lag, Lead – Lag Compensation using bode plot

UNIT-V

State Space Analysis: Concepts of state, State variables and state model, Derivation of state models from transfer functions and differential equations. Controllable, Observable and Diagonal state models - State transition matrix - Solution of state equations by time domain method - Concepts of Controllability and Observability

TEXT BOOKS :

1. Control System Engineering, I.J. Nagrath, M. Gopal, New Age International (P) Limited publishers, 2008. (Unit 1-5)
2. Control System Principles and Design, M. Gopal, Tata McGraw Hill, 2nd Edition, 2003 (Unit 1-5).
3. Control systems, A.NagoorKani, RBA publications, 3rd Edition, 2015. (Unit 1-5).
4. Automatic control systems, S.Hasan saeed, KATSON Books, 8th Revised Edition, 2014. (Unit 1-5)

REFERENCES/SUGGESTED READING:

1. "Modern Control Systems", K. Ogata Prentice Hall of India, 4th Edition,2002.
2. "Automatic control systems", B.C.Kuo, Wiley India, 7th Edition, 2002.
3. "Control systems", N.C.Jagan, B.S Publications, 2nd Edition, 2008.

Course Code	Course Title	Core/Elective					
4PC407EE	ELECTRICAL CIRCUITS-II	Core					
		L	T	P/D	Credits	CIE	SEE
		3	1	-	3	40	60

Prerequisite : Circuit concepts, Electrical Circuits -I

COURSE OBJECTIVES :

The objective of this course is to make the student

1. To understand Magnetic Circuits, Network Topology.
2. To evaluate Network parameters of given Electrical network.
3. To analyze various types of filters and attenuators.
4. To study the aspects of network synthesis and analysis of two port networks.

COURSE OUTCOMES :

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

1. Knowledge about different network parameters and their relations.
2. Analyze the Electrical Circuits with the concept of Network topology.
3. Determine the parameters for the design of various filters.
4. Find network functions and two port parameters.
5. Represent the transfer function for the given network.

UNIT-I:

Network Parameters: Two port network parameters – Z, Y, ABCD and hybrid parameters and their relations. Cascaded networks, concept of transformed network – two-port network parameters using transformed variables.

UNIT-II:

Network Functions: The concept of Complex Frequency, Physical Interpretation of Complex Frequency, Transform Impedance and Transform Circuits, Series and parallel Combination of Elements, Terminal Pairs or Ports, Networks Functions for the One-port and Two-port, Poles and Zeros of Network Functions, Significance of poles and Zeros, Properties of Driving Point Functions, Properties of Transfer Functions, Necessary Conditions for Driving Point Functions, Necessary Conditions for Transfer Functions, Time Domain Response from Pole Zero Plot.

UNIT-III:

Network Synthesis: Hurwitz polynomials, Positive Real Functions, Frequency Response of Reactive One-ports, Synthesis of Reactive One-ports by Foster's Method, Synthesis of Reactive One-ports by Cauer Method, Synthesis of RL network by Foster's Method, Synthesis of RL network by Cauer's Method, Synthesis of RC network by Foster's Method, Synthesis of RC network by Cauer's Method.

UNIT-IV:

Graph Theory: Definitions, Incidence matrix, Properties of Incidence matrix, Incidence matrix and KCL, Tie-Set matrix, Tie-Set matrix and link currents, Cut-Set matrix, Cut-Set matrix and Branch Voltages, Mesh Analysis, Nodal Analysis.

UNIT-V:

Filters and Attenuators: Classification of filters- Low Pass, High Pass, Band Pass, Band Elimination filters, Filter networks, equation of filter networks, Prototype filter design. Attenuators- classification.

TEXT BOOKS :

1. M E Van Valkenberg, "Network Analysis", PHI, 3rd Edition, 2014.
2. Fundamentals of electric circuits by Charles K.Alexander and N.O.Sadiku, Fifth Edition

REFERENCES/SUGGESTED READING:

1. John Bird, "Electrical Circuit Theory and Technology", Newnes, 2nd Edition, 2003.
2. C L Wadhwa, "Electrical Circuit Analysis including Passive Network Synthesis", New Age International, 2 nd Edition, 2009.
3. David A Bell, "Electric circuits", Oxford University Press, 7th Edition, 2009.
4. E Hughes, "Electrical and Electronics Technology", Pearson Education, 2010.
5. A Chakrabarthy, "Electric Circuits", Dhanipat Rai & Sons, 6th Edition, 2010.

Course Code	Course Title	Core/Elective					
4ES405CS	PYTHON PROGRAMMING	Core					
		L	T	P/D	Credits	CIE	SEE
		3	-	-	3	40	60

Prerequisite : Experience with a high level language (C/C++, Java, MATLAB) is suggested.

COURSE OBJECTIVES :

The objective of this course is to make the student

1. To be able to introduce core programming basics and program design with functions using Pythonprogramming language.
2. To understand a range of Object-Oriented Programming, as well as in-depth data and information processing techniques.
3. To understand the high-performance programs designed to strengthen the practical expertise.

COURSE OUTCOMES :

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

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Create, run and manipulate Python Programs using core data structures like Lists, Tuples and Dictionaries.
4. Interpret the concepts of Object-Oriented Programming as used in Python.
5. Create and animate a variety of shapes and develop an application with graphical user interface (GUI).
6. Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

UNIT-I :

Introduction to Python: installing Python, basic syntax, interactive shell, editing, saving, and running a script. The concept of data types, variables, assignments, immutable variables, numerical types, arithmetic operators and expressions, comments

in the program, understanding error messages. Conditions, Boolean logic, logical operators, ranges, Control statements.

UNIT-II:

Strings and Files: Strings and text files, manipulating files and directories, os and sys modules, text files: reading/writing text and numbers from/to a file, creating and reading a formatted file (csv or tab-separated). String manipulations: subscript operator, indexing, slicing a string, strings and number system: converting strings to numbers and vice versa.

Lists, tuples, and dictionaries

basic list operators, replacing, inserting, removing an element, searching and sorting lists, dictionary literals, adding and removing keys, accessing and replacing values, traversing dictionaries.

UNIT – III :

Design with functions: Hiding redundancy, complexity, arguments and return values, formal vs actual arguments, named arguments. Program structure and design. Recursive functions.

Classes and OOP: Classes, objects, attributes and methods, defining classes, design with classes, data modeling, persistent storage of objects, inheritance, polymorphism, operator overloading (_eq_, _str_, etc), abstract classes, exception handling, try block.

UNIT - IV :

Simple Algorithms and Data structures: Search Algorithms, Sorting Algorithms, Hash Tables.

Simple Graphics and Image Processing: "turtle" module, simple 2d drawing - colors, shapes, digital images, image file formats, image processing Simple image manipulations with 'image' module (convert to bw, greyscale, blur, etc).

UNIT - V :

Graphical user interfaces: Event-driven programming paradigm, tkinter, module, creating simple GUI, buttons, labels, entry fields, dialogs, widget attributes - sizes, fonts, colors layouts, nested frames

Multithreading, Networks, and Client/Server Programming: Introduction to HTML, interacting with remote HTML server, running html-based queries, downloading pages, CGI programming, programming a simple CGI form.

TEXT BOOKS :

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2nd Edition, 2017, Cengage Learning
2. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India

REFERENCES/SUGGESTED READING:

1. Mark Summerfield. ?Programming in Python 3: A Complete introduction to the Python Language, Addison-Wesley Professional, 2009.
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist,,,,, 2nd edition, Updated for Python 3, Shroff/O,,Reilly Publishers, 2016
3. NPTEL Course, Programming, Data Structures and Algorithms using Python, Link: https://nptel.ac.in/courses/106106145
4. NPTEL Course, The Joy of Computing using Python, Link: https://nptel.ac.in/courses/106106182 5.FOSSEE, Python, Link: https://python.fossee.in/

Course Code	Course Title	Core/Elective					
4MC403HS	INDIAN CONSTITUTION	Core					
		L	T	P/D	Credits	CIE	SEE
		2	-	-	-	40	60

Prerequisite : Elementary Civics-School level

COURSE OBJECTIVES :

The objective of this course is to make the student

1. To create awareness and relevance of the Indian Constitution, its directive principles.
2. To impart understanding of the role, powers and functions of administration at the Central, State and local levels.
3. To create awareness and understanding of Fundamental Rights, State Policy and Duties of Ideal citizen
4. To expose students to the relations between Central/Federal, State and Provincial units, divisions ofexecutive, legislative and judiciary in them.
5. To impart knowledge about the statutory institutions and their role.

COURSE OUTCOMES :

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

1. Have a general knowledge and back ground about the Constitution of India and its importance.
2. Will distinguish and understand the working of the Central, state and provincial levels of administration.
3. Will be conscious about the fundamental duties, responsibilities and rights as an ideal citizen of India
4. Will be able to perceive and interpret the functioning and distribution of resources between centre and state.
5. Have awareness and relate to the existing hierarchy of the social structure, election.

UNIT - I :

Introduction to Constitution- Meaning, reasons for having a constitution. **Evolution of the Indian Constitution:** History, 1909 Act,1919 Act and 1935 Act and Permeable **Constituent Assembly:** Composition and Functions;

UNIT - II :

Government vs Governance:

Union Government: Political Executive-President, Prime Minister, Council of Ministers, Bureaucratic Executive.

State Government: Executive: Governor, Chief Minister, Council of Ministers

Local Government: Panchayat Raj Institutions, Rural and Urban local bodies-composition.

UNIT-III:

Rights and Duties : Fundamental Rights, Directive principles of State Policy, Fundamental Duties of a good citizen.

Public Interest Litigation.

UNIT-IV:

Relation between Federal and Provincial units:

Union-State relations: Administrative, Legislative and Financial, Inter-State council, NITI Ayog , Finance Commission of India.

UNIT-V :

Constitutional and Statutory Bodies:

Election Commission and Electoral Reforms, National Human Rights Commission, National Commission for Women, National Commission for Minorities, National Commission for Protection.

TEXT BOOKS :

1. Durga Das Basu, "Introduction to the Constitution of India", English-Hardcover –:Lexis Nexis, New Delhi.
2. Dr. B.L. Fadia, Dr. Kuldeep Fadia , "Indian Government and Politics", Sahithya Bhavan Publications, Agra.
3. M . Lakshmikanth, "Indian polity', Tata McGraw Hill.

REFERENCES/SUGGESTED READING:

1. M.V. Pylee, " Indian Constitution".
2. Khattar, "Indian Political System".
3. Constitution of India, Telugu Academy.

Course Code	Course Title	Core/Elective					
4PC452EE	ELECTRICAL CIRCUITS LAB	Core					
		L	T	P/D	Credits	CIE	SEE
		-	-	2	1	40	60

Prerequisite: Basic Electrical and Electronics Engineering, Electrical Circuits

COURSE OBJECTIVES:

The objective of this course is to make the student

1. Apply the theoretical knowledge in doing practical experiments and acquire skills to handle instruments.
2. Understand the behavior of electrical elements, circuits.
3. Understand the practical verification of different laws and theorems.
4. Understand the behavior of electrical circuits Using MATLAB/SIMULINK/ PYTHON

COURSE OUTCOMES :

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

1. Explain common electrical components and their ratings
2. Understand and apply basic laws to analyze an electrical circuit
3. Apply the concepts of theorems to analyze the electricalcircuits
4. Analyze performance of DC and AC electrical circuits
5. Design and analyze the behavior of circuits in MATLAB/SIMULINK/ PYTHON.

LIST OF EXPERIMENTS

1. CRO- applications, measurements of R, L, C using LCR meter, color coding method.
2. Verification of KVL and KCL
3. Verification of Superposition and Reciprocity theorem.
4. Verification of Thevinin's and Norton's thoerem.
5. Verification of Maximum power transfer theorem.
6. Verification of Milliman's and Tellegen's theorem.

7. Analysis of series RL & RC Circuits with AC excitation.
8. Calculation of Z and Y parameters for a given two port network.
9. Calculation of h and ABCD parameters for a given two port network.
10. Verification of Phase and Line relations for voltages and currents in a three-phase network.
11. Series Resonance- Calculation of Bandwidth and Q-Factor.
12. Simulation of series RL and RC Circuits to analyze transient behavior using MATLAB/SIMULINK/PYTHON.
13. Simulation of series and parallel resonance circuit using MATLAB/ SIMULINK/PYTHON.
14. Simulation of electrical circuits for Mesh and Nodal analysis using MATLAB/ SIMULINK/PYTHON.

Note: A minimum of Ten experiments to be performed.

REFERENCES/SUGGESTED READING:

1. Fundamentals of Electric Circuits, Charles k. Alexander and Matthew N. O. Sadiku, Tata McGraw Hills Education, Edition 3, 2013.
2. Electrical Circuit Analysis, William H Hayt and Jack Kemmerly, 8th Edition, 2014.
3. Circuit Theory Analysis and Synthesis by Abhijit Chakrabarti, Dhanpat Raj & Co., 2018.
4. Fundamentals of Electrical Engineering and Electronics", J.B. Gupta, S. K. Kataria & Sons Publications, 2002.

Course Code	Course Title	Core/Elective					
4PC453EE	CONTROL SYSTEMS LAB	Core					
		L	T	P/D	Credits	CIE	SEE
		-	-	2	1	40	60

Prerequisite : Basics of circuits, Laplace transform Inverse Laplace transform and partial fractions

COURSE OBJECTIVES :

The objective of this course is to make the student

1. Develop transfer function of various control system plants practically by conducting theexperiments.
2. Understand the various controllers.
3. Programming and control system concepts using MATLAB/PYTHON

COURSE OUTCOMES :

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

1. To develop transfer function of various control system plants practically by conducting theexperiments.
2. Study the Performance of P, PI and PID Controllers and Analyze the concepts to A.C and D.C position controlsystem.
3. Design lag and lead compensation networks.
4. Apply the concepts of control systems in developing Program using MATLAB/PYTHON
5. Determine the time response of second order system and Determine frequency response of compensatingnetworks.

LIST OF EXPERIMENTS

1. Characteristics of D.C. and AC. Servomotors.
2. Characteristics of synchro's.
3. Frequency response of compensating networks.
4. Step response of second order system.
5. D.C. Position control system.
6. A.C. Position control system.

7. Performance of P, PI and PID Controller on system response.
8. Design of lag and lead compensation for the given plant.
9. Temperature control systems.
10. Simulation of Root locus, Nyquist plot, Bode plot using MATLAB/ SIMULINK/PYTHON.
11. Time response of Second order system using MATLAB//SIMULINK/ PYTHON.
12. Conversion of state to transfer function and transfer function state spaceusing MATLAB//SIMULINK/PYTHON.
13. Design of lead and lag compensators using MATLAB/SIMULINK/PYTHON.
14. Frequency response characteristics and relative stability analysisusing MATLAB//SIMULINK/PYTHON.

Note : A minimum of Ten experiments to be performed. R

EFERENCES/SUGGESTED READING:

1. Automatic control systems, S.Hasan saeed, KATSON Books, 8th Revised Edition, 2014.
2. Control System Principles and Design, M. Gopal, Tata McGraw Hill, 2nd Edition, 2003.
3. Control System Engineering, I.J. Nagrath, M. Gopal, New Age International (P) Limited publishers, 2008.
4. Control systems, A.NagoorKani, RBA publications, 3rd Edition, 2015.

Course Code	Course Title	Core/Elective					
4ES455CS	PYTHON PROGRAMMING LAB	Core					
		L	T	P/D	Credits	CIE	SEE
		-	-	2	1	40	60

Prerequisite: Basic Electrical and Electronics Engineering, Electrical Circuits

COURSE OBJECTIVES:

The objective of this course is to make the student

1. To learn how to design and program using lists, tuples, and dictionaries.
2. To learn how to use indexing and slicing to access data in Python programs.
3. To learn structure and components of a Python and to read and write files.
4. To learn how to design object-oriented programs with Python classes and Exception handling techniques.
5. To learn how to design and build the GUI applications usingpython.

COURSE OUTCOMES :

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

1. Develop solutions to simple computational problems using Python programs.
2. Solve problems using conditionals and loops in Python.
3. Develop Python programs by defining functions and calling them.
4. Use Python lists, tuples and dictionaries for representing compound data.
5. Develop Python programs for GUI applications

LIST OF EXPERIMENTS

1. Develop program to demonstrate different number data types in python
2. Develop program to understand the control structures of python
3. Develop program on String manipulation
4. Develop program to perform various operations on files
5. Develop programs to learn different types of structures (list, dictionary, tuples) in python
6. Develop programs to learn concept of functions scoping, recursion and list mutability

7. Develop program to demonstrate classes and OOP principles
8. Develop programs for data structure algorithms using python – searching, sorting and hash tables
9. Develop programs to understand working of exception handling and assertions
10. Draw graphics using Turtle
11. Develop event driven GUI programs
12. Develop Program for demonstration client server communication

Note : A minimum of Ten experiments to be performed.

REFERENCES/SUGGESTED READING:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2nd Edition, 2017, Cengage Learning
2. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India