DEPARTMENT OF

ELECTRICAL AND ELECTRONICS ENGINEERING

Scheme of Instructions, Examinations & Syllabi

(Autonomous BE Curriculum with effect from the Academic Year: **2025-2026**)

For

III & IV Semester of

Four Year Degree Programme

For

Bachelor of Engineering (B.E)

In

ELECTRICAL AND ELECTRONICS ENGINEERING

M24 Curriculum

Methodist College of Engineering & Technology,
Affiliated by Osmania University Hyderabad, approved by AICTE, New Delhi,
KingKoti Road, Abids, Hyderabad, Telangana 500001.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To become a reputed centre for imparting quality education in Electricaland Electronics Engineering with human values, ethics and social responsibility

MISSION

- To impart fundamental knowledge of Electrical, Electronics and Computational Technology.
- To develop professional skills through hands-on experience aligned to industry needs.
- To undertake research in sunrise areas of Electrical and Electronics Engineering.
- To motivate and facilitate individual and team activities to enhance personality skills.

PROGRAM EDUCATIONAL OBJECTIVES

The Graduates of the program shall be able to:

- **PEO1**. Utilize domain knowledge required for analyzing and resolving practical Electrical Engineering problems.
- **PEO2**.Willing to undertake inter-disciplinary projects, demonstrate the professional skills and flair for investigation.
- **PEO3**. Imbibe the state of the art technologies in the ever transforming technical scenario.
- **PEO4**. Exhibit social and professional ethics for sustainable development of the society.

PROGRAM SPECIFIC OUTCOMES

Electrical and Electronics Engineering Graduates will be able to:

- **PSO1**.Provide effective solutions in the fields of Power Electronics, Power Systems and Electrical Machines usingMATLAB/MULTISIM.
- **PSO2.** Design and Develop various Electrical and Electronics Systems, particularly Renewable Energy Systems.
- **PSO3.** Demonstrate the overall knowledge and contribute for the betterment of the society.

Semester-III									
S.No	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			Hours Per week			Duration in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
Theory Courses									
1	M24HS303BM	Managerial Economics and Financial Accounts	3	0	0	3	40	60	3
2	M24PC301EE	Electromagnetic Fields	3	0	0	3	40	60	3
3	M24PC302EE	Electrical Circuits–I	3	0	0	3	40	60	3
4	M24PC303EE	Power Systems-I	3	0	0	3	40	60	3
5	M24ES301EC	Electronics Devices and Linear Integrated Circuits	3	0	0	3	40	60	3
6	M24ES306EE	Python Programming for Electrical Engineers	2	0	0	2	40	60	2
7	M24HS302HS	Human Values and Professional Ethics	2	0	0	2	40	60	2
Laboratories									
8	M24ES351EC	Electronics Devices and Circuits Lab	0	0	2	2	40	60	1
9	M24ES355EE	Python Programming for Electrical Engineers Lab	0	0	2	2	40	60	1
Total			**19**	**0**	**4**	**23**	**360**	**540**	**21**

****Bridge Courses being offered to Lateral Entry admitted students****

S. No	Semester	Subject Code	Subject Name	Credits
1	III	M24BR354CS	PPS Lab (Programming for Problem Solving Lab)	0
2	III	M24BR304HS	Yoga/NSS/Sports	0

NOTE: In accordance with the National Credit Framework (NCrF), which defines 1 credit as equivalent to 30 hours of learning, the conventional L: T: P (Lecture: Tutorial: Practical) distribution has been mapped to Notional Hours, as reflected in the table below.

SEMESTER-III										
S.No	Course Code	Course Title	Scheme of Instruction					Scheme of Examination		Credits
			Notional hrs				Total Notional hrs	Maximum Marks		
			L	T	P/PW	TW/SL		CIE	SEE	
	Theory Courses									
1	M24HS303BM	Managerial Economics and Financial Accounts	45	15	-	30	90	40	60	3
2	M24PC301EE	Electromagnetic Fields	45	15	-	30	90	40	60	3
3	M24PC302EE	Electrical Circuits–I	45	15	-	30	90	40	60	3
4	M24PC303EE	Power Systems-I	45	15	-	30	90	40	60	3
5	M24ES301EC	Electronics Devices and Linear Integrated Circuits	45	15	-	30	90	40	60	3
6	M24ES306EE	Python Programming for Electrical Engineers	30	-	-	30	60	40	60	2
7	M24HS302HS	Human Values and Professional Ethics	30	-	-	30	60	40	60	2
	Laboratories									
8	M24ES351EC	Electronics Devices and Circuits Lab	-	-	30	-	30	40	60	1
9	M24ES355EE	Python Programming for Electrical Engineers Lab	-	-	30	-	30	40	60	1
Total			**285**	**75**	**60**	**210**	**630**	**360**	**540**	**21**

****Bridge Courses being offered to Lateral Entry admitted students****

S. No	Semester	Subject Code	Subject Name	Credits
1	III	M24BR354CS	PPS Lab (Programming for Problem Solving Lab)	0
2	III	M24BR304HS	Yoga/NSS/Sports	0

S.No	Course Code	Course Title	Semester - IV						Credits
			Scheme of Instruction				Scheme of Examination		
			Hours Per week			Duration in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
Theory Courses									
1	M24BS405HS	Numerical Methods and Fourier Analysis	3	0	0	3	40	60	3
2	M24PC404EE	Power Systems-II	3	0	0	3	40	60	3
3	M24PC405EE	Electrical Circuits-II	3	0	0	3	40	60	3
4	M24PC406EE	Electrical Machines-I	3	0	0	3	40	60	3
5	M24PC407EE	Digital Logic Design	3	0	0	3	40	60	3
6	M24ES403CS	Fundamentals of Artificial Intelligence	2	0	0	2	40	60	2
7	M24MC402HS	Essence of Indian Traditional Knowledge	2	0	0	2	40	60	1
Laboratories									
8	M24PC451EE	Electrical Circuits Lab	0	0	2	2	40	60	1
9	M24PC452EE	Digital Logic Design Lab	0	0	2	2	40	60	1
10	M24ES457CS	Artificial Intelligence Lab	0	0	2	2	40	60	1
11	M24SE351EE	Technical Training-I	0	0	2	2	40	60	1
Total			**19**	**0**	**8**	**27**	**440**	**660**	**22**

****Bridge Courses being offered to Lateral Entry admitted students****

S. No	Semester	Subject Code	Subject Name	Credits
1	IV	M24BR403CE	Environmental Science	0
2	IV	M24BR451HS	English Lab	0

NOTE: In accordance with the National Credit Framework (NCrF), which defines 1 credit as equivalent to 30 hours of learning, the conventional L: T: P (Lecture: Tutorial: Practical) distribution has been mapped to Notional Hours, as reflected in the table below.

SEMESTER-IV											Credits
S.No	Course Code	Course Title	Scheme of Instruction					Scheme of Examination		
			Notional hrs				Total Notional hrs	Maximum Marks		
			L	T	P/PW	TW/SL		CIE	SEE	
	Theory Courses									
1	M24BS405HS	Numerical Methods and Fourier Analysis	45	15	-	30	90	40	60	3
2	M24PC404EE	Power Systems-II	45	15	-	30	90	40	60	3
3	M24PC405EE	Electrical Circuits-II	45	15	-	30	90	40	60	3
4	M24PC406EE	Electrical Machines-I	45	15	-	30	90	40	60	3
5	M24PC407EE	Digital Logic Design	45	15	-	30	90	40	60	3
6	M24ES403CS	Fundamentals of Artificial Intelligence	30	-	-	30	60	40	60	2
7	M24MC402HS	Essence of Indian Traditional Knowledge	30	-	-	-	60	40	60	1
	Laboratories									
8	M24PC451EE	Electrical Circuits Lab	-	-	30	-	30	40	60	1
9	M24PC452EE	Digital Logic Design Lab	-	-	30	-	30	40	60	1
10	M24ES457CS	Artificial Intelligence Lab	-	-	30	-	30	40	60	1
11	M24SE351EE	Technical Training-I	-	-	30	-	30	40	60	1
Total			**285**	**75**	**120**	**180**	**660**	**440**	**660**	**22**

Bridge Courses being offered to Lateral Entry admitted students**

S. No	Semester	Subject Code	Subject Name	Credits
1	IV	M24BR403CE	Environmental Science	0
2	IV	M24BR451HS	English Lab	0

SEMESTER-III										
S.No	**Course Code**	**Course Title**	**Scheme of Instruction**					**Scheme of Examination**		**Credits**
			Notional hrs				**Total Notional hrs**	**Maximum Marks**		
			L	**T**	**P/PW**	**TW/SL**		**CIE**	**SEE**	
	Theory Courses									
1	M24HS303BM	Managerial Economics and Financial Accounts	45	15	-	30	90	40	60	3
2	M24PC301EE	Electromagnetic Fields	45	15	-	30	90	40	60	3
3	M24PC302EE	Electrical Circuits–I	45	15	-	30	90	40	60	3
4	M24PC303EE	Power Systems-I	45	15	-	30	90	40	60	3
5	M24ES301EC	Electronics Devices and Linear Integrated Circuits	45	15	-	30	90	40	60	3
6	M24ES306EE	Python Programming for Electrical Engineers	30	-	-	30	60	40	60	2
7	M24HS302HS	Human Values and Professional Ethics	30	-	-	30	60	40	60	2
	Laboratories									
8	M24ES351EC	Electronics Devices and Circuits Lab	-	-	30	-	30	40	60	1
9	M24ES355EE	Python Programming for Electrical Engineers Lab	-	-	30	-	30	40	60	1
Total			**285**	**75**	**60**	**210**	**630**	**360**	**540**	**21**

Course Code	Course Title	Notional Hours					Core/Elective	
M24HS303BM	Managerial Economics and Financial Accounts						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
----		45	15	-	30	3	40	60

Course Objectives: The objective of this course is to make the student

1. Understand responsibilities of a manager of a business undertaking
2. Analyze various determinants influencing demand and price
3. Understand the principles of accounting and prepare Journal, Ledger, Trial Balance & Final accounts
4. Understand Financial statement Analysis
5. 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. Explain various factors influencing demand & market structure
3. Explain the principles of Accounting & solve the problems
4. Analyze the Financial performance
5. Explain the capital structure& to take decision on selection of projects

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO2	-	-	-	-	-	-	-	2	2	3	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	-	-	-
AVG	-	-	-	-	-	-	-	2	2	3	-	-	-	-

UNIT-I

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

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

UNIT-IV

Financial statement Analysis: - - Preparation of final accounts with simple adjustments (including Problems) -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. I.M.Panday Financial Management, Vikas Publishing House.
2. 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	Notional Hours					Core/Elective	
M24PC301EE	ELECTROMAGNETIC FIELDS						Core	
Prerequisites		**L**	**T**	**P/PW**	**TW/SL**	**Credits**	**CIE**	**SEE**
Engineering Physics		**45**	**15**	**-**	**30**	**3**	**40**	**60**

Course Objectives: The objective of this course is to make the student

1. Acquire conceptual and basic mathematical understanding of electric and magnetic fields in free space and in materials.
2. Understand the coupling between electric and magnetic fields through Faraday's law, displacement current and Maxwell's equations.
3. Understand wave propagation in loss less and in lossy media.

Course Outcomes: After completion of the course, the student will be able to

1. Explain the basic mathematical concepts related to electromagnetic vector fields, Faraday's law, induced emf and Maxwell's equations.
2. Explain coulomb's law, Gauss's law, Biot-Savart law, electric field intensity, magnetic field intensity, potential, and dipole.
3. Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, and electric energy density.
4. Apply the principles of magneto statics to the solutions of problems relating to magnetic field and magnetic potential, and magnetic energy density.
5. Analyze the conversion of vector from one coordinate system to another, the applications of EM waves in different Medias and to compute the time average power density, electric and magnetic boundary conditions.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	1	1
CO2	3	-	-	-	-	-	-	-	-	-	-	-	1	1
CO3	3	-	-	-	-	-	-	-	-	-	-	-	2	2
CO4	3	-	-	-	-	-	-	-	-	-	-	-	2	2
CO5	-	3	-	-	-	-	-	2	2	-	-	-	2	2
AVG	3	3	-	-	-	-	-	2	2	-	-	-	1.6	1.6

Unit-I

Review of Vector Analysis: Vector algebra-addition, subtraction, components of vectors, scalar and vector multiplications, triple products, three orthogonal coordinate systems (rectangular, cylindrical and spherical), Vector calculus-differentiation, partial differentiation, integration, vector operator Del, gradient, divergence and curl, integral theorems of vectors, Conversion of a vector from one coordinate system to another, stokes theorem.

Unit-II

Electrostatics-I: Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions, Gauss law and its applications, Absolute Electric potential, potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density, dipole, dipole moment, potential due to dipole, polarization, numerical problems.

Unit-III

Electrostatics-II: Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Capacitance of a two wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's

equations with single variable, numerical problems.

Unit-IV

Magnetostatics-I: Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors, Force on a moving charge, Force on a differential current element, Force between differential current elements, Nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuits, inductances and mutual inductances, Faraday's law for Electromagnetic induction, numerical problems.

Unit-V

Magnetostatics-II & Electromagnetic waves: Integral & differential form of Maxwell's equations, Motional Electromotive forces. Electrical and Magnetic boundary conditions, Derivation of Wave Equation, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane waves in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors, Poynting theorem.

TEXTBOOKS:

1. M. N. O. Sadiku, "Principles of Electromagnetics", Oxford University Publication, 2014
2. Pramanik,"Electromagnetism-Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009
3. W. Hayt, "Engineering Electromagnetics", Mc Graw Hill Education, 2012

REFERENCES/SUGGESTEDREADING:

1. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.
2. G. W. Carter, "The electromagnetic field in its engineering aspects", Longmans

E. G. Cullwick, "The Fundamentals of Electromagnetism", Cambridge University B. D. Popovic, "Introductory Engineering Electromagnetics", Addison-Wesley Educational Publishers, International Edition.

Course Code	Course Title	Notional Hours					Core/Elective	
M24PC302EE	ELECTRICAL CIRCUITS-I						Core	
Prerequisites		**L**	**T**	**P/PW**	**TW/SL**	**Credits**	**CIE**	**SEE**
FEEE		**45**	**15**	**-**	**30**	**3**	**40**	**60**

Course Objectives: The objective of this course is to make the student

1. Familiarize with AC fundamentals and solve electrical circuits when excited by AC Supply.
2. Understand the concept of electrical resonance and network theorems for reducing complex networks.
3. Familiarize with three phase AC fundamentals and measure active and reactive power.
4. Understand the concept of transients and its analysis in electrical circuits.

Course Outcomes: After completion of the course, the student will be able to

1. Explain the concepts of single phase, three phase systems and magnetic circuits.
2. Calculate the parameters of magnetic circuits and electrical circuits under steady state condition.
3. Analyze electrical circuits with network theorems, mesh and nodal analysis methods.
4. Analyze electrical circuits under resonance condition.
5. Analyze electrical circuits under transient condition with and without Laplace transforms.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	-	-	-	-	-	-	2	2	-	-	-	2	2
CO2	3	-	-	-	-	-	-	-	-	-	-	-	2	2
CO3	-	3	-	-	-	-	-	-	-	-	-	-	2	2
CO4	-	3	-	-	-	-	-	-	-	-	-	-	2	2
CO5	-	3	-	-	-	-	-	-	-	-	-	-	2	2
AVG	3	3	-	-	-	-	-	2	2	-	-	-	2	2

Unit-I

Single Phase A.C. Circuits: R.M.S. and Average values for different periodic waveforms, J-notation, Complex and Polar forms of representation, Steady State Analysis of R, L and C (in Series, Parallel and Series Parallel Combinations) with Sinusoidal Excitation, Concept of Reactance, Impedance, Susceptance and Admittance, Phase and Phase difference, Concept of Power Factor, Real and Reactive powers, Complex power.

Unit-II

Resonance: Series and Parallel Resonance, Band width and Q- factor.

Network Theorems for AC Excitations: Superposition theorem, Thevenin's theorem, Norton's theorem, and Maximum Power Transfer theorems.

Unit-III

Three-Phase AC Circuits: Phase sequence-Star and delta connection, Relation between line and phase voltages and currents in balanced systems, Analysis of balanced and unbalanced 3 phase circuits-Measurement of active and reactive power.

Unit-IV

Magnetic Circuits: Introduction, Self and Mutual Inductance, Dot Convention, Coefficient of coupling, Analysis of magnetic circuits, comparison of Electrical and Magnetic circuits, numerical problems.

Unit-V

Transient Analysis: Transient response of R-L, R-C, R-L-C circuits (Series and parallel combination) for D.C and A.C excitation-Initial conditions, solution method using differential equation and Laplace transforms.

TEXTBOOKS:

1. Charles k. Alexander and Matthew N.O. Sadiku, Fundamentals of Electric Circuits, Tata Mc Graw Hills Education, 6th Edition, 2016.
2. William Hayt and Kemmerly, Electrical Circuit Analysis, 9th Edition, 2022
3. Abhijit Chakrabarti , Circuit Theory Analysis and Synthesis, Dhanpat Raj & Co.,2025.

REFERENCES/SUGGESTEDREADING:

1. J. B. Gupta, Fundamentals of Electrical Engineering and Electronics, S. K. Kataria & Sons Publications, 2009.
2. C L Wadhwa, Electrical Circuit Analysis including Passive Network Synthesis, New Age International, 2nd Edition, 2018.
3. David A Bell, Electric Circuits, Oxford University Press, 7th Edition, 2019.
4. E Hughes Pearson Education , Electrical and Electronics Technology, 10th Edition 2010.

Course Code	Course Title	Notional Hours					Core/Elective	
M24PC303EE	POWER SYSTEMS-I						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
----		45	15	-	30	3	40	60

Course Objectives: The objective of this course is to make the student

1. Understand the fundamentals of various conventional power plants like Thermal, Hydel, and Nuclear.
2. Understand the economics of Power Generation, Types of costs, methods of power factor improvement, Tariffs.
3. Understand construction of Over Head lines, materials, Supports, insulators and Underground cables.

Course Outcomes : After completion of the course, the student will be able to

1. Explain the working principles, layouts, and components of various power systems including thermal, hydro, nuclear generation, transmission lines, and AC/DC distribution networks.
2. Apply suitable techniques to improve power factor and calculate transmission line inductance and capacitance using GMR and GMD.
3. Apply electrical engineering principles to calculate sag and tension in conductors and voltage drops in DC and AC distribution systems.
4. Analyze the technical, structural, and economic aspects of power generation, transmission, and distribution systems including site selection, insulator behaviour, and AC system performance.
5. Evaluate the effectiveness of power generation methods, tariff structures, and cable grading techniques in optimizing system efficiency and performance.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	-	-	-	-	-	-	2	2	-	-	-	1	3
CO2	3	-	-	-	-	-	-	-	-	-	-	3	2	3
CO3	3	-	-	-	-	-	-	-	-	-	-	3	3	3
CO4	-	3	-	-	-	-	-	-	-	-	-	2	2	3
CO5	-	-	-	3	-	-	-	2	2	-	-	1	1	3
AVG	3	3	-	3	-	-	-	2	2	-	-	2.25	1.8	3

Unit-I:

Thermal Power Stations: General layout of modern thermal power plant, Selection of site, operation, 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:

Nuclear power: Fissile materials, Nuclear Fission and Chain reaction Layout and types of nuclear reactors, Advantages and disadvantages.

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

Unit-III:

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.

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

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

Unit-IV:

Inductance and Capacitance Calculations of Transmission Lines: Resistance, inductance and capacitance of transmission lines, single phase and 3-phase lines with symmetrical and unsymmetrical spacing, composite conductors, GMR and GMD, transposition, bundled conductors, skin effect, proximity effect.

Unit-V:

DC Distribution: Classification of Distribution Systems. - Comparison of DC vs. AC and Under-Ground vs. Over-Head Distribution Systems. - Requirements and Design features of Distribution Systems. Voltage Drop Calculations in D.C Distributor fed at one end and at both the ends.

AC Distribution: Introduction, AC distribution, Single phase, 3-phase, 3 phase 4 wire system, Voltage Drop Calculations in A.C Distribution Systems.

TEXTBOOKS:

1. C.L. Wadhwa, "Electrical Power Systems", 8th Edition, New Age International, 2022.
2. V.K Mehta and Rohit Mehta, 'Principles of Power System", 7th Edition, S. Chand & Company Ltd, New Delhi 2022.

REFERENCES/SUGGESTEDREADING:

1. A. Chakrabarti, M.L.Soni, P.V.Gupta, U.S. Batnagar, "A Text book on Power System Engineering", Dhanpat Rai Publishing Company (P) Ltd, 2008.
2. W.D. Stevenson, "Elements of Power System Analysis", 4th Edition, Mc Graw Hill, 2012.

Course Code	Course Title	Notional Hours					Core/Elective	
M24ES306EE	Python Programming Electrical Engineers						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
PPS		30	-	-	30	2	40	60

Course Objectives: The objective of this course is to make the student

1. Introduce students to the fundamentals of Python programming, including syntax, data types, and basic program structure with applications in electrical calculations like Ohm's Law and energy consumption.
2. Apply control structures (decision-making and looping statements) for solving basic electrical engineering problems such as resistance analysis and overload detection.
3. Develop skills in using functions and arrays for performing modular programming and repeated computations relevant to electrical circuits and transformations.
4. Manage and process electrical system data using lists, tuples, dictionaries, and file handling techniques.
5. Provide hands-on experience in data analysis and visualization using NumPy, Pandas, and Matplotlib, with a focus on interpreting results for sustainable energy systems

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

1**. Describe** the syntax, data types, and structure of simple Python programs.

2. **Apply** conditional and looping constructs to develop logical solutions for basic problems.

3. **Apply** functions and arrays to perform modular and repeated computations like star-delta transformation.

4. **Manage** and manipulate electrical data using lists, dictionaries, and file operations.

5. **Analyze** and visualize electrical data using NumPy, Pandas, and Matplotlib, supporting clean energy solutions.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	-	-	-	3	-	-	-	-	-	-	-	-	2
CO2	3	-	-	-	3	-	-	-	-	-	-	-	-	2
CO3	3	-	-	-	3	-	-	-	-	-	-	-	-	2
CO4	-	3	-	-	3	-	-	-	-	-	-	-	-	2
CO5	-	3	-	-	3	-	-	-	-	-	-	-	-	2
AVG	3	3	-	-	3	-	-	-	-	-	-	-	-	2

Unit-I: Fundamentals of Python Programming

Introduction to Python; Installation and setup; Interactive and script modes; Python IDEs; Keywords and identifiers; Variables and data types; Input and output functions; Operators and expressions; Operator precedence; Writing and executing simple Python programs; Comments and code readability, Calculate current using Ohm's Law (V = IR) with user inputs. Estimate daily energy consumption given wattage and hours of operation.

Unit-II: Control Structures and Flow of Execution

Boolean values and operators; Conditional statements: if, if-else, if-elf-else; Looping constructs: for loop, while loop; Nested loops; Control statements: break, continue, pass; Use of loops and conditions in engineering problem solving, Detect overload by comparing current with wire capacity, Compute total resistance in series or parallel based on user choice.

Unit-III: Functions and Arrays

Function definition and calling; Parameters and return values; Scope of variables; Built-in functions; Recursive functions; Arrays in Python; Accessing elements of an array; Array operations and methods; Applications using functions and arrays, Define a function to compute star-delta transformations, Use arrays to calculate current values for multiple voltages.

Unit-IV: Lists, Tuples, Dictionary and File Handling

Lists: creation, indexing, slicing, operations, and methods; List comprehensions; Tuples: creation, operations, and tuple unpacking; Dictionaries: creation, key-value access, methods; Dictionary comprehensions; Introduction to file handling: reading and writing text files. Store and analyze daily meter readings using lists, Maintain a dictionary of electrical devices and their power ratings, Log voltage and current readings to a text file with timestamps.

Unit-V: Data Analysis

Introduction to NumPy: arrays and basic operations; Introduction to Pandas: Series and Data Frames; Basic data manipulation and summary statistics; Introduction to Matplotlib: plotting line and bar graphs; Exploratory Data Analysis (EDA); Solve mesh or nodal circuit equations using NumPy arrays. Plot hourly load profiles of electrical demand using Matplotlib.

TEXT BOOKS:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 3rd Edition, Cengage Learning, 2024.
2. Matthes, E. (2023). Python crash course: A hands-on, project-based introduction to programming, 3rd Edition, no starch press, 2023.

REFERENCES/SUGGESTEDREADING:

1. Wes McKinney, *Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter*, 3rd Edition, O'Reilly Media, 2022.
2. NPTEL Course, The Joy of Computing using Python, Link:https://nptel.ac.in/courses/106106182.

Course Code	Course Title	Notional Hours					Core/Elective	
M24ES313EC	Electronics Devices and Linear Integrated Circuits						Core	
Prerequisites		**L**	**T**	**P/PW**	**TW/SL**	**Credits**	**CIE**	**SEE**
FEEE		**45**	**15**	**-**	**30**	**3**	**40**	**60**

Course Objectives: The objective of this course is to make the student

1. Understand the working of rectifiers, filters, clippers, clampers, and special purpose diodes and operation amplifiers including their characteristics, models, and real-world applications.
2. Study the characteristics and biasing techniques of BJTs and analyze their thermal behaviour
3. Learn the concepts of negative feedback and how it affects amplifier performance
4. Understand the working and design of different types of oscillators using operation amplifiers

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

1. Interpret the operating principles and apply design techniques for wave-shaping and signal conditioning using passive and semiconductor components and understand the operating principles of oscillators.
2. Demonstrate the ability to model, bias, and assess the thermal behaviour and stability criteria of BJT-based amplifiers.
3. Analyze feedback amplifier topologies and determine their impact on gain, bandwidth, and impedance for enhanced system performance.
4. Construct and evaluate inverting, non-inverting, integrators, differentiators, comparators configurations and waveform generators using operational amplifiers.
5. Explain the characteristics and applications of operational amplifiers configurations.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	-	-	3	-	-	-	-	-	-	-	-	-	2
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-	2
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	2
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	2
AVG	3	3	-	-	-	-	-	-	-	-	-	-	-	2

UNIT–I

Brief Review of Rectifier, Study of LC Filter, Clipping Circuits–Positive clipper, Negative Clipper & Dual Clipper and Clamping Circuits – Unbiased Clamper- Positive Clamper, Negative Clamper and Biased Clamper - Positive Biased Clamper

Special Purpose Diodes: UJT, Tunnel Diode, Schottky Diode, Photo Diode and Light Emitting Diode

UNIT–II

Small Signal Model of BJT: Analysis of BJT as Amplifier, Transistor Biasing: Fixed Bias, Collector Bias & Self Bias, Bias Stability, Thermal Stability (S, S''&S'') and Thermal runaway, Heat Sink.

UNIT-III

Feedback Amplifiers: The feedback concept, General characteristics of negative feedback amplifier, Effect of negative feedback on input and output impedances, Method of analysis of feedback amplifiers, Analysis of Voltage series, voltage shunt, current series and current shunt feedback amplifiers.

UNIT–IV

Operational Amplifier: Operational Amplifier block diagram, ideal Op-Amp Characteristics
DC Characteristics: Input offset voltage; Output offset voltage, input offset and bias currents, Slew rate, CMRR and PSRR.
AC Characteristics: Frequency Response, Gain-Bandwidth Product, Slew Rate and Transient Response

UNIT–V

Operation Amplifier Applications: Inverting and Non-inverting amplifiers, Voltage Follower, Difference Amplifier, Summing Amplifier, Integrator and differentiator, Log and antilog amplifiers, Comparator, Schmitt Trigger.
Operation amplifier based Oscillators: Oscillator principles, Oscillator Types**,** Phase shift Oscillator, Wien-bridge Oscillator, Square wave Generator, Triangular Wave Generator, Sawtooth Wave Generator, Voltage Controlled oscillator.

TEXT BOOKS:

1. Millman and Halkias, "Electronic Devices and Circuits", 4th Edition, McGraw Hill Publication, 2015
2. Jacob Millman, Christos Halkias, Chetan Parikh, "Integrated Electronics", 2nd Edition, Tata McGraw Hill Publication, 2017
3. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", 4th Edition, Pearson, 2015

REFERENCES/SUGGESTEDREADING:

1. Robert L. Boylestad and Louis Boylestad, "Electronic Devices and Circuit Theory", 11th Edition, Pearson, 2015
2. David Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008
3. V. K. Mehta and Rohit Mehta, "Principles of Electronics", 12th Edition, S Chand, 2020
4. D. Roy Choudhary and Shail Bala Jain, "Linear Integrated Circuits", 5th Edition, New Age International, 2018
5. S. Salivahanan and V. S. Kanchan Bhaaskaran, "Linear Integrated Circuits and Applications", 1st Edition, McGraw Hill, 2018

Course Code	Course Title	Notional Hours					Core/Elective	
M24HS302HS	Human Values and Professional Ethics						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
----		30	-	-	30	2	40	60

Course Objectives: The objective of this course is to make the student

1. To create an awareness on Human Values and Engineering Ethics.
2. To move from discrimination to commitment.
3. To understand social responsibility of an Engineer.
4. To appreciate ethical dilemma while discharging duties in professional life.
5. To encourage students to discover what they consider valuable in life.

Course Outcomes: After completion of the course, the student will be able to

1. Relate the significance of value inputs and start applying them in their life and profession.
2. Compare and contrast between values and skills, happiness and accumulation of physical facilities with regard to the self and the body, intention and competence of an individual, etc.
3. Apply ethical values in the light of the problems from the perspective of the social context.
4. Evaluate the role of a human being in ensuring harmony in society and nature.
5. Distinguish the difference between ethical and unethical practices, and apply ethical practices in personal and professional lives

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	-	-	-	-	-	-	3	3	3	-	3	-	-	-
CO2	-	-	-	-	-	-	3	3	3	-	3	-	-	-
CO3	-	-	-	-	-	-	3	3	3	-	3	-	-	-
CO4	-	-	-	-	-	-	3	3	3	-	3	-	-	-
CO5	-	-	-	-	-	-	3	3	3	-	3	-	-	-
AVG	-	-	-	-	-	-	3	3	3	-	3	-	-	-

Unit-I: Introduction to Value Education (6 Hrs)

1. Value Education, Definition, Concept and Need for Value Education
2. The Content and Process of Value Education
3. Self-Exploration as a means of Value Education
4. The basic human aspirations-Continuous Happiness and Prosperity

Unit-II: Harmony in the Human Being (6 Hrs)

1. Human Being is more than just the Body
2. Harmony of the Self ('I') with the Body
3. Understanding myself as co-existence of the self and the body:

a. Needs of the self and needs of the body

b. Activities in the self and activities in the body

Unit-III: Harmony in the Family and Society and Harmony in the Nature (6 Hrs)

1. Family as a basic unit of Human Interaction
2. Understanding the values in human relationships-Trust, Respect, Affection, Care, Guidance, Reverence, Glory, Gratitude and Love
3. Identification of comprehensive human goals
4. The five dimensions of human endeavours

Unit-IV: Social Ethics(6 Hrs)

1. The Basics for Ethical Human conduct
2. Challenges to ethical conduct in existence
3. Harmony in nature-Understanding the interconnectedness and mutual fulfilment
4. Harmony in existence-Understanding existence as co-existence

Unit-V: Professional Ethics (6Hrs)

1. Professional ethics in the light of right understanding
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education

TEXT BOOKS:

1. Gaur. R.R. , Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
2. R. Subramanian, Professional Ethics includes Human values, Oxford University Press, 2013.
3. A.N Tripathy, Human Values, New Age International Publishers, 2003.
4. Bajpai.B.L., Indian Ethos and Modern Management, New Royal Book Co., Lucknow, Reprinted, 2004
5. Bertrand Russell Human Society in Ethics & Politics, Taylor and Francis, 2007

REFERENCES/SUGGESTEDREADING:

1. Corliss Lamont, Philosophy of Humanism,Humanist Press, 1997
2. Gaur. R.R. , Sangal. R , Bagaria. G.P, Teachers Manual Excel Books, 2009.
3. Mortimer. J. Adler, – Whatman has made of man,Hardcover,2007

Course Code	Course Title	Notional Hours					Core/Elective	
M24ES361EC	Electronics Devices and Circuits Lab						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
EDLIC		-	-	30	-	1	40	60

Course Objectives: The objective of this course is to make the student

1. Analyze the characteristics and performance of electronic components, such as diodes, transistors, and operational amplifiers, to understand their real-time applications.
2. Implement various feedback mechanisms to study their effects on amplifier gain, stability, and frequency response.
3. Investigate waveform shaping circuits like clipping and clamping to understand signal modification techniques.
4. Design and evaluate different types of oscillators for stable frequency generation in electronic circuits.
5. Apply operational amplifier configurations to implement arithmetic operations and signal conditioning circuits.

Course Outcomes: After completion of the course, the student will be able to

1. Explain the operation of basic electronic devices and design rectifier circuits (with/without filters) to regulate output voltage and minimize ripple.
2. Implement clipping, clamping, and UJT-based circuits to control waveform levels and perform switching operations.
3. Analyze the effect of feedback on amplifiers to evaluate changes in gain, input/output impedance, and overall performance.
4. Design and test RC, LC, and crystal oscillators for stable signal generation, and apply operational amplifiers in various configurations for amplification and arithmetic operations.
5. Interpret experimental results, troubleshoot and optimize circuits, and document findings effectively with accurate technical analysis.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	2	-	2	1	-	-	2	2	-	-	-	-	2
CO2	3	2	2	-	1	-	-	2	2	-	-	-	-	2
CO3	3	2	-	2	-	-	-	2	2	-	-	-	-	2
CO4	2	2	3	2	1	-	-	2	2	-	-	-	-	2
CO5	2	3	2	3	-	-	-	2	2	-	-	-	-	2
AVG	2.6	2.2	2.3	2.2	1	-	-	2	2	-	-	-	-	2

HARDWARE-BASED EXPERIMENTS (CIRCUIT IMPLEMENTATION & TESTING)

1. Half-Wave Rectifier with and without Filters : Design and analyze the performance of a half-wave rectifier circuit without a filter and with different filter types (capacitor filter and π-section filter) to observe their impact on output voltage stability and ripple reduction.

2. Clipping and Clamping Circuits: Study and implement diode-based clipping and clamping circuits to understand their ability to shape and modify waveforms, limiting voltage levels or shifting signal baselines.

3. V-I Characteristics of UJT: Determine the voltage-current (V-I) characteristics of a Uni-Junction Transistor (UJT) and analyze its behavior as a switching device with negative resistance properties.

4. Voltage Series Feedback Amplifier: Evaluate a voltage series feedback amplifier, investigating the impact of negative feedback on gain, input impedance, output impedance, and stability.

5. Voltage Shunt Feedback Amplifier: Analyze the functioning of a voltage shunt feedback amplifier, demonstrating its characteristics, stability, and ability to enhance linearity by incorporating negative feedback.

6. Current Series Feedback Amplifier: Understand the working of a current series feedback amplifier, focusing on its gain stability and impedance variations due to feedback incorporation.

7. RC Phase Shift Oscillator: Design and implement an RC Phase Shift Oscillator, verifying the phase shift conditions for sustained oscillations and analyzing waveform stability.

8. Hartley & Colpitts Oscillators: Construct and examine the working principles of Hartley and Colpitts oscillators, demonstrating the role of inductive and capacitive feedback networks in frequency generation.

9. Voltage Follower, Inverting and Non-Inverting Amplifiers using Op-Amp: Implement and analyze three fundamental operational amplifier circuits:

- Voltage follower to study unity gain buffering.
- Inverting amplifier to explore signal inversion with controlled gain.
- Non-inverting amplifier to achieve amplification while maintaining phase integrity.

10. Arithmetic operations using Op-Amp: Design and evaluate various arithmetic circuits using an operational amplifier, including summing, subtracting, logarithmic, and anti-logarithmic operations, demonstrating their practical significance in signal processing applications.

B. SPICE-BASED SIMULATION EXPERIMENTS *(ANY THREE SIMULATIONS MUST BE PERFORMED)*

11. Half-Wave Rectifier with and without Filters : Simulate and analyze the performance of a half-wave rectifier circuit without a filter and with different filter types (capacitor filter and π-section filter) to observe their impact on output voltage stability and ripple reduction.

12. Clipping and Clamping Circuits: Simulate diode-based clipping and clamping circuits to understand their ability to shape and modify waveforms, limiting voltage levels or shifting signal baselines.

13. V-I Characteristics of UJT: Simulate the voltage-current (V-I) characteristics of a Uni-Junction Transistor (UJT) and analyze its behaviour as a switching device with negative resistance properties.
14. Voltage Series Feedback Amplifier: Simulate a voltage series feedback amplifier, and investigate the impact of negative feedback on gain, input impedance, output impedance, and stability.

C. EXPERIMENTS BEYOND THE SYLLABUS

15. Two-Stage RC Phase Shift Amplifier: Design, implement, and analyze the operation of a two-stage RC phase shift amplifier, examining its gain, phase shift characteristics, and frequency response while demonstrating the effects of cascading amplifier stages

16. JFET Amplifier: analyze **signal amplification using a Junction Field Effect Transistor (JFET)**, study **biasing techniques for stable operation**, evaluate **input impedance and gain characteristics**, verify **frequency response**, and explore its **applications in low-noise amplification and signal processing**

Note: **Minimum of 10 experiments** must be performed, ensuring a mix of hardware and simulation-based analysis.
Mandatory simulation of at least three experiments using SPICE for theoretical verification and practical validation.

Course Code	Course Title	Notional Hours					Core/Elective	
M24ES355EE	Python Programming Electrical Engineers Lab						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
Python Programming Electrical Engineers		-	-	30	-	1	40	60

Course Objectives: The objectives of this course is to impart knowledge of

1. Python programming concepts including data types, type conversion, operators, and control structures
2. Modular and reusable code through functions and effective string manipulations
3. Data structures and file operations for effective data handling and storage.
4. Data analysis and visualization using libraries such as Matplotlib, NumPy, and Pandas in engineering contexts

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

1. Demonstrate the use of fundamental Python programming constructs such as data types, operators, and control structures to develop basic computational logic.
2. Construct modular programs using user-defined functions and string manipulation techniques
3. Implement data organization using Python's lists, tuples, dictionaries, and perform file handling for reading and writing operations.
4. Visualize engineering data using NumPy, Pandas, and plotting libraries to derive meaningful insights from datasets
5. Develop geospatial visualizations using Python tools to support site selection and sustainable planning of renewable energy systems such as solar farms and wind parks, contributing to increased adoption of clean energy.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	-	3	-	-	3	-	-	3	2	-	-	-	-	2
CO2	-	3	-	-	3	-	-	3	2	-	-	-	-	2
CO3	-	3	-	-	3	-	-	3	2	-	-	-	-	2
CO4	-	3	-	-	3	-	-	3	2	-	-	-	-	2
CO5	-	3	-	-	3	-	-	3	2	-	-	-	-	2
AVG	-	3	-	-	3	-	-	3	2	-	-	-	-	2

LIST OF EXPERIMENTS

1. Demonstrate Different Number Data Types and Type Conversions in Python
2. Implement Control Structures to Solve Logical Problems
3. Operators and expressions in circuit problem solving.
4. Conditional statements – Overload detection in electrical circuits.
5. Looping constructs – Repeated calculations for resistor networks.
6. Functions for star-delta transformation and AC signal values.
7. Arrays and vectorized operations for multiple voltage/current cases.
8. Calculation of Force, Electric field and Potential at a given point using Python commands.

9. Calculation of ripple factor for a given rectifier: Half-wave/Full-wave/Bridge circuit using Python program.
10. Obtain the characteristics for the given circuit using Maximum power transfer theorem

In addition to the above Ten experiments, at least any two of the Experiments from the list are required to be conducted:

11. Modeling of an electrical circuit using Python program.
12. Apply Nodal analysis and Mesh analysis for a given electrical circuit.
13. Conversion between Star-Delta configurations and generate three phase voltage waveforms for Star and Delta configurations using Python commands.

TEXT BOOKS:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 3rd Edition, Cengage Learning, 2024.
2. Matthes, E. (2023). Python crash course: A hands-on, project-based introduction to programming. 3rd Edition, no starch press, 2023.

REFERENCES/SUGGESTEDREADING:

1. Wes McKinney, *Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter*, 3rd Edition, O'Reilly Media, 2022
2. NPTEL Course, The Joy of Computing using Python, Link:https://nptel.ac.in/courses/106106182

SEMESTER-IV											Credits
S.No	Course Code	Course Title	Scheme of Instruction					Scheme of Examination			
			Notional hrs				Total Notional hrs	Maximum Marks			
			L	T	P/PW	TW/SL		CIE	SEE		
	Theory Courses										
1	M24BS405HS	Numerical Methods and Fourier Analysis	45	15	-	30	90	40	60		3
2	M24PC404EE	Power Systems-II	45	15	-	30	90	40	60		3
3	M24PC405EE	Electrical Circuits-II	45	15	-	30	90	40	60		3
4	M24PC406EE	Electrical Machines-I	45	15	-	30	90	40	60		3
5	M24PC407EE	Digital Logic Design	45	15	-	30	90	40	60		3
6	M24ES403CS	Fundamentals of Artificial Intelligence	30	-	-	30	60	40	60		2
7	M24MC402HS	Essence of Indian Traditional Knowledge	30	-	-	-	60	40	60		1
	Laboratories										
8	M24PC451EE	Electrical Circuits Lab	-	-	30	-	30	40	60		1
9	M24PC452EE	Digital Logic Design Lab	-	-	30	-	30	40	60		1
10	M24ES457CS	Artificial Intelligence Lab	-	-	30	-	30	40	60		1
11	M24SE351EE	Technical Training-I	-	-	30	-	30	40	60		1
Total			**285**	**75**	**120**	**180**	**660**	**440**	**660**		**22**

Course Code	Course Title	Notional Hours					Core/Elective	
M24BS405HS	Numerical Methods and Fourier Analysis						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
Engineering Mathematics		45	15	-	30	3	40	60

Course Objectives: The objective of this course is to make the student

1. Learn an alternative methods and analytical methods in mathematical concepts.
2. Apply numerical techniques in solving ordinary differential equations.
3. Understand Interpolation and numerical methods to fit a curve
4. Understand Fourier transforms and Fourier series

Course Outcomes: After completion of the course, the student will be able to

1. Compute the solution of algebraic and transcendental equations using numerical methods.
2. Apply numerical techniques to solve ordinary differential equations and definite integrals.
3. Apply numerical methods to interpolate values and fit different curves from given data.
4. Expand function as a Fourier series
5. Apply Fourier series transforms and inverse Fourier transform for given functions.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	-	-	-	-	-	-	-	2	2	-	-	-	-
CO2	3	3	-	-	-	-	-	-	2	2	-	-	-	-
CO3	3	-	-	-	-	-	-	-	2	2	-	-	-	-
CO4	3	3	-	-	-	-	-	-	2	2	-	-	-	-
CO5	3	2	-	-	-	-	-	-	3	3	-	-	-	-
AVG	3	2.6	-	-	-	-	-	-	2.2	2.2	-	-	-	-

UNIT 1:

Numerical Solutions of Algebraic and Transcendental Equations: Introduction, Bisection Method, Regula-False method, Newton Raphson method, solving linear system of equations by Gauss-Jacobi and Gauss-Seidel method.

UNIT II:

Interpolation: Newton's Forward and Backward difference interpolations, Gauss Forward and Backward interpolations Lagrange's interpolation.

Curve Fitting: Fitting a linear, second degree, exponential curve by method of least squares for the discrete data.

UNIT III:

Numerical solutions of Ordinary Differential Equations: Solution of ordinary differential equations by Taylor's Series, Picard's method of Successive approximations, Euler's method, Fourth Order Runge-Kutta Method.

Numerical integration: Trapezoidal Rule, Simpson's 1/3rd and 3/8th Rule

UNIT IV:

Fourier Series: Fourier series expansions of even and odd functions, convergence of Fourier series (without proof) and Fourier half range series.

UNIT V:

Fourier Transforms-: Fourier Integral Theorem (without proof), Fourier Sine and Cosine Integrals, Fourier Transform of a function, Cosine & Sine Transforms, properties, inverse Fourier transforms, sine and cosine transforms, Shannon's sampling theorem (without proof), Uncertainty Principle.

TEXT BOOKS:

1. Dr.B.S Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers.
2. B.V.Ramana,Higher Engineering Mathematics,3rd Edition 2015
   Computation, 6th Edition, New Age International Publishers. 2020-2021
3. S.S.Sastry, Introductory Methods of Numerical Analysis, 5th Edition, PHI Learning Pvt. Ltd.

REFERENCE BOOKS:

1. R K Jain & S R K Iyengar, Advanced Engineering Mathematics, 5th Edition, Narosa Publishers, 6th Edition, 2021
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, 2012.

Course Code	Course Title	Notional Hours					Core/Elective	
M24PC404EE	POWER SYSTEMS-II						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
Power Systems-I		45	15	-	30	3	40	60

Course Objectives: The objective of this course is to make the student

1. Analyze the performance of transmission lines under various configurations using equivalent circuits, ABCD constants, and to understand phenomena like the Ferranti effect and corona discharge.
2. Understand different methods of voltage control in power systems and apply per unit system for analyzing symmetrical and unsymmetrical faults.
3. Understand the causes and effects of traveling waves in power systems.

Course Outcomes: After completion of the course, the student will be able to

1. Explain the fundamental concepts of transmission line modeling, system compensation, per unit analysis, symmetrical components, and travelling wave phenomena in power systems.
2. Apply standard methods to evaluate the performance of transmission lines and compute essential parameters such as voltage regulation, efficiency, and fault levels.
3. Apply per unit system techniques to convert system quantities, construct impedance diagrams, and analyze symmetrical conditions in power systems.
4. Analyze the effects of transients and surge phenomena on transmission lines under abnormal operating conditions and at junctions.
5. Evaluate the impact of corona effects and unsymmetrical faults on power system performance, including the analysis of corona losses, fault current levels, and voltages under different fault impedances and network conditions.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	-	-	-	-	-	-	-	-	-	-	1	1	1
CO2	3	-	-	-	-	-	-	-	-	-	-	3	2	1
CO3	3	-	-	-	-	-	-	-	-	-	-	2	1	-
CO4	-	3	-	-	-	-	-	-	-	-	-	2	2	2
CO5	-	-	-	3	-	-	-	-	-	-	-	3	2	1
AVG	3	3	-	3	-	-	-	-	-	-	-	-	-	-

UNIT-I

Performance of Transmission Lines: The Equivalent circuit representation of lines, Short Transmission lines, and Medium transmission lines: Nominal-T, Nominal-π and Long transmission lines, ABCD constants, Ferranti Effect, power flow through a transmission line.

Corona: Disruptive and Visual critical voltages-Corona loss-Minimization of corona effects.

UNIT-II

Voltage Control: Methods of voltage control- shunt and series capacitors/Inductors, tap changing transformers and synchronous phase-modifiers.

UNIT-III

Per Unit Representation of Power Systems: The one-line diagram, impedance and reactance diagrams, per unit quantities, changing the base of per unit quantities, advantages of per unit system.

Symmetrical Three-phase faults: Transients in RL series circuits-short circuit currents-Reactance's of synchronous

machines - Symmetrical fault calculations, Short circuit capacity of bus.

UNIT-IV

Symmetrical Components: Significance of positive, negative and zero sequence components, Average3-phase power in terms of symmetrical components, sequence impedances and sequence networks.

Unsymmetrical Faults: Fault calculations, sequence network equations, single line to ground fault, line to line fault, double line to ground fault, three phase fault, and faults with fault impedance.

UNIT-V

Travelling Waves on Transmission lines: Causes of over voltages-Travelling wave theory-Wave equation- Open circuited line-The short-circuited line-Junction of lines of different natural impedances-Reflection and Refraction Coefficients-Junction of cable and overhead lines –Junction of three lines of different natural impedances, line terminated through a capacitance.

TEXTBOOKS:

1. C.L. Wadhwa: Electrical Power Systems, New Age International Pub. Co., 8th Edition, 2022.
2. John J. Grainger, W.D. Stevenson: Power System Analysis, Tata McGraw-Hill International (Indian Edition) 5th Edition, 2010.
3. D.P. Kothari and I.J. Nagrath: Modern Power System Analysis-Tata McGraw-Hill Pub. Co., New Delhi, 5th Edition, 2022.

REFERENCES:

1. V.K. Metha, Rohit Mehta, Principles of Power Systems, S. Chand & Company Ltd, 2013.
2. Rajput, RK: Power System Engineering, Laxmi Publications, New Delhi, 2nd Edition, 2016.

Course Code	Course Title	Notional Hours					Core/Elective	
M24PC405EE	ELECTRICAL CIRCUITS-II						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
Electrical Circuits-I		45	15	-	30	3	40	60

Course Objectives: The objective of this course is to make the students to

1. Understand Network Topology.
2. Evaluate Network parameters of given Electrical network.
3. Analyze various types of filters and attenuators.
4. Familiarize 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. Explain the basic concepts of two port network, complex frequency, transformed network, graph theory, filters and attenuators.
2. Compute two-port network parameters, and driving point impedance functions.
3. Analyze electrical circuits with the concept of network topology.
4. Analyze and design various types of filters and attenuators.
5. Synthesize electrical network using Foster and Cauer Forms.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	-	-	-	-	-	-	-	-	-	-	2	2	1
CO2	3	-	-	-	-	-	-	2	2	-	-	2	2	1
CO3	-	3	-	-	-	-	-	2	2	-	-	2	2	1
CO4	-	3	-	-	-	-	-	-	-	-	-	2	2	1
CO5	-	-	-	3	-	-	-	-	-	-	-	2	2	1
AVG	3	3	-	3	-	-	-	2	2	-	-	2	2	1

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, Proto type filter design. Attenuators- classification-T-type, -type, Lattice-type, Bridged T-type attenuators.

TEXTBOOKS:

1. M E VanValkenberg, "Network Analysis", Pearson Education, 3rd Edition, 2019.
2. Charles K.Alexander and N.O. Sadiku, "Fundamentals of electric circuits", Mc Graw Hill Education, 7th Edition, 2022.
3. Abhijit Chakrabarti, "Circuit Theory", Dhanpat Rai & Sons, 7th Edition, 2018.

REFERENCES:

1. John Bird, "Electrical Circuit Theory and Technology", Newnes, 2nd Edition, 2013.
2. C L Wadhwa, "Electrical Circuit Analysis including Passive Network Synthesis", New Age International Private Limited, 2nd Edition, 2018.
3. David A Bell, "Electric circuits", Oxford University Press, 7th Edition, 2009.

Course Code	Course Title	Notional Hours					Core/Elective	
M24PC406EE	ELECTRICALMACHINES-I						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
Engineering Physics, FEEE, EMF		45	15	-	30	3	40	60

Course Objectives: The objective of this course is to make the student to

1. Understand the Concept of Magnetic Circuits.
2. Impart knowledge on Construction, Working and Applications of DC Machines.
3. Understand & Study Speed Control Methods and Testing of DC Motors.
4. Understand Construction, Working of Single-Phase transformer and conduct various tests on the transformer.

Course Outcomes: After completion of the course, the student will be able to

1. Explain & interpret electromechanical energy conversion principles, construction, working, characteristics and Speed control methods of DC machines and 1-ø transformers with EMF Equations, Auto transformers and identify different types of 3-ø transformer connections.
2. Apply principles of electromagnetic induction to explain the construction, operation, performance, and applications of various DC machines and justify the need for starters.
3. Describe commutation and its improvement methods; predetermine transformer performance using equivalent circuits, voltage regulation, and efficiency calculations, construction, operation, and advantages 3-ø transformers over a bank of 1- ø transformers.
4. Analyze energy interactions in magnetic systems, different DC machine windings, effects of armature reaction and compensating windings, perform speed control techniques and calculate the efficiency and performance of DC machines under various operating conditions.
5. Analyze transformer equivalent circuits, efficiency, losses, and load sharing in parallel operation, copper savings in auto-transformers, different three-phase transformer connections with their phase relationships and applications.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	-	-	-	-	-	-	2	2	-	-	3	3	1
CO2	3	-	-	-	-	-	-	2	2	-	-	3	3	1
CO3	3	-	-	-	-	-	-	-	-	-	-	3	3	1
CO4	-	3	-	-	-	-	-	-	-	-	-	3	3	1
CO5	-	3	-	-	-	-	-	-	-	-	-	3	3	1
AVG	3	3	-	-	-	-	-	2	2	-	-	3	3	1

UNIT-I

Electromechanical Energy Conversion Principles: Principles of energy conversion, single excited and doubly excited magnetic systems, singly excited electric field systems, Faraday's laws, and 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 interpoles 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: Swinburne's test, Brake test, Hopkinson's test, Field's test and Retardation test. Calculation of efficiency based on all the above tests.

UNIT-IV

Single-Phase 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: Principle of operation of Auto Transformers, saving of copper compared to two-winding transformer and its applications.

Three-Phase Transformers: Merits of three-phase Transformers over three-phase transformer bank, Type of connections (Delta-Delta, Delta-Star, Star-Delta, Star-Star, V-V connection and T-T Connections).

TEXTBOOKS:

1. Dr. P.S. Bimbhra , Electrical Machinery, Khanna Publishers, 2021.
2. Stephen D. Umans & Fitzgerald and Kingsley's, Electric Machinery,–TMH Publishers, 7th Edition, 2020.
3. Nagrath & D.P.Kothari , Electrical Machines, TMH Publishers, 5th Edition, 2018.

REFERENCES:

1. J.B. Gupta, Theory & Performance of Electrical Machines, S.K. Kataria & Sons, 5th Edition, 2013.
2. A.E.Clayton & N N Hancock, The Performance and Design of Direct Current Machines, CBS Publishers, 2004.
3. M.G.Say, Performance and design of AC machines, CBS Publishers, 2002.
4. Ashfaq Husain, Haroon Ashfaq, Electrical Machines, Dhanpat Rai and Company, 3rd Edition, 2023.

Course Code	Course Title	Notional Hours					Core/Elective	
M24PC407EE	DIGITAL LOGIC DESIGN						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
----		45	15	-	30	3	40	60

Course Objectives: The objective of this course is to make the students to

1. Familiarize with fundamental of number systems, Boolean algebra, and logic gates, and their application in digital circuit design.
2. Familiarize with various Boolean function minimization techniques and digital code converters for efficient circuit implementation.
3. Develop proficiency in the design and analysis of combinational and sequential logic circuits, with an emphasis on practical applications.
4. Understand memory systems, programmable logic devices, and their functions, as well as the design of digital systems using these devices.
5. Solve Boolean functions using programmable logic devices such as PLA and PAL, and understand FPGA and CPLD systems for digital design.

Course Outcomes: After completion of the course, the student will be able to

1. Explain the fundamental concepts of number systems, Boolean algebra, logic gates, memory devices, and programmable logic devices.
2. Apply digital logic design principles to solve problems in Boolean algebra, circuit design, and code conversion.
3. Analyze Boolean expressions, logic circuits, and the functionality of digital devices.
4. Analyze the performance of digital circuits and systems using combinational logic.
5. Analyze digital systems using sequential logic.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	-	-	-	-	-	-	2	2	-	-	-	-	2
CO2	3	-	-	-	-	-	-	2	2	-	-	-	-	2
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	2
CO4	-	3	-	-	-	-	-	-	-	-	-	-	-	2
CO5	-	3	-	-	-	-	-	-	-	-	-	-	-	2
AVG	3	3	-	-	-	-	-	2	2	-	-	-	-	2

UNIT I: Number Systems, Logic Gates, Boolean Algebra, and Binary Code

Number Systems and Conversions: Binary, Octal, Decimal, Hexadecimal, Complements: 1's, 2's, 9's, and 10's Complements, Signed Number Representation: Sign-magnitude, 1's and 2's Complement, Binary Codes: Weighted Codes (BCD, 8421), Non-weighted Codes (Excess-3, Gray Code) Alphanumeric Codes (ASCII, EBCDIC),

Binary Arithmetic: Addition, Subtraction, Multiplication, Division, BCD Addition

Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR, Truth Tables and Circuit Realization

Boolean Algebra: Laws, Theorems, De Morgan's Theorem, Canonical Forms : Sum of Products (SOP), Product of Sums (POS), Minterms, Maxterms.

UNIT II: Boolean Function Minimization and Code Converters:

Simplification Using Boolean Algebra, Karnaugh Maps (K-Map): 2 to 4 variables Quine-Mc Cluskey Method: Prime Implicants, Essential Prime Implicants ,Code Converters :Binary to Gray and Gray to

Binary, BCD to Excess-3 and vice versa , Error Detection and Correction: Even/Odd Parity, Hamming Code (1-bit error correction) , Parity Generators and Checkers.

UNIT III: Combinational Logic Circuits:

Introduction , Arithmetic Circuits: Half Adder, Full Adder, Carry Look-Ahead Adder, BCD Adder Half and Full Subtractor, Multiplexers : 2:1,4:1, 8:1 – Design and Applications, Demultiplexers:1:4, 1:8 – Design and Applications , Encoders and Decoders :Priority Encoder, Decimal-to-BCD ,Binary to 7-Segment Decoder Implementation of Boolean Functions Using Multiplexers, Comparators : 1-bit, 2 bit and4-bit Magnitude Comparators.

UNIT IV: Sequential Logic Circuits

Latches : SR and D Latch – Construction, Operation, Comparison of Latches and Flip-Flops, Flip-Flops: SR, D, JK, T , Truth Tables, Excitation Tables, Characteristic Equations , Master-Slave Configuration, Flip-Flop Conversions , Registers: SISO, SIPO, PISO, PIPO, Universal Shift Register , Counters (using JK or T Flip-Flops):Asynchronous Counters: 3-bit and4-bit Up Counter ,3-bit Down Counter ,3-bit Up/Down Counter Synchronous Counters: 3-bit and 4-bit Up Counter , 3-bit Down Counter ,3-bit Up/Down Mod-N Counters: Mod-6 and Mod-10 , Ring Counters, Johnson Counters.

UNIT V: Memory and Programmable Logic Devices

Memory Classification: ROM, RAM, PROM, EPROM, EEPROM, Flash, Memory Organization: Address Lines, Word Size, Memory Cell Block Diagram, Memory Decoding and Address Mapping.

Programmable Logic Devices: PLA: Architecture and Applications, PAL: Architecture and Applications Overview of CPLD and FPGA Architectures and Applications.

TEXTBOOKS:

1. M. Morris Mano and Michael D. Ciletti, Digital Design, Pearson Education publication, 6th Edition.
2. A. Anand Kumar, Fundamentals of Digital Circuits, Prentice Hall India publication, 4th Edition.

REFERENCES:

1. Anil K. Maini, Digital Electronics, Wiley publication, 4th Edition.
2. R .P. Jain, Modern Digital Electronics, , Tata Mc Graw-Hill Education publication, 4th Edition.
3. B. R. Gupta and J. P. Gupta, Digital Electronics and Logic Design, Dhanpat Rai Publication, 2nd Edition
4. M. Morris Mano, Digital Logic and Computer Design, Pearson Education publication, 2nd Edition
5. John M. Yarbrough, Digital Logic Design, Thomson Learning publication, 3rd Edition.

Course Code	Course Title	Notional Hours					Core/Elective	
M24ES403CS	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
----		30	-	-	30	2	40	60

Course Objectives: The objective of this course is to

1. Understand the foundations, history, and applications of Artificial Intelligence.
2. Learn the structure of intelligent agents and search strategies for problem-solving.
3. Study logical reasoning, adversarial search, and constraint satisfaction techniques.
4. Explore knowledge representation methods and probabilistic reasoning models.
5. Analyze decision-making under uncertainty using probabilistic approaches.

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

1. Explain the foundations, history and real-world applications of Artificial Intelligence.
2. Analyze the structure and behavior of intelligent agents and various searching techniques used in problem-solving.
3. Apply logical reasoning, planning, game strategies, and constraint satisfaction techniques for decision-making in structured environments.
4. Formulate and solve sequential decision-making problems under uncertainty using probabilistic models.
5. Compare different knowledge representation methods, problem solving techniques and reasoning models.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	-	-	-	-	-	-	-	-	-	3	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	3	-	-	3
CO3	3	3	-	3	-	-	-	-	3	-	3	-	-	3
CO4	3	3	-	3	-	-	-	-	3	-	3	-	-	3
CO5	3	3	-	3	-	-	-	-	3	-	3	-	-	3
AVG	3	3	-	3	-	-	-	-	3	-	3	-	-	3

UNIT I

Introduction: Foundations of AI, History, State of the Art, Risks and Benefits.

Intelligent agents: Agents and Environment, The Concept of Rationality, Structure of an Agent, Types of Agents.

Solving problems by Search- Problem-Solving Agents, State space representation, Search graph and Search tree, Searching for Solutions.

UNIT II

Uninformed Search Strategies: Uniform cost search, Iterative deepening Depth-first search, Bidirectional search.

Informed (Heuristic) Search Strategies: Heuristic Functions, Hill- climbing, Greedy best-first search, A* search, Simulated Annealing search.
Adversarial Search: Game Theory, Alpha–Beta Pruning.

UNIT III
Constraint Satisfaction Problems (CSP): Introduction, components, constraint types, and solving techniques using backtracking, inference, and heuristics.
Planning: Simple planning agents, basic plan representation, goal-based planning, state-space planning, and planning as search**.**
Logic Programming Basics: propositional and predicate logic, natural deduction, resolution. **Knowledge-Based Agents:** Architecture, reasoning mechanisms, connection to logic systems, overview of expert systems.

UNIT IV
Knowledge Representation: Introduction, approaches to knowledge Representation, Knowledge Representation using Semantic Network and Frames.
Probabilistic Reasoning: Basics of probability, Bayes rule, Bayesian networks representation, construction, exact and approximate inference, temporal model, hidden markov model, decision making under uncertainty.

UNIT V
Case Studies:
GPS route planning using state-space search, puzzle solving :8-puzzle, Sudoku with A* and heuristics, game AI: Chess or Tic-Tac-Toe using minimax with pruning, Sudoku solving via CSP, and virtual assistants: Siri or Alexa using knowledge graphs and Bayesian reasoning.

TEXT BOOKS:

1. Artificial Intelligence – A Modern Approach, Stuart Russell and Peter Norvig, Pearson Education Press.
2. Artificial Intelligence, Kevin Knight, Elaine Rich, B. Nair, McGraw Hill.

REFERENCE BOOKS:

1. Artificial Intelligence: Structures and Strategies for Complex Problem Solving, George F. Luger, Pearson.

Artificial Intelligence, David L. Poole and Alan K. Mackworth, Cambridge University Press.

Course Code	Course Title	Notional Hours					Core/Elective	
M24MC402HS	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
---		30	-	-	30	2	40	60

Course Objectives: : The objective of this course is to make the student

1. Reinforce the students understanding with the pan-Indian heritage in terms of culture, traditions and knowledge.
2. Impart the basic understanding of the importance of the various Indian Languages and Literature
3. Impart basic knowledge of Indian religion and Philosophies.
4. Impart basic knowledge on Indian Paintings, Music, Dance and Drama, Handicrafts and Indian Architecture.
5. Explore the Sciences, the contribution of scientists and the education system in Ancient, Medieval and Modern India.

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

1. Explain the concepts of Indian culture and Traditions and their Importance
2. Distinguish the Indian Languages
3. Show the basic understanding of Indian religion and Philosophy
4. Show the basic understanding about the fine arts in India
5. Analyze and apply the principles of traditional Indian Education to contemporary learning systems

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	-	-	2	-	-	3	2	2	2	-	2	-	-	-
CO2	-	-	2	-	-	2	2	2	2	-	3	-	-	-
CO3	-	-	1	-	-	3	3	2	2	-	3	-	-	-
CO4	-	-	2	-	-	3	2	2	2	1	3	-	-	-
CO5	-	-	3	-	-	3	2	3	3	2	3	-	-	-
AVG	-	-	2	-	-	2.8	2.2	2.2	2.2	1.5	2.8	-	-	-

UNIT- I

-Introduction to Indian Culture and heritage

UNIT -II

Indian Languages, Culture and Literature:

-the evolution and role of Sanskrit, significance of scriptures to current society

-Indian philosophies, other Sanskrit literature, literature of south India

-Northern Indian languages &literature

UNIT - III

Religion and Philosophy:

-Religion and Philosophy in ancient India (Buddhism, Jainism and Shatdarshanas)

-Religion and Philosophy in medieval India
-Religious reform movements in modern India (Brahma Samaj & Arya Samaj)

UNIT-IV

Fine Arts in India (Art, Technology& Engineering):
-Indian Painting, Indian handicrafts
-Music: Divisions of Indian classic music, modern Indian music
-Dance and Drama (classical and folk dances)
-Indian Architecture (Harappa and Mohenjo-Daro, Buddhist Sculpture, Asokan rock cut pillars, Iron pillar of Mehrauli); Medieval – Brihadeeswara temple, Ramappa Temple, Vijayanagar, Hampi and modern) Science and Technology in India

UNIT - V

Education System in India:
-Education in ancient, medieval and modern India –Women Education in India, National Education Policy -2020.

TEXTBOOKS:

1 .Indian Knowledge Systems (2 Vols-Set), Kapil Kapoor and Avadhesh Kumar Singh; ISBN 10: 8124603367 / ISBN 13: 9788124603369, Published by D K Print world, Publication Date: 2007

2. Science in Samskrit, Samskrita Bharati, Published by Samskrita Bharati, New Delhi, India, 2007; ISBN 10: 8187276339 / ISBN 13: 9788187276333.

3. Traditional Knowledge System and Technology in India, Book by Basanta Kumar Mohanta and Vipin K. Singh, Originally published: 2012 Publication Date: 2012; ISBN 10: 8177023101ISBN 13: 9788177023107.

4. Position paper, National Focus Group on Arts, Music, Dance and Theatre NCERT, March 2006, ISBN 81-7450-494-X, NCERT, New Delhi, 2010.

5. Evolution Of Indian Culture -(TEXT BOOK)- By B.N. Luniya, Ina Publishers, 2010

REFERENCES:

1. Indian Art and Culture, 4th Edition, By Nitin Singhania, ISBN: 9354601804 · 9789354601804, © 2022 | Published: December 20, 2021

2. 'Education and Examination Systems in Ancient India, written/authored/edited by S. Narain', published 2017, English-Hardcover, ISBN 9789351282518 publisher: Kalpaz Publications.

3. Satya Prakash, Founders of Sciences in Ancient India, Vijay Kumar Publisher, New Delhi, 1989

4. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, New Delhi, 2005

Course Code	Course Title	Notional Hours					Core/Elective	
M24PC451EE	ELECTRICAL CIRCUITS LAB						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
EC-I, EC-II		-	-	30	-	1	40	60

Course Objectives: The objective of this course is to make the student

1. Understand the behavior of electrical elements circuits.
2. Understand the practical verification of different laws and theorems.
3. Understand the behavior of electrical circuits Using MATLAB/SIMULINK/PYTHON.

Course Outcomes: After completion of the course, the student will be able to

1. Measure electrical parameters such as R, L, C using electrical instruments such as LCR meter, and multimeter with accuracy.
2. Master the concepts of theorems to analyze the electrical circuits.
3. Measure two-port network parameters of an electrical circuit.
4. Perform experiment on DC and AC electrical circuits to evaluate its performance.
5. Execute an MATLAB/SIMULINK/PYTHON code to study the behaviour of electrical circuits.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
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CO2	3	-	-	-	-	-	-	3	2	-	-	-	2	2
CO3	3	-	-	-	-	-	-	3	2	-	-	-	2	2
CO4	-	3	-	-	-	-	-	3	2	-	-	-	2	2
CO5	-	3	-	-	3	-	-	3	2	-	-	2	2	2
AVG	3	3	-	-	3	-	-	3	2	-	-	2	2	2

LIST OF EXPERIMENTS

1. CRO-applications, measurements of R, L, C using LCR meter, color coding method.
2. Verification of Reciprocity theorem.
3. Verification of Tellegen's theorem.
4. Verification of Milliman's theorem
5. Analysis of series RL&RC Circuits with AC excitation.
6. Calculation of Z and Y parameters for a given two port network.
7. Calculation of h and ABCD parameters for a given two port network.
8. Verification of Phase and Line relations for voltages and currents in a three-phase network.
9. Series Resonance-Calculation of Band width and Q-Factor.
10. Simulation of series RL and RC Circuits to analyze transient behavior using MATLAB/SIMULINK/PYTHON
11. Simulation of series and parallel resonance circuit using MATLAB/SIMULINK/PYTHON
12. Simulation of electrical circuits for Mesh and Nodal analysis using MATLAB/SIMULINK/PYTHON

Note: A minimum of Ten experiments to be performed.

REFERENCES:

1. Fundamentals of Electric Circuits, Charles K. Alexander and Matthew N. O. Sadiku, Tata Mc Graw Hills Education, Edition 6, 2016.
2. Electrical Circuit Analysis, William H Hayt and Jack Kemmerly, 9th Edition, 2022
3. Circuit Theory Analysis and Synthesis by Abhijit Chakrabarti, Dhanpat Raj & Co., 2025.
4. Fundamentals of Electrical Engineering and Electronics", J.B.Gupta, S.K.Kataria & Sons Publications, 2009.

Course Code	Course Title	Notional Hours					Core/Elective	
M24PC452EE	DIGITAL LOGIC DESIGN LAB						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
DLD		-	-	30	-	1	40	60

Course Objectives: The objective of this course is to

1. Familiarize with basic logic gates and verify their truth tables through hardware and simulation.
2. Develop the ability to design and implement combinational circuits such as adders, subtractors, multiplexers, code converters, and parity checkers.
3. Understand and implement sequential logic circuits like flip-flops and counters (synchronous and asynchronous).
4. Provide hands-on experience in simulating digital logic circuits using software tools.
5. Enhance analytical and designs skills through experimentation, observation, and trouble shooting of digital circuits.

Course Outcomes: After completion of the course, the student will be able to

1. Verify the truth tables of basic logic gates using hardware and simulation tools.
2. Follow Boolean algebra techniques to simplify and realize logic functions using logic gates.
3. Execute an MATLAB/SIMULINK/PYTHON code to study digital logic circuits.
4. Assemble and build sequential logic circuits including flip-flops and up/down counters.
5. Build combinational logic circuits such as adders, subtractors, multiplexers, and code converters.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	-	-	-	-	-	-	3	2	-	-	-	-	2
CO2	3	-	-	-	-	-	-	3	2	-	-	-	-	2
CO3	3	-	-	-	3	-	-	3	2	-	-	-	-	2
CO4	-	3	-	-	-	-	-	3	2	-	-	-	-	2
CO5	-	3	-	-	-	-	-	3	2	-	-	-	-	2
AVG	3	3	-	-	3	-	-	3	2	-	-	-	-	2

LIST OF EXPERIMENTS:

1. Verification of truth tables for basic logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR).
2. Implementation of Half Adder and Full Adder circuits.
3. Implementation of Half Subtractor, and Full Subtractor circuits.
4. BCD to Excess-3 code converter using logic gates.
5. Implementation of 4:1 Multiplexer.
6. Asynchronous 4 bit up & Down counters.
7. Synchronous 4 bit up & Down counters.
8. Parity Checker and Parity Generator (Even and Odd Parity).
9. Logic gates and verification of truth tables using MULTISIM/MATLAB.
10. Half Adder and Full Adder circuits using MULTISIM/MATLAB.
11. Half Subtractor, and Full Subtractor circuits using MULTISIM/MATLAB.
12. SR, D, JK, and T Flip-Flops using MULTISIM/MATLAB.

Note: At least Ten experiments should be conducted.

REFERENCES:

1. Digital Design by M. Morris Mano and Michael D.Ciletti, 6th Edition, Pearson Education publication
2. Fundamentals of Digital Circuits by A. Anand Kumar, 4th Edition, Prentice Hall India publication
3. Modern Digital Electronics by R. P. Jain, 4th Edition, Tata Mc Graw-Hill Education publication
4. Digital Principles and Applications by Donald P.Leach, Albert Paul Malvino, & Goutam Saha 8th Edition, Tata Mc Graw-Hill Education Publication

Course Code	Course Title	Notional Hours					Core/Elective	
M24ES457CS	ARTIFICIAL INTELLIGENCE LAB						Core	
Prerequisites		**L**	**T**	**P/PW**	**TW/SL**	**Credits**	**CIE**	**SEE**
Fundamentals of Artificial Intelligence		-	-	**30**	-	**1**	**40**	**60**

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Course Objectives: The objective of this course is to

1. Introduce basic and advanced search techniques used in artificial intelligence for problem-solving.
2. Develop practical skills in implementing AI algorithms for classical and real-world problems.
3. Apply informed and uninformed search strategies for solving state-space and path finding problems.
4. Understand adversarial search concepts through implementation of game-playing agents.
5. Design simple AI agents capable of decision-making in uncertain and interactive environments.

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

1. Apply uninformed search strategies to solve AI problems.
2. Solve constraint and search problems using efficient algorithms.
3. Apply informed search techniques to solve complex problems efficiently.
4. Develop adversarial search strategies for game-based scenarios.
5. Design intelligent agents for interactive applications.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	3	-	-	2	-	-	-	-	-	1	-	-	3
CO2	3	3	2	2	2	-	-	-	-	-	1	-	-	3
CO3	3	3	2	2	3	-	-	-	-	-	1	-	-	3
CO4	3	2	2	-	2	-	-	-	-	-	-	-	-	3
CO5	3	2	2	-	2	-	-	-	2	-	1	-	-	3
AVG	3	2.6	2	2	2.2	-	-	-	2	-	1	-	-	3

LIST OF PROGRAMS

1. Write a program to implement Uninformed search techniques:
   a. BFS
   b. DFS
2. Develop a program to solve the Water Jug Problem using Breadth First Search technique.
3. Write a program to solve 5-queens problem using Depth First Search technique.
4. Design and implement solution for 8-puzzle problem using A* search algorithm.
5. Develop a python program to solve maze navigation problem using greedy best first search.
6. Write a Program to Implement Alpha-Beta Pruning using Python.
7. Implement Minimax algorithm for finding an optimal decision in a tic-tac toe game.
8. Implement an AI agent for Hangman Game

Course Code	Course Title	Notional Hours					Core/Elective	
M24SE351EE	TECHNICAL TRAINING-I						Core	
Prerequisites		L	T	P/PW	TW/SL	Credits	CIE	SEE
----		-	-	30	-	1	40	60

. Course Objectives: The objective of this course is to

1. Equip students with practical exposure to technical tools and software relevant to core Electrical engineering domains.
2. Enable students to apply software-based solutions to engineering problems through modeling, simulation.
3. Enhance skill-based learning in line with current industry practices and technological advancements.
4. Develop the ability to adapt and learn new tools independently for professional development.
5. Foster competency in interpreting results, generating technical documentation, and presenting engineering solutions effectively.

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

1**:** Apply the fundamental functions of a selected engineering software/tool to real time solutions.
2: Create and simulate engineering components/systems using the selected tool.
3: Solve practical problems relevant to Electrical Engineering domains using digital methods.
4: Interpret simulation/design/analysis outcomes and validate them against expected physical behavior.
5: Create professional reports and presentations based on technical work carried out using the tool.

CO-PO/PSO MAPPING TABLE: (Scale:1-Slight, 2-Moderate, 3-High)

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3	2	-	-	3	-	-	-	-	2	-	3	-	-
CO2	3	3	3	2	3	-	-	-	-	-	-	3	-	-
CO3	3	3	2	2	3	-	-	-	-	-	-	2	3	3
CO4	3	3	2	3	3	-	-	-	-	-	-	2	-	-
CO5	-	-	-	-	2	-	-	-	2	3	2	2	-	-
AVG	3	2.7	2.3	2.3	2.8	-	-	-	2	2.5	2	2.4	3	3

Module 1: Introduction to the Software

- Overview of the tool's domain (design/analysis/automation).
- Interface, workspace, navigation.
- Application areas in electrical engineering.

Module 2: Basic Features and Workflow

- Tool-specific commands, modeling/simulation techniques.
- Creating geometry or setting up analysis.
- Workflow examples (design > simulate > evaluate).

Module 3: Engineering Application Tasks

- Component-level or system-level design/simulation.

- Case-based learning: Realistic tasks or industry examples.
- Iterative improvement based on results.

Module 4: Interpretation and Validation

- Reading results (graphs, plots, etc.).
- Comparing with theoretical/empirical expectations.
- Troubleshooting and refining.

Module 5: Documentation and Reporting

- Exporting results and creating visual content.
- Preparing technical reports.
- Oral presentation and technical documentation.

Note: One software/tool will be selected each academic year (e.g., Arduino, AutoCAD, PSpice, MULTISIM, MATLAB, Proteus, Labview etc.) based on industry trends and availability.