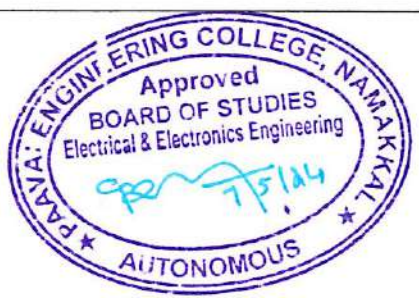
**PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637018**
**(AUTONOMOUS)**
**B.E. ELECTRICAL AND ELECTRONICS ENGINEERING**
**REGULATIONS 2023**
**(CHOICE BASED CREDIT SYSTEM)**
*(Applicable to the students admitted for the academic year 2023-2024 onwards)*
**CURRICULUM**

| SEMESTER III | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S.No** | **Category** | **Course Code** | **Course Title** | **L** | **T** | **P** | **C** |
| **Theory** | | | | | | | |
| 1 | BS | MA23301 | Transform Techniques and Partial Differential Equations | 3 | 1 | 0 | 4 |
| 2 | PC | EE23301 | Electromagnetic Theory | 3 | 0 | 0 | 3 |
| 3 | PC | EE23302 | Electrical Machines I | 3 | 1 | 0 | 4 |
| 4 | PC | EE23303 | Electron Devices and Circuits | 3 | 0 | 0 | 3 |
| 5 | MC | MC23301 | Environmental Sciences and Sustainability | 2 | 0 | 0 | 0 |
| **Theory with Practical** | | | | | | | |
| 6 | ES | IT23306 | Object Oriented Programming with C++ | 3 | 0 | 2 | 4 |
| **Practical** | | | | | | | |
| 7 | PC | EE23304 | Electrical Machines I Laboratory | 0 | 0 | 4 | 2 |
| 8 | PC | EE23305 | Electronic Devices Laboratory | 0 | 0 | 2 | 1 |
| 9 | EE | GE23301 | Professional Development I | 0 | 0 | 2 | 1 |
| | | | **TOTAL** | **17** | **2** | **10** | **22** |

| SEMESTER IV | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S.No** | **Category** | **Course Code** | **Course Title** | **L** | **T** | **P** | **C** |
| **Theory** | | | | | | | |
| 1 | BS | MA23404 | Numerical Methods | 3 | 1 | 0 | 4 |
| 2 | PC | EE23401 | Electrical Machines II | 3 | 0 | 0 | 3 |
| 3 | PC | EE23402 | Linear Integrated Circuits and Applications | 3 | 0 | 0 | 3 |
| 4 | PC | EE23403 | Signals and Systems | 3 | 1 | 0 | 4 |
| 5 | MC | MC23401 | Human Values and Gender Equality | 2 | 0 | 0 | 0 |
| **Theory with Practical** | | | | | | | |
| 6 | PC | EE23404 | Digital Logic Circuits | 3 | 0 | 2 | 4 |
| **Practical** | | | | | | | |
| 7 | PC | EE23405 | Electrical Machines II Laboratory | 0 | 0 | 4 | 2 |
| 8 | PC | EE23406 | Linear Integrated Circuits Laboratory | 0 | 0 | 4 | 2 |
| 9 | EE | GE23401 | Professional Development II | 0 | 0 | 2 | 1 |
| | | | **TOTAL** | **17** | **1** | **12** | **23** |



**SEMESTER III**

| MA23301 | TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS | 3 | 1 | 0 | 4 |
|---|---|---|---|---|---|

(Common to Aero, Agri, BME, Biotech, Civil, Chemical, EEE, Food, Pharma, Mech, MCT, R&A)

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1. | develop the knowledge of periodic and non-periodic functions and their representations using Fourier series. |
| 2. | acquaint the student with Fourier transform techniques used in wide variety of situations. |
| 3. | introduce the basic concepts of PDE for solving standard partial differential equations. |
| 4. | acquaint the student with Fourier series techniques in solving heat flow problems used in various situations. |
| 5. | develop Z transform techniques for discrete time systems. |

| UNIT I | FOURIER SERIES | 12 |
|---|---|---|

Dirichlet's conditions; General Fourier series; Odd and even functions; Half range series; Statement of Complex form of Fourier series; Parseval's identity; Harmonic analysis.

| UNIT II | FOURIER TRANSFORMS | 12 |
|---|---|---|

Fourier integral theorem (without proof); Fourier transform pair; Sine and cosine transform - Properties; Transforms of elementary functions; Convolution theorem; Parseval's identity.

| UNIT III | PARTIAL DIFFERENTIAL EQUATIONS | 12 |
|---|---|---|

Formation of partial differential equations; Lagrange's linear equation; Solutions of four standard types of first order partial differential equations; Linear partial differential equations of second order with constant coefficients.

| UNIT IV | FOURIER SERIES SOLUTION TO PARTIAL DIFFERENTIAL EQUATIONS | 12 |
|---|---|---|

Solutions of One-dimensional wave and heat equation; Steady state two-dimensional heat equation.

| UNIT V | Z -TRANSFORMS AND DIFFERENCE EQUATIONS | 12 |
|---|---|---|

Z-transforms - Elementary properties; Inverse Z-transform; Method of partial fraction ; Residue method; Convolution theorem; Solution of difference equations by Z-transform.

| | TOTAL PERIODS | 60 |
|---|---|---|

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | BT Mapped (Highest Level) |
|---|---|---|
| CO1 | classify the properties of periodic and non-periodic vibrations with the help of Fourier series. | Applying (K3) |
| CO2 | apply the Fourier transform to convert the function from frequency domain to time domain. | Applying (K3) |

| | | |
|---|---|---|
| **CO3** | demonstrate partial differential equations that occur in many engineering applications. | Applying (K3) |
| **CO4** | apply Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations. | Applying (K3) |
| **CO5** | apply knowledge of Z transform to analyse linear time invariant systems. | Applying (K3) |

**TEXT BOOKS**

1. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second Edition, Reprint, 2012.
2. Grewal. B.S, "Higher Engineering Mathematics", Forty fourth Edition, Khanna Publications, New Delhi, 2018.

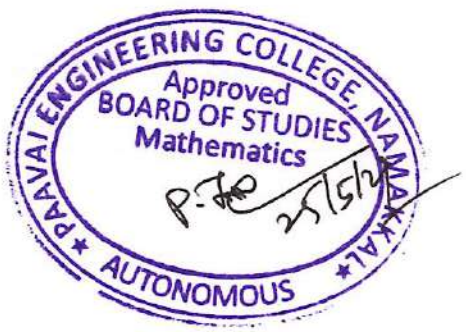
**REFERENCES**

1. Erwin Kreyszig, "Advanced Engineering Mathematics ", Tenth Edition, Wiley Publications, New Delhi, India, 2016.
2. Ramana. B.V., "Higher Engineering Mathematics", Tata Mc Graw Hill Publishing Company limited, New Delhi 2010.
3. Glyn James, "Advanced Modern Engineering Mathematics", Third Edition, Pearson Education 2007.
4. Wylie. R.C. and Barrett. L.C., "Advanced Engineering Mathematics", Tata Mc-Graw Hill Publishing Company limited, Sixth Edition, New Delhi, 2012.

**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | Programme Outcomes PO's | | | | | | | | | | | | PSO's | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO's** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **CO1** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 1 | 3 |
| **CO2** | 2 | 3 | 3 | 2 | - | - | - | - | - | - | - | 3 | 2 | 3 |
| **CO3** | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 2 | 3 |
| **CO4** | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 2 | 3 |
| **CO5** | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 3 |



| EE23301 | ELECTROMAGNETIC THEORY | 3 | 0 | 0 | 3 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

1. know the basic mathematical concepts related to electromagnetic fields.
2. impart the information on the concept of electric field and its applications.
3. acquire knowledge about the electric potential and its applications.
4. observe the concept of magnetic field and inductance.
5. recognize the field equations and electromagnetic waves.

**UNIT I** **CO-ORDINATE SYSTEMS AND VECTOR CALCULUS** **9**

Sources and effects of electromagnetic fields; Co-ordinate systems - Rectangular, cylindrical and spherical, relationship between coordinate systems; Vector calculus - Line, surface and volume integrals; Gradient, divergence and curl; Divergence theorem; Stoke's theorem.

**UNIT II** **ELECTROSTATICS I** **9**

Coulomb's law - Principle of superposition, continuous charge distribution; Electric field intensity - Electric field intensity due to discrete charges, Electric field due to continuous uniform charge distribution in finite and infinite line, circular disc and sheet; Electric flux density; Gauss law and its applications.

**UNIT III** **ELECTROSTATICS II** **9**

Electric potential - Potential due to infinite line charge, circular disc electric potential due to dipole; Equipotential surface; Conductors and dielectrics - Dielectric polarization; Poisson's and Laplace's equations; Capacitance - Capacitance of different dielectric media, parallel plate and sphere; Boundary conditions between dielectric media; Energy density.

**UNIT IV** **MAGNETOSTATICS** **9**

Magnetic flux density; Biot-Savart's Law - Magnetic field intensity on the straight conductors, circular coil, rectangular coil and toroid; Ampere's circuital law and its application; Lorentz force equations and applications; Magnetic boundary condition; Inductance - Self and mutual inductance; Inductance of solenoid, toroid, transmission line; Energy stored in magnetic field.

**UNIT V** **APPLICATION OF ELECTROMAGNETICS** **9**

Faraday's laws; Induced EMF - Transformer and motional EMF; Maxwell's equations (differential and integral forms); Conduction and displacement current - Continuity equation of current; Relationship between field theory and circuit theory; Wave equations - Plane waves in free space; Poynting theorem, poynting vector and its significance.

**TOTAL PERIODS** **45**

| COURSE OUTCOMES | | |
|---|---|---|
| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
| **CO1** | apply the concept of vector calculus for different coordinate systems. | Applying (K3) |
| **CO2** | describe the electric field intensity in various applications using appropriate laws. | Understanding (K2) |
| **CO3** | illustrate the concept of electric potential for different geometrics. | Applying (K3) |
| **CO4** | elaborate the magnetic field of moving charges in different space. | Understanding (K2) |
| **CO5** | use the Maxwell's equation and analyse the electromagnetic waves. | Applying (K3) |

**TEXT BOOKS**

1. Matthew N.O. Sadiku and S.V. Kulkarni, "Principles of Electromagnetics", Oxford University Press, Fifth Edition, 2015.
2. W H Hayt Jr, J A Buck and M Jaleel Akhtar, "Engineering Electromagnetics", McGraw Hill India, Ninth Edition, 2020.

**REFERENCES**

1. K.A. Gangadhar and P.M. Ramanathan, "Electromagnetic Field Theory", Khanna Publishers, Sixteenth Edition, 2015.
2. David J. Griffiths, "Introduction to Electrodynamics", Pearson Education India Learning Private Limited, Fourth Edition, 2015.
3. R. Meenakumari and R.Subasri "Electromagnetic Fields", New Age International Publishers, Second Edition, 2017.
4. S. Salivahanan, S. Karthie, "Electromagnetic Field Theory", McGraw Hill Education (India) Private Limited, Second Edition, Reprint 2018.

**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | **Programme Outcomes PO's** | | | | | | | | | | | | **PSO's** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO's** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **CO1** | 3 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 | 3 |
| **CO2** | 2 | 3 | 1 | - | - | - | - | - | - | - | - | 1 | 2 | 3 |
| **CO3** | 3 | 3 | 1 | - | - | - | - | - | - | - | - | 1 | 2 | 3 |
| **CO4** | 2 | 3 | 1 | - | - | - | - | - | - | - | - | 1 | 2 | 3 |
| **CO5** | 3 | 3 | 1 | - | - | - | - | - | - | - | - | 1 | 2 | 3 |

| EE23302 | ELECTRICAL MACHINES I | 3 | 1 | 0 | 4 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1. | understand the principle of excitation systems and concepts of rotating machines. |
| 2. | acquire knowledge about the working principles, types and characteristics of DC generators. |
| 3. | know the working principle, characteristics, methods of speed control of DC motors. |
| 4. | understand the principle of operation and performance of transformer. |
| 5. | identify the types of testing in DC machines and transformers. |

| UNIT I | CONCEPTS OF ELECTROMECHANICAL ENERGY CONVERSION | 12 |
|---|---|---|

Introduction to magnetic circuits - Magneto motive force (MMF), flux, reluctance, inductance, magnetically induced e.m.f and force; Hysteresis and Eddy current losses; Energy in magnetic systems - Principles of electromechanical energy conversion, Single and multiple excited systems; Rotating magnetic field.

| UNIT II | DC GENERATORS | 12 |
|---|---|---|

DC Generators - Constructional details, emf equation; Methods of excitation - self and separately excited generators; Characteristics - Series, shunt and compound generators; Armature reaction and commutation; Efficiency and power stages in DC generator - Condition for maximum efficiency; Applications.

| UNIT III | DC MOTORS | 12 |
|---|---|---|

DC motors - Principle of operation, back emf and torque equation; Characteristics - Series, shunt and compound motors; Starting of DC motors - Types of starters; Speed control of DC series and shunt motors.

| UNIT IV | TRANSFORMERS | 12 |
|---|---|---|

Transformer - Construction, principle of operation, emf equation, transformation ratio; Transformer on no-load and load condition - Parameters referred to HV / LV windings, equivalent circuit; Regulation; Three phase transformers – Construction, types of connections; Auto transformer - construction, principle, applications; All day efficiency.

| UNIT V | TESTING OF DC MACHINES AND TRANSFORMERS | 12 |
|---|---|---|

Losses and efficiency in DC machines and transformers; Condition for maximum efficiency; Testing of DC machines - Brake test, Swinburne's test, retardation test and Hopkinson's test; Testing of transformers - Polarity test, load test, open circuit and short circuit tests.

| | TOTAL PERIODS | 60 |
|---|---|---|

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | BT Mapped (Highest Level) |
|---|---|---|
| CO1 | explain the working principle of electromechanical energy conversion and rotating machines. | Understanding (K2) |

| | | |
|---|---|---|
| **CO2** | describe the construction, operation, types and characteristics of DC generators. | Understanding (K2) |
| **CO3** | determine the characteristics of DC motor for real time applications. | Applying (K3) |
| **CO4** | examine the performance of transformers. | Applying (K3) |
| **CO5** | identify the various losses in DC machines and transformers. | Applying (K3) |

**TEXT BOOKS**

1. A.E. Fitzgerald, Charles Kingsley, Stephen. D.Umans, "Electric Machinery", Tata McGraw Hill Publishing Company Ltd, Reprint 2016.
2. J. Nagrath and D.P. Kothari, "Electric Machines", Tata McGraw Hill Publishing Company Ltd, 2017.

**REFERENCES**


1. B.L.Theraja, A.K.Theraja, "Electrical Technology", Volume 2, S.Chand Publishers, 2016
2. Smarajit Ghosh, "Electrical Machines", Pearson Education, 2016.
3. Parkar Smith, N.N., "Problems in Electrical Engineering" CBS Publishers and Distributers, 2017.
4. J.B. Gupta, "Theory and Performance of Electrical Machines", S.K.Kataria and Sons, 2016.


**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | Programme Outcomes PO's | | | | | | | | | | | | PSO's | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO's** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **CO1** | 2 | 1 | - | - | - | - | - | - | - | - | - | 1 | 2 | 2 |
| **CO2** | 2 | 2 | 1 | - | - | - | 1 | - | - | - | - | 1 | 2 | 3 |
| **CO3** | 3 | 2 | 1 | - | - | - | 1 | - | - | - | - | 1 | 2 | 3 |
| **CO4** | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | 2 | 3 |
| **CO5** | 3 | 3 | 1 | 1 | - | - | - | - | - | - | - | 1 | 2 | 3 |

| EE23303 | ELECTRON DEVICES AND CIRCUITS | 3 | 0 | 0 | 3 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

1. understand the structure of basic electronic devices.
2. learn the concepts of active, passive circuit elements and its characteristics.
3. familiarize the operation of transistor BJT.
4. acquaint the characteristics of amplifier gain and frequency response for amplifiers.
5. learn the required functionality of feedback amplifier and oscillators.

**UNIT I** **PN JUNCTION DEVICES** **9**

PN junction diode - Structure, operation and V-I characteristics, diffusion and transition capacitance; Half wave and full wave rectifier; Zener diode and its characteristics; Zener as regulator; Photodiode; Laser diode; Opto-coupler.

**UNIT II** **TRANSISTORS** **9**

BJT, JFET, MOSFET, UJT - Structure, operation, V-I characteristics; IGBT - Structure and V-I characteristics.

**UNIT III** **AMPLIFIERS** **9**

BJT – Common emitter amplifier circuit, common collector amplifier circuit; Two port devices and the hybrid model; Transistor hybrid model, h-Parameter model for the common emitter; Small signal model; Analysis of CE, CB, CC amplifiers using simplified hybrid model, frequency response of an amplifier.

**UNIT IV** **MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER** **9**

Two stage cascade amplifier; Method of coupling multistage amplifier - RC coupling, transformer coupling, direct coupling; Emitter coupled differential amplifier - Difference mode of operation and common mode of operation; Power amplifier - Classification power amplifier.

**UNIT V** **FEEDBACK AMPLIFIERS AND OSCILLATORS** **9**

Negative and positive feedback - Voltage / current, series, shunt feedback, advantages; Transistor based oscillators - Wien bridge, Hartley, crystal oscillators.

**TOTAL PERIODS** **45**

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
|---|---|---|
| **CO1** | explain the structure and operation of PN junction, zener diode and rectifiers. | Understanding (K2) |
| **CO2** | illustrate the structure and characteristics BJT, FET, MOSFET, UJT and IGBT. | Applying (K3) |
| **CO3** | examine the performance of various configurations of BJT and MOSFET based amplifier. | Applying (K3) |

| | | |
|---|---|---|
| **CO4** | interpret the characteristics of various types of amplifier. | Understanding (K2) |
| **CO5** | manipulate the operation of feedback amplifiers and different oscillators. | Applying (K3) |

**TEXT BOOKS**

1. David A. Bell , "Electronic Devices and Circuits", Oxford University higher education, Fifth Edition, Reprint 2018.
2. Sedra and smith, "Microelectronic Circuits", Oxford University Press, Seventh Edition, 2017.

**REFERENCES**

1. Balbir Kumar, Shail.B.Jain, "Electronic devices and circuits" PHI learning private limited, Second Edition 2014.
2. Thomas L.Floyd, "Electronic devices", Conventional current version, Pearson prentice hall, Tenth Edition, 2017.
3. Robert L.Boylestad, "Electronic devices and circuit theory", Pearson prentice Hall, Eleventh Edition, 2013.
4. Robert B. Northrop, "Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation", CRC Press, Second Edition, Reprint 2017.

**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | Programme Outcomes PO's | | | | | | | | | | | | PSO's | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO's** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **CO1** | 3 | 1 | 1 | 1 | - | - | 1 | - | - | - | 1 | 1 | 2 | 3 |
| **CO2** | 3 | 2 | 2 | 1 | - | 1 | - | - | - | - | 1 | 1 | 3 | 3 |
| **CO3** | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | 1 | 3 | 3 |
| **CO4** | 2 | 3 | 2 | 1 | - | - | - | - | - | - | 1 | 1 | 3 | 3 |
| **CO5** | 3 | 2 | 2 | 1 | - | 1 | 1 | - | - | - | 1 | 1 | 2 | 3 |

| MC23301 | ENVIRONMENTAL SCIENCES AND SUSTAINABILITY | 2 | 0 | 0 | 0 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1. | establish the knowledge of precious resources of the environment and their various impacts. |
| 2. | create awareness on ecosystem and biodiversity preserve. |
| 3. | learn scientific and technological solutions to current day pollution issues. |
| 4. | analyze climate changes, concept of carbon credit and the challenges of environmental management. |
| 5. | understand green materials, energy cycles and the role of sustainable urbanization. |

| UNIT I | ENVIRONMENT AND NATURAL RESOURCES | 6 |
|---|---|---|

Definition, scope and importance of Environment. Forest resources: Use and over-exploitation, deforestation, - mining, dams and their effects on forests and tribal people. Water resources: Use and over- utilization of surface and ground water, dams-benefits and problems. Food resources: effects of modern agriculture, fertilizer-pesticide problems. Role of an individual in conservation of natural resources.

| UNIT II | ECOSYSTEMS AND BIODIVERSITY | 6 |
|---|---|---|

Concept of an ecosystem: Structure and function of an ecosystem - ecological succession - food chains and food webs. Ecosystems- Types of ecosystem: Introduction - forest ecosystem and lake ecosystems. Biodiversity: Introduction - definition (genetic - species - ecosystem). Diversity - Value of biodiversity - Hotspots of biodiversity - Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity

| UNIT III | ENVIRONMENTAL POLLUTION | 6 |
|---|---|---|

Pollution: Définition - air pollution - water pollution - marine pollution - noise pollution. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - Electronic waste – Sources - Causes and its effects - Pollution case studies - Field study of local polluted site – Industrial/Agricultural.

| UNIT IV | SUSTAINABILITY AND ENVIRONMENT | 6 |
|---|---|---|

Sustainability - from unsustainability to sustainability-millennium development goals, and protocols. Sustainable development goals-targets, indicators and intervention areas. Climate change - acid rain - ozone layer depletion. Regional and local environmental issues and possible solutions - case studies. Concept of carbon credit, carbon footprint. Environmental management in industry - A case study.

| UNIT V | SUSTAINABILITY PRACTICES | 6 |
|---|---|---|

Zero waste and R concept, Circular economy, ISO 14000 Series, Environmental Impact Assessment - Sustainable energy: Non-conventional Sources, Green materials, Energy Cycles - carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio economical and technological change.

| | TOTAL PERIODS | 30 |
|---|---|---|

| COURSE OUTCOMES | | |
|---|---|---|
| At the end of this course, students will be able to | | BT Mapped (Highest Level) |
| CO1 | find the method of conservation of natural resources. | Understanding (K2) |
| CO2 | understand ecosystem and the conservation of biodiversity. | Understanding (K2) |
| CO3 | aware of environmental pollution and interpret its effects. | Understanding (K2) |
| CO4 | apply sustainable development for technological advancement and societal development. | Applying (K3) |
| CO5 | measure the sustainability practices for green energy cycles. | Analyzing (K4) |

**TEXT BOOKS**

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, 1st edition, 2017.
2. Gilbert M. Masters, Wendell P. Ela "Introduction to Environmental Engineering and Science", 3rd edition, Pearson, 2022.

**REFERENCES**

1. William P.Cunningham and Mary Ann Cunningham, "Environmental Science: A Global Concern",McGraw Hill, 16th edition, 2023.
2. C.S.Rao,, "Environmental Pollution and Control Engineering", New Age International (P) ltd Publication, New Delhi, 4th edition, 2021.
3. Erach Bharucha, "Textbook of Environmental Studies", Universities Press Pvt. Ltd., Hyderabad, 3rd edition, 2020.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 4th Edition, 2015.

**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | Programme Outcomes PO's | | | | | | | | | | | | PSO's | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO's | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| CO1 | 2 | 1 | - | - | - | 2 | - | - | 1 | 1 | - | - | 1 | 1 |
| CO2 | 2 | 2 | - | - | 1 | 1 | - | 1 | - | - | - | - | 1 | 2 |
| CO3 | 3 | - | - | 1 | - | - | - | 3 | - | - | - | 2 | 2 | 1 |
| CO4 | 2 | 2 | - | - | 1 | - | - | - | 1 | - | 1 | 1 | 1 | 1 |
| CO5 | 3 | 2 | - | 1 | - | - | - | 1 | - | - | - | 1 | 1 | 2 |

| IT23306 | OBJECT ORIENTED PROGRAMMING WITH C++ (Common to EEE and BME) | 3 | 0 | 2 | 4 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

1. introduction to C++ and its variables, data type, operators.
2. acquire the knowledge about object oriented programming (OOP).
3. study about operator overloading and inheritance in C++.
4. understand the concepts of polymorphism and templates.
5. familiarize the students with templates and generic programming.

**UNIT I** **INTRODUCTION TO C++** **9**

Object oriented programming concepts - Introduction to C++, tokens, keywords, identifiers and constants; Basic data types - User defined data types, derived data types,symbolic constants; Declaration of variables - Dynamic initialization of variables, reference variables; Operators in C++ - Scope resolution operator - Manipulators - Expressions and their types - Control structures - The main function – Function prototyping -Call by value - Call by reference - Inline functions -Default arguments - Function overloading.

**UNIT II** **CLASSES AND OBJECTS** **9**

Specifying a class – Defining member functions, private member functions, arrays within a class, Memory allocation for objects, static data members, static member functions, arrays of objects, objects as function arguments, friend functions, returning objects; Constructors - Parameterized constructors, Multiple constructors in a class, constructors with default arguments, Dynamic initialization of objects, copy constructor, dynamic constructors, destructors.

**UNIT III** **OPERATOR OVERLOADING ANDINHERITANCE** **9**

Defining operator overloading - Overloading unary, binary operators; Manipulation of strings using operators–Rules for overloading operators– Type conversions– Inheritance - Defining derived classes, Single inheritance, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance; Virtual base classes – Abstract classes.

**UNIT IV** **POLYMORPHISM AND TEMPLATES** **9**

Introduction to pointers to objects - This pointer, pointers to derived classes, virtual functions, pure virtual functions; Templates - Function templates, user defined template arguments, class templates.

**UNIT V** **EXCEPTION HANDING AND GENERIC PROGRAMMING** **9**

Exception Handling - Exception handling mechanism, multiple catch, nested try, rethrowing the exception – Namespaces – std namespace- Standard Template Library

**LIST OF EXPERIMENTS**

1. Write C++ programs using classes and objects.
2. Design C++ classes with static members, methods with default arguments, friend functions.

| | |
|---|---|
| 3. | Develop C++ programs using constructor, destructor, and copy constructor. |
| 4. | Develop C++ programs operator overloading and inheritance. |
| 5. | Develop C++ programs using virtual function and templates. |
| 6. | Develop C++ programs using exceptions handling. |

| | |
|---|---|
| **TOTAL PERIODS** | **75** |

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
|---|---|---|
| **CO1** | describe the basic concepts of object-oriented programming with C++. | Understanding (K2) |
| **CO2** | analyze a problem and identify classes, objects and the relationships among them. | Analyzing (K4) |
| **CO3** | make use of overloading and inheritance concepts to solve real world problems. | Applying (K3) |
| **CO4** | develop application using polymorphism and templates. | Applying (K3) |
| **CO5** | apply the features of exception handling and generic programming. | Applying (K3) |

**TEXT BOOKS**


1. E.Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill, Eigth Edition, 2020.
2. Herbert Schildt "C++: The Complete Reference", Tata McGraw Hill, Fourth Edition, 2017.


**REFERENCES**


1. Ira Pohl, "Object Oriented Programming using C++", Pearson Education, Second Edition, Reprint 2009.
2. S. B. Lippman, JoseeLajoie, Barbara E. Moo, "C++ Primer", Pearson Education, Fifth Edition, 2013.
3. B. Stroustrup, "The C++ Programming language", Pearson Education, Third Edition, 2010.
4. Paul Deitel, Harvey Deitel, "C++ How to Program", Pearson Education, Tenth Edition, 2017.


**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | **Programme Outcomes PO's** | | | | | | | | | | | | **PSO's** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO's** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **CO1** | 2 | 2 | 3 | 2 | - | - | - | - | 2 | - | - | 2 | 2 | 1 |
| **CO2** | 3 | 3 | 3 | 2 | - | - | - | - | 2 | - | - | 2 | 2 | 1 |
| **CO3** | 3 | 3 | 3 | 2 | - | - | - | - | 2 | - | - | 2 | 2 | 1 |
| **CO4** | 3 | 3 | 3 | 2 | - | - | - | - | 2 | - | - | 2 | 2 | 1 |
| **CO5** | 3 | 3 | 3 | 2 | - | - | - | - | 2 | - | - | 2 | 2 | 1 |

| EE23304 | ELECTRICAL MACHINES I LABORATORY | 0 | 0 | 4 | 2 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

1. test the performance of DC generators.
2. perform various test on DC motors.
3. acquire knowledge on transformer characteristics for regulation and efficiency.
4. gain ideas in testing of transformer to analyse the performance.

**LIST OF EXPERIMENTS**

1. Open circuit characteristics and load test on self excited DC generator.
2. Open circuit characteristics and load test on separately excited DC generator.
3. Load test on DC shunt generator and compound generator.
4. Load test on DC shunt motor and compound motor.
5. Load test on DC series motor.
6. Speed control of DC shunt motor.
7. Swinburne's test.
8. Load test on single phase transformer.
9. Open circuit and short circuit test on single phase transformer.
10. Separation of no load losses in single phase transformer.

**TOTAL PERIODS** 60

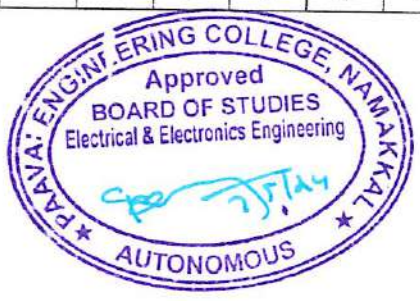
**COURSE OUTCOMES**

| At the end of this course, students will be able to | | BT Mapped (Highest Level) |
|---|---|---|
| CO1 | determine the performance of different types of DC generators for real time applications. | Understanding (K2) |
| CO2 | calculate the efficiency of DC motors for given application | Applying (K3) |
| CO3 | analyse the characteristics of transformer. | Applying (K3) |
| CO4 | calculate the equivalent circuit parameters and performance of transformers. | Applying (K3) |

**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| CO's | PO's | | | | | | | | | | | | PSO's | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| CO1 | 3 | 2 | 1 | 1 | - | - | - | - | 2 | - | - | 1 | 3 | 2 |
| CO2 | 3 | 2 | 1 | 1 | - | - | - | - | 2 | - | - | 1 | 3 | 2 |
| CO3 | 3 | 2 | 1 | 1 | - | - | - | - | 2 | - | - | 1 | 3 | 2 |
| CO4 | 3 | 3 | 2 | 1 | - | - | - | - | 2 | - | - | 1 | 3 | 2 |



| EE23305 | ELECTRONIC DEVICES LABORATORY | 0 | 0 | 2 | 1 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1. | conduct experiments for determining the characteristics of various electronic devices. |
| 2. | familiarize the characteristics of amplifier circuits with CE,CB,CC configuration. |
| 3. | test the characteristics UJT transistor. |
| 4. | acquaint the knowledge on characteristics of FET and differential amplifier. |

**LIST OF EXPERIMENTS**

1. Characteristics of semiconductor diode.
2. Voltage regulator using zener diode.
3. Photodiode, phototransistor characteristics and study of light activated relay circuit.
4. Single phase half wave and full wave rectifiers with inductive and capacitive filters.
5. Characteristics of transistor under CE, CB and CC.
6. Characteristics of UJT.
7. Characteristics of FET.
8. Differential amplifiers using FET.

| | |
|---|---|
| **TOTAL PERIODS** | **30** |

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
|---|---|---|
| **CO1** | examine the characteristics of various electronic devices. | Understanding (K2) |
| **CO2** | analyse the characteristics of amplifier circuits with CE,CB,CC configuration | Applying (K3) |
| **CO3** | observe the characteristics of UJT transistor. | Applying (K3) |
| **CO4** | investigate the characteristics of FET and differential amplifier. | Understanding (K2) |

**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| CO's | Programme Outcomes PO's | | | | | | | | | | | | PSO's | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| CO1 | 3 | 1 | 1 | 1 | 1 | - | - | 2 | 1 | - | 1 | 1 | 3 | 3 |
| CO2 | 3 | 2 | 2 | 1 | 1 | - | - | 2 | 1 | - | 1 | 1 | 3 | 3 |
| CO3 | 3 | 3 | 2 | 1 | 1 | - | - | 2 | 1 | - | 1 | 1 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 1 | 1 | - | - | 2 | 1 | - | 1 | 1 | 3 | 3 |

| GE23301 | PROFESSIONAL DEVELOPMENT I | 0 | 0 | 2 | 1 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

1. enhance and evaluate the student's professional skills and introduce the function of corporate world.
2. enhance and develop the students behavioral, speaking and listening skills to face the interview.
3. solve advance level verbal aptitude tests to get placed in Tier I companies.
4. improve their reasoning skills to get placed in reputed companies.

| UNIT I | SELF - UNDERSTANDING AND PERSONALITY ENHANCEMENT SKILLS | 7 |
|---|---|---|

Introduction self-exploration; SWOT analysis - Types and barriers; Effective communication in workplace; Leadership skills; Decision making - Problem solving; Goal setting - Critical, strategic and lateral thinking; JAM level- I; Basic resume building level- I.

| UNIT II | BEHAVIOURAL SKILLS, LISTENING AND SPEAKING SKILLS | 7 |
|---|---|---|

Behavioural skills; Time management; Emotional intelligence; Analytical thinking- Listening; Listening and hearing; Self-introduction; Group discussion - Types and importance, evaluation criteria, do's and don'ts of GD; GD Level-1.

| UNIT III | QUANTITATIVE APTITUDE | 8 |
|---|---|---|

Number System; LCM and HCF; Simple interest and compound interest; Average; Pipes and cisterns; Area; Profit and loss.

| UNIT IV | LOGICAL REASONING | 8 |
|---|---|---|

Logical sequence; Analogy; Classification; Causes and effect; Making judgment; Directions.

| | TOTAL PERIODS | 30 |
|---|---|---|

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | BT Mapped (Highest Level) |
|---|---|---|
| CO1 | define and analyze soft skills to improve the leadership skills. | Analyzing (K4) |
| CO2 | demonstrate the behavioral skills through various activities. | Applying (K3) |
| CO3 | develop the problem solving skills through quantitative aptitude. | Applying (K3) |
| CO4 | illustrate the logical reasoning Skills to solve real world problems. | Analyzing (K4) |

**TEXT BOOKS**

1. Agarwal, R.S. "Objective General English", S.Chand & Co.2021.
2. Agarwal, R.S. "Quantitative Aptitude", S.Chand & Co.2021.

**REFERENCES**

1. Abhijit Guha, "Quantitative Aptitude ", Tata-Mcgraw Hill, 2023.

2. Agarwal, R.S." a modern approach to Verbal & Non Verbal Reasoning", S.Chand & Co Ltd, New Delhi.2021.
3. Word Power Made Easy By Norman Lewis, Wr.Goyal Publications, 2021.

**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | Programme Outcomes PO's | | | | | | | | | | | | PSO's | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO's** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **CO1** | - | - | - | - | - | - | 3 | 3 | 2 | 3 | - | 3 | 1 | 1 |
| **CO2** | - | - | - | - | - | - | 2 | 3 | 2 | 3 | - | 3 | 1 | 1 |
| **CO3** | 3 | 2 | 2 | 2 | - | 1 | - | - | - | - | 2 | - | 2 | 2 |
| **CO4** | 2 | 1 | 3 | 2 | - | 3 | 3 | 1 | - | 1 | 2 | - | 2 | 2 |

**SEMESTER IV**

| MA23404 | NUMERICAL METHODS (Common to Aero & EEE) | 3 | 1 | 0 | 4 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1. | apply various numerical techniques for solving algebraic/transcendental equations and system of linear equations. |
| 2. | analyse the knowledge of interpolation using numerical data. |
| 3. | develop the knowledge of numerical differentiation and numerical integration techniques. |
| 4. | acquaint the knowledge of various techniques and methods of solving ordinary differential equations. |
| 5. | apply finite difference methods of solving boundary value problems. |

| UNIT I | SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS | 12 |
|---|---|---|

Solution of equations - Iteration method: Numerical solution to transcendental equations by Newton Raphson method; Solution of linear system by Gaussian elimination and Gauss - Jordon method; Inverse of a matrix by Gauss Jordon method; Iterative method: Gauss-Seidel method, Eigenvalue of a matrix by power method.

| UNIT II | INTERPOLATION AND APPROXIMATION | 12 |
|---|---|---|

Newton's forward and backward difference formulas; Lagrangian method for Polynomials; Divided differences, Newton's Divided Difference; Hermite Interpolation Polynomial and Interpolating with a cubic spline

| UNIT III | NUMERICAL DIFFERENTIATION AND INTEGRATION | 12 |
|---|---|---|

Differentiation using interpolation formulae; Numerical integration by trapezoidal, Simpson's 1/3, Romberg's method, Two and Three point Gaussian quadrature formulas; Double integrals using trapezoidal and Simpsons rule

| UNIT IV | INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS | 12 |
|---|---|---|

Single step methods - Taylor series method, Modified Euler method for first order equation, Fourth order Runge - Kutta method for solving first and second order equations; Multistep methods - Milne's and Adam's predictor and corrector methods.

| UNIT V | BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS | 12 |
|---|---|---|

Finite difference solution of second order ordinary differential equation; Finite difference solution of one dimensional heat equation by Crank Nicolson and Bender Schmidt Method; One dimensional wave equation and two dimensional Laplace and Poisson equations.

| | TOTAL PERIODS | 60 |
|---|---|---|

| COURSE OUTCOMES | | |
|---|---|---|
| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
| **CO1** | apply various numerical techniques to solve algebraic and transcendental equations. | Applying (K3) |
| **CO2** | apply the interpolation methods for constructing approximate polynomials. | Applying (K3) |
| **CO3** | derive the concepts of numerical differentiation and integration. | Applying (K3) |
| **CO4** | compute the solution of first order ordinary differential equations by numerical techniques. | Applying (K3) |
| **CO5** | derive the computational methods of solving various boundary value problems. | Applying (K3) |

**TEXT BOOKS**

1. Gerald C.F. and Wheatley, P.O., "Applied Numerical Analysis" Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. Sankar Rao K " Numerical Methods For Scientists And Engineers", Third Edition Princtice Hall of India Private, New Delhi, 2007.

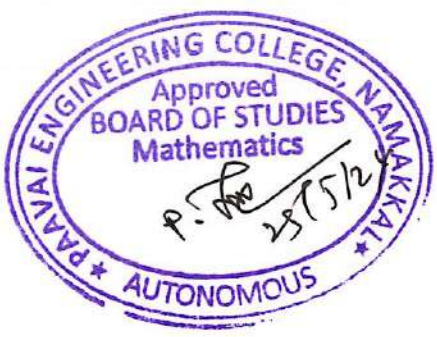
**REFERENCES**

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2003.
2. Erwin Kreyszig., "Advanced Engineering Mathematics" Tenth Edition, Wiley Publications, 2010.
3. M.K.Jain, S.R.K. Iyangar, R.K.Jain, "Numerical Methods for Scientific & Engineering Computation" New Age International (P) Ltd, New Delhi, 2005.
4. M.B.K. Moorthy and P.Geetha, "Numerical Methods", Tata McGraw Hill Publications Company, New Delhi, 2011.

**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | **Programme Outcomes PO's** | | | | | | | | | | | | **PSO's** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO's** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **CO1** | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | 2 | 1 | 3 |
| **CO2** | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | 2 | 2 | 3 |
| **CO3** | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 3 | 2 | 3 |
| **CO4** | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | 2 | 2 | 3 |
| **CO5** | 3 | 2 | 3 | 2 | - | - | - | - | - | - | - | 3 | 2 | 3 |



| EE23401 | ELECTRICAL MACHINES II | 3 | 0 | 0 | 3 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

1. introduce the basic mathematical concepts related to synchronous generator.
2. impart the information on the concept of synchronous motor.
3. acquire knowledge about three phase induction motor.
4. observe the concept of starting and speed control of three phase induction motor.
5. recognize the performance of single phase induction motor and types of special machines.

| UNIT I | SYNCHRONOUS GENERATOR | 9 |
|---|---|---|

Constructional details – Types of rotors, emf equation, synchronous reactance, armature reaction; Voltage regulation – EMF, MMF, ZPF and ASA methods; Synchronizing and parallel operation – Synchronizing torque, Change of excitation and mechanical input; Two reaction theory – Determination of direct and quadrature axis synchronous reactance using slip test.

| UNIT II | SYNCHRONOUS MOTOR | 9 |
|---|---|---|

Introduction - Principle of operation, torque equation, operation on infinite bus bars; V and inverted V curves; Power input and power developed equations; Starting methods; Current loci - Constant power input, constant excitation and constant power developed.

| UNIT III | THREE PHASE INDUCTION MOTOR | 9 |
|---|---|---|

Constructional details – Types of rotors, principle of operation, slip, equivalent circuit, torque-Slip characteristics, condition for maximum torque, losses and efficiency; Load test - No load and blocked rotor test; Circle diagram; Separation of no load losses; Double cage rotors.

| UNIT IV | STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR | 9 |
|---|---|---|

Starters - Need for starting; Types of starters – Stator resistance and reactance, rotor resistance, autotransformer and star-delta starters; Speed control – Change of voltage, torque, number of poles and slip control; Cascaded connection; Slip power recovery scheme.

| UNIT V | SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES | 9 |
|---|---|---|

Single phase induction motor - Constructional and working principle, Double field revolving theory, equivalent circuit, no load and blocked rotor test, performance analysis; Starting methods of single phase induction motors; Special machines - Repulsion motor, universal motor, AC servomotor, linear induction motor, hysteresis motor; Induction generators.

| | TOTAL PERIODS | 45 |
|---|---|---|

| COURSE OUTCOMES | | |
|---|---|---|
| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
| **CO1** | describe the construction and behavior of synchronous generator. | Understanding (K2) |
| **CO2** | illustrate the construction and operation of synchronous motor. | Applying (K3) |
| **CO3** | explain the performance characteristics of three-phase induction motor. | Understanding (K2) |
| **CO4** | identify the starting and speed control for three phase induction motor. | Analyzing (K4) |
| **CO5** | interpret the operation of single phase induction motor and special machines. | Understanding (K2) |

**TEXT BOOKS**


1. A.E. Fitzgerald, Charles Kingsley, Stephen. D.Umans, "Electric Machinery", Tata McGraw Hill Publishing Company Ltd, Reprint 2016.
2. I.J. Nagrath and D.P. Kothari, "Electric Machines", Tata McGraw Hill Publishing Company Ltd, 2017.


**REFERENCES**


1. B.L.Theraja, A.K.Theraja, "Electrical Technology", Volume II, S.Chand Publishers, 2016.
2. J.B. Gupta, "Theory and Performance of Electrical Machines", S.K.Kataria and Sons, 2015, International Publishers, 2012.
3. K. Murugesh Kumar, "Electric Machines", Vikas publishing house Pvt Ltd, Eleventh Edition 2020.
4. Mehta. V.K and Rohit Mehta, "Principle of Electrical Machines", S.Chand Publishers, Eigth Edition 2019.


**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | **Programme Outcomes PO's** | | | | | | | | | | | | **PSO's** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO's** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **CO1** | 3 | 2 | 1 | 1 | - | - | 1 | 1 | - | - | 1 | 1 | 2 | 3 |
| **CO2** | 3 | 2 | 1 | 1 | - | 1 | 1 | - | 2 | - | - | 1 | 2 | 3 |
| **CO3** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | 1 | 1 | 3 | 3 |
| **CO4** | 3 | 2 | 1 | 2 | - | 1 | 1 | - | - | - | - | 1 | 1 | 3 |
| **CO5** | 3 | 2 | 1 | 1 | - | - | 1 | 1 | - | - | 1 | 1 | 2 | 3 |

| EE23402 | LINEAR INTEGRATED CIRCUITS AND APPLICATIONS | 3 | 0 | 0 | 3 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

1. know the basic IC fabrication procedure and implementation.
2. impart the information on the characteristics and application of Op-amp IC's.
3. acquire knowledge about the waveform generation and converters.
4. observe the concept of basic function and applications of special IC's.
5. recognize the internal functional blocks of application IC's.

| UNIT I | FABRICATION OF IC'S | 9 |
|---|---|---|

IC classification; Steps in fabrication of IC - Wafer preparation, epitaxial growth, oxidation, masking and etching, diffusion of impurities, isolation techniques, metallization; Fabrication of typical circuits using resistors, capacitors, diodes and BJT.

| UNIT II | OP-AMP CHARACTERISTICS AND APPLICATIONS | 9 |
|---|---|---|

Ideal Op-amp characteristics; DC and AC characteristics of Op-amp; Inverting and non-inverting amplifiers (simple problems); Ideal inverting summing amplifier (simple problems); Ideal difference amplifier (simple problems); Voltage follower; Differentiator; Integrator; Nonlinear applications - Clamper, clipper.

| UNIT III | WAVEFORM GENERATORS AND CONVERTERS | 9 |
|---|---|---|

Sine wave generator - Wein-bridge oscillator, phase shift oscillator; Square wave; Triangular wave; Digital to analog converters - Weighted, R-2R ladder DAC; Analog to digital converter -Flash, successive approximation and dual slope.

| UNIT IV | SPECIAL IC'S | 9 |
|---|---|---|

IC555 Timer - Timer functional diagram, astable operation; Voltage controlled oscillator - Operation of IC-566; Phase locked loop - Operation of 565 PLL; Application of PLL - Frequency multiplier, frequency synthesizer; Analog multiplier - Basic multiplier and its characteristics, voltage divider using multiplier, squaring circuits using multiplier, square rooting circuit using multiplier, RMS detector.

| UNIT V | APPLICATION IC'S | 9 |
|---|---|---|

Regulator IC's - 78XX, 79XX fixed voltage regulators; IC 723 general purpose register; Three terminal adjustable regulator - LM 317; ICL 8038 function generator IC; Isolation amplifiers; Opto couplers; Opto electronics IC's.

| | TOTAL PERIODS | 45 |
|---|---|---|

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | BT Mapped (Highest Level) |
|---|---|---|
| CO1 | describe the fabrication procedure of integrated circuit. | Understanding (K2) |

| | | |
|---|---|---|
| **CO2** | examine the performance characteristics of Op-amp for different application. | Applying (K3) |
| **CO3** | illustrate the concept of op-amp for different waveform generators. | Applying (K3) |
| **CO4** | explain the concept of special IC's and its application. | Understanding (K2) |
| **CO5** | express the IC's concept to various applications. | Applying (K3) |

**TEXT BOOKS**

1. D. Roy Choudhary, Sheil B. Jani, "Linear Integrated Circuits", New Age, Fourth Edition, 2018.
2. Ramakant A.Gayakward, "Op-amps and Linear Integrated Circuits", Pearson Education, PHI Fourth Edition, 2021.

**REFERENCES**

1. Fiore, "Op-amps and Linear Integrated Circuits Concepts and Applications", Cengage, Seventh Edition, Reprint 2018.
2. Floyd, Buchla, "Fundamentals of Analog Circuits", Pearson, 2013.
3. Jacob Millman, Christos C.Halkias, "Integrated Electronics - Analog and Digital Circuits System", McGraw Hill, Second Edition, 2017.
4. Robert F.Coughlin, Fredrick F. Driscoll, "Op-amp and Linear IC's", Pearson, Sixth Edition, Reprint 2017.

**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | Programme Outcomes PO's | | | | | | | | | | | | PSO's | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO's** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **CO1** | 3 | - | 1 | - | - | - | - | - | 1 | - | 2 | 1 | 3 | 3 |
| **CO2** | 3 | 2 | 3 | 1 | - | - | - | - | 1 | - | 2 | 1 | 3 | 3 |
| **CO3** | 3 | 1 | 1 | 1 | 2 | - | - | - | 1 | - | 2 | 1 | 3 | 3 |
| **CO4** | 3 | - | 2 | 1 | 2 | - | - | - | 1 | - | 2 | 1 | 3 | 3 |
| **CO5** | 3 | - | 2 | 1 | - | - | - | - | 1 | - | 2 | 1 | 3 | 3 |

| EE23403 | SIGNALS AND SYSTEMS | 3 | 1 | 0 | 4 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1. | understand the fundamentals and classifications of continuous time signals and systems. |
| 2. | know the essentials and categorizations of discrete time signals and systems. |
| 3. | familiar with Fourier series, Fourier transforms and learn to apply frequency analysis. |
| 4. | impart knowledge on Z-transforms for continuous time signals. |
| 5. | acquire information on the sampling, sampling theorem and its implications. |

| UNIT I | INTRODUCTION TO CONTINUOUS TIME SIGNALS AND SYSTEMS | 12 |
|---|---|---|

Standard continuous time signals; Classification of continuous time signals; Mathematical operation on continuous time signals; Classification of continuous time systems.

| UNIT II | DISCRETE TIME SIGNALS AND SYSTEMS | 12 |
|---|---|---|

Standard discrete time signals; Classification of discrete time signal; Mathematical operation on discrete time signal; Classification of discrete time systems; Convolution - Linear, tabular, and circular methods.

| UNIT III | FOURIER SERIES AND TRANSFORMS | 12 |
|---|---|---|

Introduction to Laplace Transform, Laplace transform into Fourier transform; Fourier series representation of continuous time periodic signals; Properties of Fourier series; Continuous time Fourier transforms; Properties of Fourier transforms; Frequency response of LTI system.

| UNIT IV | Z - TRANSFORMS | 12 |
|---|---|---|

Review of Z-Transform; Region of Convergence; Characterization of LTI systems using Z –Transforms; Inverse Z-transforms - Power series expansion, partial fraction expansion.

| UNIT V | SAMPLING AND RECONSTRUCTION | 12 |
|---|---|---|

Sampling Theorem; Effects of sampling and aliasing; Sampling of continuous time signals with sample and hold; Reconstruction of signal from samples - Interpolation.

| | TOTAL PERIODS | 60 |
|---|---|---|

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | BT Mapped (Highest Level) |
|---|---|---|
| CO1 | explain the concepts of continuous time signals and systems in time domain. | Understanding (K2) |
| CO2 | determine the classifications of discrete time signals and systems. | Understanding (K2) |
| CO3 | identify the performance of Fourier series, Fourier transforms in frequency domain. | Applying (K3) |

| | | |
|---|---|---|
| CO4 | describe Z-transform for identify region for convergence of continuous time system. | Understanding (K2) |
| CO5 | illustrate the concepts of sampling and reconstruction of signals. | Applying (K3) |

**TEXT BOOKS**

1. A Nagoor Kani, Nagoor, "Signals and systems", McGraw-Hill Education (India) Pvt Limited, Seventh Edition, Reprint 2019.
2. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and systems", Prentice Hall India, Reprint 2016.

**REFERENCES**


1. Simon Haykins and Barry Van Veen, "Signals and Systems", John Wiley and Sons, 2014.
2. H. P. Hsu, "Signals and systems", Schaum's series, McGraw Hill Education, 2015.
3. M. J. Robert "Signals and Systems-Analysis using Transform Methods and MATLAB", McGraw Hill Education, 2014
4. M. J. Robert "Fundamentals of Digital signal Processing using MATLAB", Cengage Learning, 2015.


**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | PO's | | | | | | | | | | | | PSO's | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO's | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| CO1 | 2 | 1 | 1 | 1 | - | - | - | - | - | - | - | 1 | 3 | 3 |
| CO2 | 2 | 1 | 1 | 1 | - | - | - | - | - | - | - | 1 | 3 | 3 |
| CO3 | 3 | 2 | 1 | 1 | - | 2 | - | - | - | - | - | 1 | 3 | 1 |
| CO4 | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | 3 | 1 |
| CO5 | 3 | 2 | 1 | 1 | - | 2 | - | - | - | - | - | 1 | 3 | 2 |

| MC23401 | HUMAN VALUES AND GENDER EQUALITY | 2 | 0 | 0 | 0 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1. | define different types of human values and their impact on individual behaviour and societal norms. |
| 2. | apply principles of personal development such as self-confidence, self-discipline, and resilience to navigate modern challenges effectively. |
| 3. | evaluate the role of values in shaping professional ethics, civic sense and global citizenship. |
| 4. | examine the socio-economic factors influencing gender inequality and explore avenues for empowerment and advocacy. |
| 5. | critically analyze prevalent issues and challenges faced by women, including gender-based violence, discrimination, and cultural biases, and propose measures for their eradication. |

| UNIT I | HUMAN VALUES | 6 |
|---|---|---|

Value Education - Definition, Types of values; Human values - Acceptance, Consideration. Appreciation, Listening. Empathy, Sympathy, Honesty, Integrity, Wisdom, Decision making, Self-actualization, Character formation towards positive personality, Contentment; - Religious Values - Humility, Compassion, Gratitude. Peace, Justice, Freedom, Equality.

| UNIT II | PERSONALITY DEVELOPMENT | 6 |
|---|---|---|

Personal Development - Introspection, Self-confidence, Self-discipline; Flexibility -Peer pressure - Sensitization towards Gender Equality; Reliability; Unity; Modern Challenges of Adolescent Emotions and behavior - Comparison and Competition, Positive and Negative attitudes; Family values; Self-improvement - Physical exercises, Meditation ,Yoga.

| UNIT III | VALUE EDUCATION TOWARDS NATIONAL AND GLOBAL DEVELOPMENT | 6 |
|---|---|---|

Professional Values -. Integrity, Responsibility, Punctuality, Dedication - Perseverance - Competence; Civic sense and Responsibility; Global Values - Computer Ethics, Moral Leadership, Code of Conduct; Corporate Social Responsibility; Aesthetic values; National Integration and International understanding of Religious Values – Spirituality, thought process.

| UNIT IV | GENDER EQUALITY | 6 |
|---|---|---|

Gender Equality - Definition, Empowerment, Economic Equality; Condition of Women in India-Education, Healthcare, Political Representation, Gender-based Violence; Challenging Stereotypes: Parental and Caregiving Responsibilities; Legal and Policy Reform; Cultural Shifts; Global Perspective; Male Chauvinism; Sustainable Development..

| UNIT V | WOMEN ISSUES AND CHALLENGES | 6 |
|---|---|---|

Women Issues and Challenges - female feticide, violence against women; Domestic violence- dowry related abuse and deaths, Physical violence, Emotional abuse; Sexual assault; Honour killing; Eve-teasing- Stalking, e-stalking (cyber-crime).

| | TOTAL PERIODS | 30 |
|---|---|---|

| COURSE OUTCOMES | | |
|---|---|---|
| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
| **CO1** | discuss the concept of human values and their significance in personal and societal development. | Understanding (K2) |
| **CO2** | demonstrate introspective skills to enhance personal growth and self-awareness. | Applying (K3) |
| **CO3** | recognize the importance of gender equality in promoting a just and equitable society. | Understanding (K2) |
| **CO4** | cultivate a sense of social responsibility and ethical conduct towards achieving national and global development. | Analyzing (K4) |
| **CO5** | analyse the challenges faced by women in various spheres and identify strategies for addressing them. | Analyzing (K4) |

**TEXT BOOKS**

1. A Foundation Course in Human Values and Professional Ethics: Presenting a Universal Approach to Value Education - Through Self-exploration. New Delhi, 2016.
2. Aurther, John. Personality Development. Lotus Press, 2018.

**REFERENCES**

1. Joshi, Dhananjay. Value Education in Global Perspective. Lotus Press, 2014.
2. Mahrotra, Mamta. Gender Inequality in India: Challenging Social Norms. Prabhat Books, 2015.

**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | PO's | | | | | | | | | | | | PSO's | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO's** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **CO1** | - | 1 | - | 1 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 3 | 1 | 1 |
| **CO2** | - | 1 | - | 1 | 1 | 1 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 1 |
| **CO3** | - | 1 | - | 1 | 1 | 1 | 2 | 3 | 1 | 1 | 1 | 3 | 1 | 1 |
| **CO4** | - | 1 | - | 1 | 1 | 1 | 2 | 3 | 2 | 2 | 1 | 2 | 1 | 1 |
| **CO5** | - | 1 | - | 1 | 1 | 1 | 1 | 3 | 2 | 2 | 1 | 3 | 1 | 1 |

| EE23404 | DIGITAL LOGIC CIRCUITS | 3 | 0 | 2 | 4 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

1. familiar with the fundamentals of digital systems.
2. understand the concepts of combinational circuits.
3. identify the analysis and design of synchronous sequential circuits.
4. design the asynchronous sequential circuits.
5. classify memory devices and logic families.

| UNIT I | FUNDAMENTALS OF DIGITAL SYSTEMS | 9 |
|---|---|---|

Logic gates - AND, OR, NOT, NAND, NOR and Ex-OR operations; Review of number system and conversion - Binary, octal, decimal and hexadecimal; Boolean functions - Canonical forms, standard forms, De-Morgan's theorem; Simplification of Boolean functions - Two variable, three variable and four variable K-maps, don't care conditions, Quine Mc-Cluskey method.

| UNIT II | COMBINATIONAL CIRCUITS | 9 |
|---|---|---|

Design of adder - Half adder, full adder; Subtractor- Half subtractor, full subtractor; Comparators; Code converters - Binary to gray, gray to binary, BCD to binary, binary to BCD; Multiplexers, demultiplexers, encoders and decoders.

| UNIT III | SYNCHRONOUS SEQUENTIAL CIRCUITS | 9 |
|---|---|---|

Flip flops - SR, D, JK and T; Analysis and design of synchronous sequential circuits, state diagram, state reduction, state assignment; Synchronous counters.

| UNIT IV | ASYNCHRONOUS SEQUENTIAL CIRCUITS | 9 |
|---|---|---|

Analysis and design of asynchronous sequential circuits - Transition table, flow table, state assignment techniques, races and hazards; Asynchronous counters and its application on digital stop watch circuit.

| UNIT V | MEMORIES AND LOGIC FAMILIES | 9 |
|---|---|---|

Memories - ROM, PROM, EPROM, EEPROM; Logic families - RTL, TTL, ECL, CMOS; Programmable logic devices - PLA, PAL, FPGA.

**LIST OF EXPERIMENTS**

1. Verification and interpretation of truth table for AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates.
2. Implementation of Boolean functions using half and full adder circuits.
3. Implementation of Boolean functions using half and full subtractor circuits.
4. Verify the binary to gray and gray to binary code conversion using logic gates.
5. Implementation of 4x1 multiplexer and 1x4 demultiplexer using logic gates.
6. Realization and verification of encoder and decoder using logic gates.
7. Verify the truth table of SR, JK flip-flops using NAND gate.

| | TOTAL PERIODS | 75 |
|---|---|---|

| COURSE OUTCOMES | | |
|---|---|---|
| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
| **CO1** | implement the operations of gate and k-map simplification. | Understanding (K2) |
| **CO2** | construct the combinational logic circuits using gates. | Analyzing (K4) |
| **CO3** | analyse finite state machines using synchronous sequential circuits. | Applying (K3) |
| **CO4** | design the asynchronous sequential circuits. | Applying (K3) |
| **CO5** | develop combinational logic circuits using memory devices. | Applying (K3) |

**TEXT BOOKS**

1. M. M. Mano, "Digital Logic and Computer Design", Pearson Education India, Fourth Edition, Reprint 2019.
2. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, Fourth Edition, 2016.

**REFERENCES**

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, Fifth Edition, 2022.
2. Thomas L Floyd, "Digital Fundamentals", Pearson Education Limited, Eleventh Edition, Reprint 2020.
3. Tocci R.J, Neal S. Widmer, "Digital Systems: Principles and Applications", Pearson Education Asia, Tenth Edition, 2014.
4. Donald P Leach, Albert Paul Malvino, Goutam Sha, "Digital Principles and Applications", Tata McGraw Hill, Seventh Edition, Reprint 2018.

**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | **Programme Outcomes PO's** | | | | | | | | | | | | **PSO's** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO's** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **CO1** | 3 | 2 | - | - | - | - | - | - | 2 | - | - | 1 | 3 | 3 |
| **CO2** | 3 | 2 | 2 | 1 | - | - | - | - | 2 | - | - | 1 | 3 | 3 |
| **CO3** | 3 | 2 | 2 | 1 | - | - | - | - | 2 | - | - | 1 | 3 | 3 |
| **CO4** | 3 | 2 | 2 | 1 | - | - | - | - | 2 | - | - | 2 | 3 | 3 |
| **CO5** | 3 | 1 | 1 | - | - | - | - | - | 2 | - | - | 2 | 3 | 3 |

| EE23405 | ELECTRICAL MACHINES II LABORATORY | 0 | 0 | 4 | 2 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1. | conduct relevant experiments for determining the performance characteristics of AC machines. |
| 2. | calculate the regulation of three phase alternator using various methods. |
| 3. | attain the V and inverted V curves of synchronous motors. |
| 4. | estimate the parameters of equivalent circuit of induction motors. |

**LIST OF EXPERIMENTS**

1. Regulation of three phase alternator by EMF and MMF methods.
2. Regulation of three phase alternator by ZPF and ASA methods.
3. Regulation of three phase salient pole alternator by slip test.
4. V and inverted V curves of three phase synchronous motor.
5. Load test on three-phase induction motor.
6. No load and blocked rotor test on three-phase induction motor.
7. Separation of No-load losses of three-phase induction motor.
8. Load test on single-phase induction motor.
9. No load and blocked rotor test on single-phase induction motor.
10. Load test on three phase alternators.

| | |
|---|---|
| **TOTAL PERIODS** | **60** |

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
|---|---|---|
| **CO1** | determine the performance characteristics of AC machines. | Understanding (K2) |
| **CO2** | compute the regulation of three phase alternator using various methods. | Applying (K3) |
| **CO3** | draw the V and inverted V curves of synchronous motors. | Applying (K3) |
| **CO4** | draw the equivalent circuit of induction motors. | Applying (K3) |

**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| CO's | PO's | | | | | | | | | | | | PSO's | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| CO1 | 3 | 2 | 2 | 2 | - | 1 | - | - | - | 2 | 1 | 2 | 3 | 3 |
| CO2 | 3 | 2 | 2 | 2 | - | 1 | - | - | - | 2 | 1 | 2 | 3 | 3 |
| CO3 | 3 | 2 | 2 | 2 | - | 1 | - | - | - | 2 | 1 | 2 | 3 | 3 |
| CO4 | 3 | 2 | 2 | 2 | - | 2 | - | - | - | 2 | 1 | 2 | 3 | 3 |

| EE23406 | LINEAR INTEGRATED CIRCUITS LABORATORY | 0 | 0 | 4 | 2 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

1. conduct experiments for determining the gain using Op-amp.
2. test the characteristics voltage follower, clipper and clamper using Op-amp.
3. acquire knowledge on the basic operations of oscillator.
4. acquaint the knowledge on the functions of fixed voltage regulators.

**LIST OF EXPERIMENTS**

1. Inverting and non-inverting amplifier using Op-amp.
2. Summing and difference amplifier using Op-amp.
3. Integrator and differentiator using Op-amp.
4. Voltage follower using Op-amp.
5. Clipper circuit using Op-amp.
6. Clamper circuit using Op-amp.
7. Wein bridge oscillator using Op-amp.
8. RC Phase shift oscillator using Op-amp.
9. Square wave generator using IC 555.
10. LM78XX fixed voltage regulators.

**TOTAL PERIODS** 60

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | BT Mapped (Highest Level) |
|---|---|---|
| CO1 | analyse the performance of amplifier using Op-amp. | Applying (K3) |
| CO2 | observe the characteristics voltage follower, clipper and clamper using op-amp. | Applying (K3) |
| CO3 | examine the performance of various oscillator using Op-amp. | Understanding (K2) |
| CO4 | determine the performance IC 555 and LM78XX. | Applying (K3) |

**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | Programme Outcomes PO's | | | | | | | | | | | | PSO's | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO's | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| CO1 | 3 | 2 | 3 | 1 | 2 | - | - | - | 2 | - | 2 | 1 | 3 | 3 |
| CO2 | 3 | 1 | 1 | 1 | 2 | - | - | - | 2 | - | 2 | 1 | 3 | 3 |
| CO3 | 3 | 2 | 2 | 1 | - | - | - | - | 2 | - | 2 | 1 | 3 | 3 |
| CO4 | 3 | 2 | 2 | 1 | - | - | - | - | 2 | - | 2 | 1 | 3 | 3 |

| GE23401 | PROFESSIONAL DEVELOPMENT II | 0 | 0 | 2 | 1 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

1. enhance their own behavioural skills to survive in corporate world.
2. evaluate their listening and speaking skills to face the interviews in a successful way.
3. solve advance level verbal aptitude tests to get placed in Tier I companies.
4. improve their reasoning skills to get placed in reputed companies.

| UNIT I | WRITING SKILLS | 7 |
|---|---|---|

Email writing; Fixing and cancelling appointments; Paper submission for seminars and conferences; Business communication; Stress management; Body language; Dress code; Self-introduction II; Update resume building II; JAM level -3.

| UNIT II | PRESENTATION SKILLS | 7 |
|---|---|---|

Presentation skills - Types and methods of delivering presentation, ways and methods to improve presentation skills; Mini presentation in smaller groups; Situational role play; Face to face interview; Group discussion level IL; JAM Level-4.

| UNIT III | QUANTITATIVE APTITUDE - I | 8 |
|---|---|---|

Simplification; Time, speed and distance; Trains; Boats and streams; Ratio and proportion; Partnership; Percentage.

| UNIT IV | LOGICAL REASONING | 8 |
|---|---|---|

Seating arrangement; Arithmetic reasoning; Character puzzle; Syllogisms; Matching definitions; Statements and arguments.

| | TOTAL PERIODS | 30 |
|---|---|---|

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | BT Mapped (Highest Level) |
|---|---|---|
| CO1 | interpret the personality development through various activities. | Understanding (K2) |
| CO2 | examine speaking and listening skills to excel in their jobs. | Analyzing (K4) |
| CO3 | develop the quantitative skills and analytical skills to face the interview. | Applying (K3) |
| CO4 | extend the reasoning abilities by scoring exceeded percentage to get placed in reputed companies. | Understanding (K2) |

**TEXT BOOKS**


1. Agarwal, R.S. "Objective General English", S.Chand & Co.2021.
2. Agarwal, R.S. "Quantitative Aptitude", S.Chand & Co.2021.


**REFERENCES**


1. Abhijit Guha, "Quantitative Aptitude ", Tata-Mcgraw Hill, 2023.

2. Agarwal, R.S." a modern approach to Verbal & Non Verbal Reasoning", S.Chand & Co Ltd, New Delhi.2021.

3. Word Power Made Easy By Norman Lewis, Wr.Goyal Publications, 2021.

**CO-PO MAPPING:**

**Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| | Programme Outcomes PO's | | | | | | | | | | | | PSO's | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO's** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** |
| **CO1** | - | - | - | - | - | - | 3 | 3 | 2 | 3 | - | 3 | 1 | 2 |
| **CO2** | - | - | - | - | - | - | 2 | 3 | 2 | 3 | - | 3 | 1 | 2 |
| **CO3** | 3 | 2 | 2 | - | - | 1 | - | - | - | - | 2 | - | 2 | 2 |
| **CO4** | 2 | 3 | 3 | 2 | - | 3 | 3 | 1 | - | 1 | 2 | - | 2 | 2 |