**PAAVAI ENGINEERING COLLEGE**
**(AUTONOMOUS)**
**B.E. MECHATRONICS ENGINEERING**
**REGULATIONS – 2023**
**CHOICE BASED CREDIT SYSTEM**
**CURRICULUM**
**(For the candidates admitted during the Academic Year 2023-2024 onwards)**
**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 | MT23301 | Metrology and Measurements | 3 | 0 | 0 | 3 |
| 3 | PC | MT23302 | Digital Electronics | 3 | 0 | 0 | 3 |
| 4 | PC | MT23303 | Sensors and Instrumentation | 3 | 0 | 0 | 3 |
| 5 | MC | MC23302 | Human Values and Gender Equality | 2 | 0 | 0 | 0 |
| **Theory with Practical** | | | | | | | |
| 6 | ES | EE23307 | Electrical Drives and Actuators | 3 | 0 | 2 | 4 |
| **Practical** | | | | | | | |
| 7 | PC | MT23304 | Design and Modelling Laboratory | 0 | 0 | 4 | 2 |
| 8 | PC | MT23305 | Sensors and Instrumentation Laboratory | 0 | 0 | 4 | 2 |
| 9 | EE | GE23301 | Professional Development I | 0 | 0 | 2 | 1 |
| | | | **Total** | **17** | **1** | **12** | **22** |

**SEMESTER IV**

| S. No | Category | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | |
| 1 | BS | MA23401 | Statistics and Numerical Methods | 3 | 1 | 0 | 4 |
| 2 | PC | MT23401 | Theory of Machines | 3 | 0 | 0 | 3 |
| 3 | PC | MT23402 | Microprocessor and Microcontroller | 3 | 0 | 0 | 3 |
| 4 | PC | MT23403 | Mechanics of Materials | 3 | 0 | 0 | 3 |
| 5 | MC | MC23401 | Environmental Sciences and Sustainability | 2 | 0 | 0 | 0 |
| **Theory with Practical** | | | | | | | |
| 6 | PC | MT23404 | Manufacturing Processes | 3 | 0 | 2 | 4 |
| **Practical** | | | | | | | |
| 7 | PC | MT23405 | Machine Dynamics Laboratory | 0 | 0 | 4 | 2 |
| 8 | PC | MT23406 | Microprocessor and Microcontroller Laboratory | 0 | 0 | 4 | 2 |
| 9 | EE | GE23401 | Professional Development II | 0 | 0 | 2 | 1 |
| | | | **Total** | **17** | **1** | **12** | **22** |

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
Mechatronics
13/5/2024
AUTONOMOUS

| 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<br>At the end of this course, the students will be able to | | BT MAPPED<br>(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**

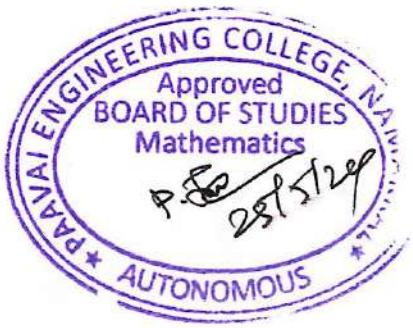
1. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.
2. Grewal. B.S, "Higher Engineering Mathematics", 44th Edition, Khanna Publications, New Delhi, (2018).

**REFERENCES**

1. Erwin Kreyszig , "Advanced Engineering Mathematics ", 10th 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", 3rd Edition, Pearson Education (2007).
4. Wylie. R.C. and Barrett. L.C., "Advanced Engineering Mathematics", Tata Mc-Graw Hill Publishing Company limited, 6th Edition, New Delhi, 2012.

**CO PO MAPPING:**

| **Mapping of Course Outcomes with Programme Outcomes (3/2/1 indicates strength of correlation) 3- Strong, 2-Medium, 1-Weak** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **Programmes Outcomes(POs)** | | | | | | | | | | | | | |
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 1 | 1 |
| **CO2** | 2 | 3 | 3 | 2 | - | - | - | - | - | - | - | 3 | 2 | 1 |
| **CO3** | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 |
| **CO4** | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 |
| **CO5** | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 |



| MT23301 | METROLOGY AND MEASUREMENTS | 3 | 0 | 0 | 3 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1 | learn the fundamentals of basic concepts and comparator. |
| 2 | understanding knowledge on angular measurements and surface finish measurements. |
| 3 | know with the screw thread and gear measurement. |
| 4 | learn on advances in metrology. |
| 5 | learn about basics of quality control and quality assurance. |

| UNIT I | BASIC CONCEPTS AND COMPARATORS | 9 |
|---|---|---|

Basic concept – Legal metrology, Precision, Accuracy; Types of errors; Standards of measurement; Principle –traceability, interchangeability and selective assembly, gauge blocks, limit gauges, fits and tolerances, tailors of gauge design; Comparators – Mechanical, Electronic, Optical and Pneumatic – Automatic gauging.

| UNIT II | ANGULAR MEASUREMENT AND SURFACE FINISH MEASUREMENT | 9 |
|---|---|---|

Angular measurement – Sine bar, Autocollimator, Optical projectors, Profile projectors, Toolmakers microscope; Measurement of surface finish – Terminology, Roughness, Waviness; Analysis of surface finish – Stylus probe instrument, Talysurf method.

| UNIT III | SCREW THREAD AND GEAR METROLOGY | 9 |
|---|---|---|

Screw thread metrology – Errors in thread, pitch error, drunkenness; Measurement of various elements thread – two and three wire method, best wire size; Thread gauges – floating carriage micrometer; Measurement of gears – Terminology, measurement of various elements of gear, tooth thickness, constant chord and base tangent method, Parkinson Gear Tester

| UNIT IV | ADVANCES IN METROLOGY | 9 |
|---|---|---|

Coordinate Measuring Machine (CMM) –Constructional features, types and applications; Computer Aided Inspection – Machine Vision system, Image processing; Basic of form error flow measurements-Mechanical flow measurements

| UNIT V | QUALITY CONTROL AND QUALITY ASSURANCE | 9 |
|---|---|---|

Quality-Characteristics-Facets of quality; Quality control-Objectives-Applications-Concepts-Policy-Planning; Quality improvement and motivation-Quality losses and avoidance; Quality economics and Quality assurance; Quality auditing - Quality program in existing organization-Quality control and break through.

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

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | BT Mapped (Highest Level) |
|---|---|---|
| CO1 | explain the various types of measurements and a comparator. | Remembering (K1) |

| | | |
|---|---|---|
| CO2 | discuss the relationship between gears and metrology. | Understanding (K2) |
| CO3 | design a specialized tool for measuring angular orientation and surface finish. | Applying (K3) |
| CO4 | Implement recent advancements in measurement techniques to enhance quality control in manufacturing processes. | Analyzing (K4) |
| CO5 | analyze the effectiveness of quality control and quality assurance measures. | Understanding (K2) |

**TEXT BOOKS**

1. Jain R.K. "Engineering Metrology", Khanna Publishers, 2018.
2. Gupta. I.C., "Engineering Metrology", Dhanpatrai Publications, 2019.

**REFERENCES**


1. Connie Dotson, et al., "Fundamentals of Dimensional Metrology", Thomas Asia, Singapore, 2018.
2. Doeblin E.O., "Measurement System Applications and Design", Tata McGraw Hill Publishing Company, New Delhi. 2019.
3. Groover M.P., "Automation, Production System and Computer Integrated Manufacturing", Prentice – Hall, New Delhi, 2019.
4. Dr.R.Venkat Reddy, "Engineering Metrology and Measurements", Invincible Publishers, 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**

| 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 | 2 | - | - | - | - | - | - | 2 | 2 | 2 |
| CO2 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | 2 |
| CO3 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | 2 |
| CO4 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | 2 |
| CO5 | 3 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | 2 |

| MT23302 | DIGITAL ELECTRONICS | 3 | 0 | 0 | 3 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1 | acquire the knowledge of digital logic and minimization technique. |
| 2 | understand the combinational circuits. |
| 3 | know the various synchronous sequential circuits. |
| 4 | study the basics of asynchronous circuits. |
| 5 | learn the concept of programmable logic devices. |

**UNIT I** **LOGIC GATES AND MINIMIZATION CIRCUITS** **9**

Analog electronics- Definition, purpose, circuits, application, comparison of analog and digital electronics; Basic digital circuits AND - OR - NAND - NOR - EX-OR operations; Boolean Algebra- Simplification of Boolean functions - minterm (SoP) - maxterm (PoS); K Map representation of functions - simplification of logic functions using K Map - Don't care conditions (upto 4 variables), Quine - McCluskey method of minimization (upto 4 variables).

**UNIT II** **COMBINATIONAL CIRCUITS** **9**

Half and Full Adders -Half and Full Subtractors; Multiplexer- Demultiplexer; Encoder – 4 to 2, 8 to 3 line encoder; Decoder –BCD to seven segment decoder; 2 bit Magnitude Comparator.

**UNIT III** **SYNCHRONOUS SEQUENTIAL CIRCUITS** **9**

Introduction to Sequential circuits - flip-flops - SR flip flops - JK flip flops - D flip flops - T flip flops - master slave flip flops; State diagram - state table - State minimization - State assignment - Excitation table and maps; Shift registers - Ring counter.

**UNIT IV** **ASYNCHRONOUS SEQUENTIAL CIRCUITS** **9**

Asynchronous sequential logic - Primitive flow table, minimization of Primitive flow table, State assignment, Excitation table; Cycles- Race Free State Assignment; Hazards in combinational circuits, Hazards elimination.

**UNIT V** **LOGIC DEVICES** **9**

Programmable logic devices (PLD) - Programmable read only memory (PROM), Programmable logic array (PLA), Programmable array logic (PAL); Complex programmable logic devices (CPLD); Field programmable gate arrays (FPGA).

**TOTAL PERIODS** **45**

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
|---|---|---|
| CO1 | understand boolean algebra principles and explain various digital logic families. | Understand (K2) |
| CO2 | design combinational circuits using logic gates. | Apply (K3) |
| CO3 | construct synchronous sequential circuits using basic flip flops. | Apply (K3) |
| CO4 | design the asynchronous logic families & its hazards. | Apply (K3) |

| | | |
|---|---|---|
| CO5 | analyze the various programmable logic devices. | Analysis (K4) |

**TEXT BOOKS**


1. M. Morris Mano, Michel D. Ciletti,"Digital Design", Pearson Education, New Delhi, 6th edition, 2018.
2. Ronald J. Tocci Neal S. Widmer and Gregory L. Moss, "Digital Systems: Principles and Applications", Prentice Hall of India, New Delhi, 12th Edition, 2018.


**REFERENCES**


1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, Fourth Edition, 2016.
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, Fifth Edition, 2022.
3. Thomas L Floyd, "Digital Fundamentals", Pearson Education Limited, Eleventh Edition, Reprint 2020.
4. Tocci R.J, Neal S. Widmer, "Digital Systems: Principles and Applications", Pearson Education Asia, Tenth Edition, 2014.


**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 | 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 |

| MT23303 | SENSORS AND INSTRUMENTATION | 3 | 0 | 0 | 3 |
|---|---|---|---|---|---|

| COURSE OBJECTIVES | |
|---|---|
| To enable the students to | |
| 1 | gain knowledge in units, standards, error analysis and characteristics of measurement systems. |
| 2 | know about the different devices available in mechanical measurement. |
| 3 | understand the basic laws used in the operation of electrical instruments and measurement techniques. |
| 4 | learn a signal conditioning circuit and data acquisition system. |
| 5 | understand the construction, working principles and characteristics of bio medical sensors. |

| UNIT I | SCIENCE OF MEASUREMENT | 9 |
|---|---|---|
| Units and standards; calibration techniques; errors in measurements; generalized measurement system; static and dynamic characteristics of transducers; generalized performance of zero order and first order systems; Classification of transducers. | | |

| UNIT II | MECHANICAL MEASUREMENT | 9 |
|---|---|---|
| Temperature measurement – filled thermometer, bimetallic thermometer; Pressure measurement – Bourdon gauge, bellows, diaphragm; Vacuum measurement – McLeod gauge, thermal conductivity gauge, Ionization gauge; Flow measurement – turbine flow meter, hot wire anemometer; | | |

| UNIT III | ELECTRICAL MEASUREMENTS | 9 |
|---|---|---|
| Potentiometer; RTD; Thermistor; Thermocouple; LVDT; RVDT; Capacitive transducers; Piezo electric transducers; Optical pyrometer; Hall effect transducers; Photo electric transducer; | | |

| UNIT IV | SIGNAL CONDITIONING AND DATA ACQUISITION | 9 |
|---|---|---|
| Types of Amplifier; Types of Filters; Sample and Hold circuit; Analog and Digital data acquisition system; Data Logging - Manufacturing, Environmental monitoring; Digital transmission system; Digital Instruments – LED and LCD. Basic sensor design circuit for temperature and pressure measurement. | | |

| UNIT V | MEASUREMENTS OF SIGNALS | 9 |
|---|---|---|
| Components of the biomedical instruments system; Electrodes – Types of electrodes – Depth and needle electrodes, surface electrodes; ECG; EEG; Heart and Lungs machine. | | |

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

| COURSE OUTCOMES | | |
|---|---|---|
| At the end of this course, students will be able to | | BT Mapped (Highest Level) |
| CO1 | define the units and standards, their conversions, characteristics and error analysis of systems. | Remembering (K1) |
| CO2 | infer the different devices available in mechanical measurements | Understanding (K2) |

| | | |
|---|---|---|
| **CO3** | classify and describe resistive, inductive and capacitive transducers which are used for measuring various parameters like displacement, temperature, humidity etc. | Understanding (K2) |
| **CO4** | construct a signal conditioning circuit and data acquisition system. | Applying (K3) |
| **CO5** | examine the utilization of biosensors and transducers in constructing uncomplicated mechatronics system. | Analyzing (K4) |

**TEXT BOOKS**

1. R.K. Rajput, "Mechanical Measurements and Instrumentation", Reprint 2013 edition, S.K. Kataria & Sons, 2013.
2. R.S. Khandpur, "Handbook of bio medical instrumentation", Tata McGraw; Hill Publishing Company Limited, New Delhi, 2024.

**REFERENCES**


1. D. Patranabis, "Sensors and Transducers", PHI, New Delhi, 2021.
2. Ernest O. Doebelin and Dhanesh N. Manik, "Measurement Systems", 7th Edition, Tata McGraw Hill, 2019.
3. D. Patranabis, "Principles of Industrial Instrumentation", 3rd Edition, McGraw Hill Education, New Delhi, 2017.
4. A.K. Sawhney, Puneet Sawhney, "A Course on Mechanical Measurement Instrumentation and Control", Dhanpat Rai and Co, New Delhi, 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**

| 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 | 3 | - | - | - | - | - | 2 | 2 | 3 |
| CO2 | 3 | 2 | 3 | 2 | 2 | 3 | - | - | - | - | - | 3 | 2 | 2 |
| CO3 | 3 | 3 | 2 | 1 | 2 | 3 | - | - | - | - | - | 2 | 3 | 1 |
| CO4 | 3 | 3 | 2 | 2 | 1 | 3 | - | - | - | - | - | 3 | 3 | 2 |
| CO5 | 3 | 2 | 3 | 1 | 2 | 3 | - | - | - | - | - | 2 | 3 | 1 |

| MC23302 | 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 behavior 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<br>At the end of this course, the students will be able to | | BT MAPPED<br>(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**

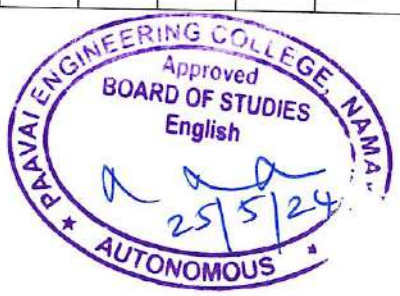
1. A Foundation Course in Human Values and Professional Ethics: Presenting a Universal Approach to Value Education - Through Self-exploration. New Delhi, 2016.
2. Aurther, John. Personality Development. Lotus Press, 2018.

**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:**

| *CO-PO & PSO Matrix Correlation :: Put if, Strong :3, Moderate : 2, Weak : 1, Nil : - | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COs | Programme Outcomes (POs) | | | | | | | | | | | | | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| 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 | 2 | 2 |
| CO5 | - | 1 | - | 1 | 1 | 1 | 1 | 3 | 2 | 2 | 1 | 3 | 2 | 2 |



| EE23307 | ELECTRICAL DRIVES AND ACTUATORS (Common to MCT and R&A) | 3 | 0 | 2 | 4 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

1. outline the representation of electrical drives.
2. get a knowledge on electric drive and their characteristics.
3. obtain the knowledge on DC motors drives by using power electronics converter.
4. study about AC motors drives controlling technique.
5. know about the special electrical motor construction and operation.

| UNIT I | FUNDAMENTALS OF ELECTRICAL DRIVES | 9 |
|---|---|---|

Basic elements; types of electric drives; Factors influencing the choice of electrical drives; classes of duty; Selection power rating of drive motors; Load equalization.

| UNIT II | DRIVE CHARACTERISTICS | 9 |
|---|---|---|

Characteristics of DC motor; Multi-quadrant operation; Three-phase induction motor - Construction, types, principle of operation, torque-slip characteristics, applications.

| UNIT III | DC MOTORS AND DRIVES | 9 |
|---|---|---|

DC Motors and their performance -Ward Leonard drive; Methods of braking; Speed control - Single phase fully controlled rectifier fed DC drives, four quadrant operation of chopper controlled DC drives.

| UNIT IV | AC MOTORS AND DRIVES | 9 |
|---|---|---|

Speed control of three phase induction motor - Stator voltage control, stator frequency control, stator voltage and frequency control, static rotor resistance control, static slip power recovery control.

| UNIT V | SPECIAL ELECTRICAL MOTOR DRIVES | 9 |
|---|---|---|

Stepper motors -Variable reluctance stepper motor, permanent magnet stepper motor; Switched reluctance motor - Construction and modes of operation; Construction and operation of BLDC motor, servo motor.

**LIST OF EXPERIMENTS**

1. Load test on DC shunt motor.
2. Load test on three phase squirrel cage induction motor.
3. Speed control of DC shunt motor (Armature and Field control).
4. Speed control of slip ring induction motor.
5. DSP based chopper fed DC motor drive.
6. Speed control of 3 phase induction motor using PWM inverter.
7. DSP based closed loop drive for induction motor.
8. Speed control of brushless DC motor.

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

| COURSE OUTCOMES | | |
|---|---|---|
| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
| **CO1** | infer the operations of electric drives. | Understanding (K2) |
| **CO2** | explain the working and characteristics of various drives. | Applying (K3) |
| **CO3** | apply the solid state switching circuits to operate various types of DC motors and drivers. | Understanding (K2) |
| **CO4** | interpret the performance of AC motors and drives. | Understanding (K2) |
| **CO5** | describe the concept special electrical motors drivers for applications. | Understanding (K2) |

**TEXT BOOKS**

1. Nagrath .I.J. & Kothari .D.P, "Electrical Machines", Tata McGraw-Hill, Fourth Edition, Reprint 2019.
2. Vedam Subrahmaniam, "Electric Drives (concepts and applications)", Tata McGraw- Hill, 2016.

**REFERENCES**

1. Gobal K. Dubey, "Fundamentals of Electrical Drives", Narosal Publishing House, New Delhi, Second Edition, Reprint 2018.
2. Theraja B.L and Theraja A.K., "A Text book of Electrical Technology", Volume – II, S,Chand Co., 2016.
3. M.D.Singh, K.B.Khanchandani, "Power Electronics", Tata McGraw-Hill, 2014.
4. Bimal K Bose, "Modern Power Electronics and AC Drives", Prentice-Hall of India Pvt. Ltd., 2013.

**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 | 2 | 3 |
| **CO2** | 3 | - | 1 | - | 2 | 1 | - | - | 2 | - | - | 1 | 1 | 3 |
| **CO3** | 3 | 1 | 1 | - | 2 | 1 | - | - | - | - | - | 1 | 1 | 3 |
| **CO4** | 3 | 1 | 1 | - | 2 | 1 | - | - | 2 | - | - | 1 | 2 | 3 |
| **CO5** | 3 | 1 | 1 | - | 2 | 1 | - | - | - | - | - | 1 | 2 | 3 |

PAAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
Electrical & Electronics Engineering
AUTONOMOUS

| MT23304 | DESIGN AND MODELLING LABORATORY | 0 | 0 | 4 | 2 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1 | design the components of machines using the given specifications. |
| 2 | analyze the tolerance values of designing components of machines. |
| 3 | assemble the various components designed for specific machines. |
| 4 | draw the components of machines based on requirement or condition given for designing specific machine manually. |

**LIST OF EXPERIMENTS**

1. CAD Introduction.
2. Study of welding symbols.
3. Study of screw thread keys and fasteners.
4. Study of limit and its geometric tolerance.
5. Converting given isometric view into orthographic views.
6. Design and Assembly of a Screw Jack.
7. Design and Assembly of a Flange Coupling.
8. Design and Assembly of a Plumber Block.
9. Design and Assembly of a Bearing.
10. Design and Assembly of a Tail stock.
11. Design and Assembly of a Universal Coupling.
12. Design and Assembly of a Connecting Rod.
13. Design and Assembly of a valve.
14. Design and Assembly of a sheet metal component.

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

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
|---|---|---|
| CO1 | learn about dimensioning, sectional views, and welding symbols. | Remembering (K1) |
| CO2 | create drawings of different components and their assembly for bearings. | Understanding (K2) |
| CO3 | evaluate both the individual part drawings and the assembly drawing of couplings. | Applying (K3) |
| CO4 | produce an assembly drawing for machine elements including a tailstock, screw jack, and connecting rod. | Analyzing (K4) |

**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 | 2 | 3 | 3 | - | 3 | - | - | - | 2 | 2 | - | 3 | 2 | 2 |
| CO2 | 2 | 2 | 3 | - | 3 | - | - | - | 2 | 2 | - | 2 | 2 | 2 |
| CO3 | 2 | 3 | 3 | - | 3 | - | - | - | 2 | 2 | - | 2 | 2 | 2 |
| CO4 | 2 | 3 | 3 | - | 3 | - | - | - | 2 | 2 | - | 2 | 2 | 2 |

PAVAI ENGINEERING COLLEGE, NAMAKKAL
Approved
BOARD OF STUDIES
Mechatronics
13/5/2024
AUTONOMOUS

| MT23305 | SENSORS AND INSTRUMENTATION LABORATORY | 0 | 0 | 4 | 2 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1 | understand the concept of temperature measurement devices. |
| 2 | know the working of displacement measurement devices. |
| 3 | understand the concept of strain and torque measurement devices. |
| 4 | learn skills needed in PC based data acquisition system. |

**LIST OF EXPERIMENTS**

1. Measurement of temperature using thermocouple.
2. Measurement of temperature using thermistor.
3. Measurement of temperature using RTD.
4. Measurement of linear and rotary displacement using potentiometer.
5. Measurement of displacement using LVDT.
6. Strain measurement using strain gauge.
7. Torque measurement using torque sensor.
8. Digital comparator.
9. Voltage to frequency and frequency to voltage converter.
10. Study of Speed and Position control of D.C servo motor.
11. Study on the application of data acquisition system for industrial purposes.

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

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
|---|---|---|
| **CO1** | choose the sensors for the measurement of temperature. | Remembering (K1) |
| **CO2** | show how displacement measurement devices are used for position control. | Understanding (K2) |
| **CO3** | select the suitable devices for strain and torque measurements. | Appling (K3) |
| **CO4** | examine the data acquisition system for various industrial applications. | Analyzing (K4) |

**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 | - | - | - | - | 3 | - | - | 2 | 2 | 3 |
| CO2 | 3 | 2 | 2 | 2 | - | - | - | - | 3 | - | - | 2 | 3 | 2 |
| CO3 | 3 | 3 | 2 | 2 | - | - | - | - | 3 | - | - | 2 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 2 | - | - | - | - | 3 | - | - | 3 | 3 | 2 |

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

**COURSE OBJECTIVES**

To enable students to

| | |
|---|---|
| 1 | enhance and evaluate the student's potential strength, personality skills and reduce weakness to survive. |
| 2 | enhance and develop the students behavioral, speaking and listening skills to face the interview. |
| 3 | solve the quantitative aptitude problems and improve their problem-solving skills. |
| 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 - 1, Basic Resume Building Level – 1.

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

Behavioral 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<br>At the end of this course, the students will be able to | | BT MAPPED<br>(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) |

**TEXTBOOKS**

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

**REFERENCES**

- Abhijit Guha, "Quantitative Aptitude ", Tata-Mcgraw Hill.2023.
- Agarwal, R.S." A Modern approach to Verbal & Non Verbal Reasoning", S.Chand & Co Ltd, newdelhi.2021
- 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)**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| CO's | Programme Outcomes (PO's) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P01 | P02 | P03 | PO4 | P05 | P06 | P07 | P08 | P09 | P010 | P011 | P012 | PSO1 | PSO2 |
| CO1 | - | - | - | - | - | - | 3 | 3 | 2 | 3 | - | 3 | 1 | 1 |
| CO2 | - | - | - | - | - | - | 2 | 3 | 2 | 3 | - | 3 | 1 | 1 |
| CO3 | 3 | 2 | 2 | 2 | - | - | 1 | - | - | - | - | - | 2 | 2 |
| CO4 | 2 | 3 | 3 | 2 | - | 3 | 3 | 1 | - | 1 | 2 | - | 2 | 2 |

| MA23401 | STATISTICS AND NUMERICAL METHODS | 3 | 1 | 0 | 4 |
|---|---|---|---|---|---|

**(Common to Civil, Chemical, Mech, MCT, R&A)**

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1. | determine the concepts of hypotheses testing, its need and applications. |
| 2. | equip with statistical techniques for designing experiments, analyzing, interpreting and presenting research data. |
| 3. | apply various numerical techniques for solving algebraic/transcendental equations and system of linear equations. |
| 4. | develop the knowledge of numerical differentiation and numerical integration techniques. |
| 5. | acquaint the knowledge of various techniques and methods of solving ordinary differential equations. |

**UNIT I** **TESTING OF HYPOTHESIS** **12**

Sampling theory; Large sample - Tests for single mean, proportion and difference of means; Small sample - Test for single mean and difference of means; Test equality of variances; Chi square test - Goodness of fit, Independence of attributes.

**UNIT II** **DESIGN OF EXPERIMENTS** **12**

Completely randomized design; Randomized block design; One way and two way classifications- Latin square design - $2^2$ factorial design.

**UNIT III** **SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS** **12**

Solution of algebraic and transcendental equations; Fixed point iteration method; Newton Raphson method; Solution of linear system of equations; Gauss elimination method – Pivoting; Gauss Jordan method; Iterative methods of Gauss Jacobi and Gauss Seidel; Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

**UNIT IV** **INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION** **12**

Interpolations - Newton's forward and backward difference interpolation; Approximation of interpolation polynomials; Divided differences; Lagrangian methods for equal and unequal intervals; Numerical differentiation and integration by trapezoidal and Simpson's 1/3 rules.

**UNIT V** **NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS** **12**

Single step methods: Taylor's series method; Euler's method, Modified Euler's method; Fourth order Runge-Kutta method for solving first order differential equations; Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.

**TOTAL PERIODS** **60**

| **COURSE OUTCOMES** At the end of this course, the students will be able to | | **BT MAPPED** (Highest Level) |
|---|---|---|
| **CO1** | apply the concept of testing of hypothesis for small and large samples in real life problems | Applying (K3) |
| **CO2** | analyse the principles to be adopted for designing the experiments. | Analysing(K4) |

| | | |
|---|---|---|
| **CO3** | apply various numerical techniques to solve algebraic and transcendental equations. | Applying(K3) |
| **CO4** | derive the concepts of numerical differentiation and integration. | Applying (K3) |
| **CO5** | compute the solution of first order ordinary differential equations by numerical techniques. | Applying (K3) |

**TEXT BOOKS**

1. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4thEdition, 2007.
2. Sankar Rao K " Numerical Methods for Scientists and Engineers –3rd Edition Princtice Hall of India Private, New Delhi, 2007.

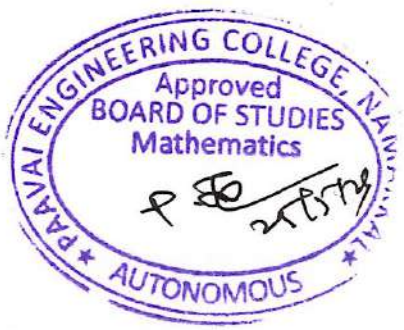
**REFERENCES**

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
3. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.
4. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

**CO PO MAPPING:**

**Mapping of Course Outcomes with Programme Outcomes**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium,1-Weak**

| COs | Programmes Outcomes (POs) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | 3 | 2 | 1 |
| CO2 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | 3 | 1 | 1 |
| CO3 | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | 2 | 1 | 2 |
| CO4 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 | 1 | 1 |
| CO5 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | 1 | 2 |



| MT23401 | THEORY OF MACHINES | 3 | 0 | 0 | 3 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1 | understand the basic of mechanisms in different machines. |
| 2 | plot the profile of various cam mechanisms. |
| 3 | phenomenon of direction of rotation, speed and torque determination for simple, compound and epicyclic gear systems. |
| 4 | calculate various forces acting on rigid bodies under static and dynamic conditions. |
| 5 | solve balancing problems related to rotating masses and apply the fundamental concepts of vibrating system to predict the natural frequency. |

| UNIT I | BASICS OF MECHANISMS | 9 |
|---|---|---|

Introduction to mechanisms; Degree of freedom; Kutzbach criterion; Grashoff's law; Kinematic inversions - Four bar chain, Single slider, Double slider crank chains; Description of common mechanisms - Quick return mechanisms, Ratchets and escapements, Indexing mechanisms.

| UNIT II | KINEMATICS OF CAM | 9 |
|---|---|---|

Classifications of Cam; Displacement diagrams - Parabolic, Simple harmonic, Uniform acceleration retardation and Cycloidal motions; Construction of cam profiles with and without offsets for various types of followers; Pressure angle and undercutting in cam.

| UNIT III | GEARS AND GEAR TRAINS | 9 |
|---|---|---|

Theory of Gearing - Spur gear nomenclature, law of gearing, tooth forms, minimum number of teeth, length of arc of contact, contact ratio; Gear trains - simple, compound, epicyclic gear trains.

| UNIT IV | FORCE ANALYSIS | 9 |
|---|---|---|

Dynamic force analysis - Inertia force and Inertia torque, D. Alembert's principle, Principle of superposition, Dynamic Analysis in Reciprocating Engines; Turning moment diagrams and Fly wheels.

| UNIT V | BALANCING AND VIBRATION | 9 |
|---|---|---|

Static and dynamic balancing - Balancing of single and several rotating masses in same and different planes; Types of vibration - Free and forced vibration, Longitudinal, Transverse and Torsional vibrations.

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

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | BT Mapped (Highest Level) |
|---|---|---|
| CO1 | describe the various mechanisms based on the degrees of freedom. | Remember (K1) |
| CO2 | design the profile of various cam mechanisms for different applications. | Understand (K2) |
| CO3 | solve and evaluate the kinematic aspects of gears and gear trains. | Understand (K2) |
| CO4 | assess inertia force, torque for reciprocating mechanisms and parameters of flywheel. | Apply (K3) |

| | | |
|---|---|---|
| CO5 | analyze the system of balancing and demonstrate the frequencies of free vibrations. | Analyze (K4) |

**TEXT BOOKS**

1. Khurmi, R.S.,"Theory of Machines", 14th Edition, S Chand Publications, 2019.
2. Rattan S.S, "Theory of Machines", 5th Edition, Tata McGraw – Hill Publishing Company Ltd., New Delhi, 2018.

**REFERENCES**


1. V.P. Singh, "Theory of Machines", 5th Edition,Dhanpat Rai & Co. (P) Limited, 2018.
2. R.K. Bansal and J.S. Brar, "Theory of Machines", Revised edition, Laxmi Publications, 2020.
3. John J. Uicker Jr., Gordon R. Pennock and Joseph E. Shigley, "Theory of Machines and Mechanisms "5th Edition, OUP USA, 2019.
4. Jr. John J. Uicke, "Theory of Machines and Mechanisms", 5th Edition, Oxford UnivPr, 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**

| | 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 | - | - | - | - | - | - | - | 2 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 |
| CO3 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| CO4 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| CO5 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |

| MT23402 | MICROPROCESSOR AND MICROCONTROLLER | 3 | 0 | 0 | 3 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1 | acquire knowledge on the architecture of 8085 microprocessor. |
| 2 | analyze the memory and I/O devices of 8085 microprocessor. |
| 3 | acquire knowledge about various interfacing devices. |
| 4 | gain information about the architecture of 8051 microcontrollers. |
| 5 | know about the application of microprocessor and microcontroller. |

**UNIT I** **8085 PROCESSOR** **9**

Hardware architecture - Pinouts. functional building blocks of processor; Instruction Set of 8085 – addressing modes – instruction and machine cycles with states and timing diagram.

**UNIT II** **MEMORY AND I/O DEVICES** **9**

Need for Interfacing - Memory Interfacing, address space partitioning, address map; Address decoding; Bus contention; I/O Interfacing - Data transfer schemes; Programmed synchronous and asynchronous; Interrupt driven transfer; Multiple devices and multiple interrupt levels; Enabling disabling and masking of interrupts.

**UNIT III** **INTERFACING DEVICES** **9**

Programmable peripheral device (8255); Programmable interval timer (8253); Programmable communication interface (USART); Programmable interrupt controller (8259); Programmable DMA controller (8257).

**UNIT IV** **8051 MICRO CONTROLLER** **9**

Hardware architecture - Pinouts, functional building blocks of processor; Memory organization - I/O ports and data transfer concepts; Data transfer - manipulation, control algorithms and I/O instructions; Interrupts.

**UNIT V** **MICROPROCESSOR AND MICROCONTROLLER APPLICATIONS** **9**

Temperature monitoring system: Automotive applications; Stepper motor control; Washing machine control; Keyboard and display interface.

**TOTAL PERIODS** **45**

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
|---|---|---|
| CO1 | explain the architecture of 8085 microprocessor. | Understand (K2) |
| CO2 | describe about memory and I/O devices in microprocessor. | Apply (K3) |
| CO3 | device interfacing concepts of various devices. | Apply (K3) |
| CO4 | describe the architecture of 8051 microcontrollers. | Apply (K3) |

| | | |
|---|---|---|
| CO5 | elaborate the real time applications of microprocessor and microcontroller. | Analysis (K4) |

**TEXT BOOKS**


1. R.S. Gaonkar, "Microprocessor Architecture Programming and Application with 8085", Wiley Eastern Ltd., New Delhi, Sixth Edition, 2013.
2. Sunil Mathur, Jeebananda Panda, "Microprocessor and Microcontrollers", PHI Learning Pvt. Ltd., 2016.
3. R.Theagarajan, S.Dhanasekaran, S.Dhanapal, "Microprocessors and its applications", New Age International, Reprint 2014.


**REFERENCES**


1. V. Douglas Hall, "Microprocessors and Interfacing Programming and Hardware", Tata McGraw - Hill Publishing Company Ltd., Reprint 2012.
2. K. Ray and K. M.Bhurchandi, "Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing", Tata McGraw - Hill Publishing Company Ltd., Reprint 2016.
3. Rafiquzzaman M., "Microprocessors Theory and Applications: Intel and Motorola", Prentice Hall, Reprint 2013.
4. Hrishna Kant, "Microprocessor& Microcontrollers", Prentice Hall of India, New Delhi, and Eastern company 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**

| CO's | Programme Outcomes PO's | | | | | | | | | | | | PSO's | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 2 | 1 | - | - | 2 | - | - | - | - | 2 | 2 | - | - |
| CO2 | 3 | 1 | 2 | - | - | 1 | - | - | - | - | 1 | 2 | - | - |
| CO3 | 3 | 2 | 1 | - | - | 2 | - | - | - | - | 2 | 2 | - | - |
| CO4 | 3 | 2 | 1 | - | - | 1 | - | - | - | - | 2 | 2 | - | - |
| CO5 | 3 | 2 | 1 | - | - | 1 | - | - | - | - | 1 | 2 | - | - |

| MT23403 | MECHANICS OF MATERIALS | 3 | 0 | 0 | 3 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1 | understand the theoretical basis about the stress, strain and elastic modulus. |
| 2 | know the stresses in inclined planes, cylinders and spherical objects. |
| 3 | understand the shear force, bending moment, deflection and slopes in various types of beams with different load conditions. |
| 4 | learn different types of load for an appropriate column. |
| 5 | understand the concept of strain energy and theory of failures. |

**UNIT I** **STRESS, STRAIN AND DEFORMATION OF SOLIDS** **9**

Introduction to Materials - Classification, Properties of Engineering Materials; Hook's law; Simple stresses and strain; Stress-Strain curve for ductile materials; Deformation of simple and compound bars under axial load, Stepped bars; Lateral strain; Poison's ratio; Volumetric strain; Elastic constants and their relationship; Factor of safety.

**UNIT II** **ANALYSIS OF STRESS IN TWO DIMENSIONS** **9**

State of stress at a point - Normal and tangential stresses on inclined planes, Principal planes and stresses, The plane of maximum shear stress; Mohr's Circle for biaxial stresses; Thin cylindrical and spherical shells, Deformation in thin cylindrical and spherical shells.

**UNIT III** **BEAMS** **9**

Types of beams - Supports and loads; Theory of simple bending; Stresses in beams-Bending and shear stress, Stress variation along the length and section of the beam; Slope and deflection of beams - Double integration and Macaulay's method; Cantilever and simply supported beams.

**UNIT IV** **COLUMNS** **9**

Column - Bucking of long columns due to axial load, Equivalent length of a column; Euler's and Rankine's formulae for columns of different end conditions.

**UNIT V** **STRAIN ENERGY** **9**

Castiglione's theorem I and II; Load deformation diagram, Strain energy due to normal stresses, Shear stresses, Modulus of resilience, Strain energy due to bending and torsion.; Theories of Failure-Maximum Principal stress theory, Maximum shear stress theory.

**TOTAL PERIODS** **45**

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
|---|---|---|
| **CO1** | study stress, strain, and elastic modulus under specified loading conditions. | Remembering (K1) |

| | | |
|---|---|---|
| **CO2** | investigate the biaxial stress states in thin cylinders and spherical shells. | Understanding (K2) |
| **CO3** | develop shear force and bending moment diagrams for standard beams. | Applying (K3) |
| **CO4** | calculate the critical load for a column considering various end conditions. | Analyzing (K4) |
| **CO5** | address issues concerning strain energy and the theory of failures through problem-solving. | Analyzing (K4) |

**TEXT BOOKS**

1. R. K. Bansal, "A text book of Strength of Materials", Laxmi Publications (P) Limited, New Delhi, 2019.
2. Egor P. Popov, "Engineering Mechanics of Solids", Prentice Hall of India Learning. Ltd., New Delhi, 2018.

**REFERENCES**

1. R.K.Rajput, "Engineering Materials", S. Chand and Company Ltd, New Delhi, 2018.
2. P. Purushothama Raj and V. Ramasamy, "Strength of Materials", Pearson Education, India, 2019.
3. S. Rattan, "Strength of Materials", 3rd edition.Tata McGraw-Hill Education.2017.
4. J.K Gupta and S.K.Gupta, "Strength of Materials: Mechanics of Solids", 1st Edition, Cengage Learning India Pvt.Ltd, 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**

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

| MC23401 | 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.

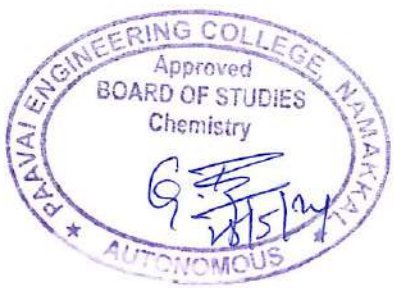
**REFERENCES**

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., 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**

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



| MT23404 | MANUFACTURING PROCESSES | 3 | 0 | 2 | 4 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1 | know the basics and working principle of sand casting and special casting processes |
| 2 | understand the various forming processes. |
| 3 | know the suitable metal removal processes for various applications. |
| 4 | learn the principles of different metal finishing processes. |
| 5 | learn the principles of different joining processes like welding, brazing, soldering and adhesive bonding. |

| UNIT I | FOUNDRY TECHNOLOGY | 9 |
|---|---|---|

Introduction to Molding and Casting; Molding sand - types, properties, preparation of green sand molding; Pattern making - Pattern materials, types and allowances; Core making - types of core, core materials, making of cores ;Casting methods - Die casting, Centrifugal Castings, Investment Casting and Shell mold Casting, Defects in casting.

| UNIT II | FORMING – PROCESSES | 9 |
|---|---|---|

Rolling - Introduction, Rolling mills, Rolling operations; Extrusion - Forward and Backward extrusion, Production of seamless tubing and pipes, Cold and Hydrostatic Extrusion; Drawing - Introduction, Hot and Cold drawing, Deep drawing, Tube and wire drawing; Sheet metal and forging operations.

| UNIT III | METAL REMOVAL PROCESSES | 9 |
|---|---|---|

Lathe - types, main parts and operations, single point cutting tool nomenclature; Drilling Machine - Types, operations, types of drills, Twist drill nomenclature; Reaming and tapping; Milling Machine - Types, operations, types of milling cutters; Planer - types, main parts, operations.

| UNIT IV | METAL FINISHING PROCESSES | 9 |
|---|---|---|

Grinding Machine - Methods of grinding, Types of grinding machines, Grinding wheel and its selection; Lapping; Honing; Super finishing; Broaching Machine - pull type and push type broachers, broaching machine types and operations.

| UNIT V | METAL JOINING PROCESSES | 9 |
|---|---|---|

Classification of Welding Process - Fusion Welding Processes - Arc Welding - Gas Tungsten Arc welding, Gas Metal Arc Welding; Electron Beam Welding, Laser Beam Welding, Solid State Welding, Cold Welding, Ultrasonic Welding; Friction Welding - Resistance Welding - Explosive Welding; Gas welding; Weld defects - types, causes and cure ; Brazing and soldering - Concepts and applications.

**LIST OF EXPERIMENTS**

1. Study on measurement (Linear measurements).
2. Step Turning.
3. Taper Turning.
4. Thread cutting operation.
5. Knurling operation.
6. Boring operation.
7. Gear Cutting operation.

8. Grinding operation (surface).
9. Shaping operation.

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

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
|---|---|---|
| **CO1** | showcase different foundry techniques such as pattern making, molding, casting, melting furnaces and inspection. | Remembering (K1) |
| **CO2** | classify different forming processes, including bulk forming and sheet metal operations. | Understanding (K2) |
| **CO3** | select the appropriate metal removal process based on the material and geometric design requirements. | Applying (K3) |
| **CO4** | propose different metal finishing methods for surface finishing operations. | Analyzing (K4) |
| **CO5** | choose the appropriate metal joining process based on the properties of the base metal. | Analyzing (K4) |

**TEXT BOOKS**


1. Kaushish J.P., "Manufacturing Processes", 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, 2023.
2. Rao P.N., "Manufacturing Technology, Volume I & II", 3rd Edition, Tata McGraw Hill Publishing Company, New Delhi, 2021.


**REFERENCES**


1. Kalpakjian, S, Schmid, - Manufacturing Process for Engineering Materialsǁ, 5th Edition, Pearson Education India, New Delhi, 2022.
2. Groover M.P., "Principles of Modern Manufacturing", Wiley India Pvt. Ltd., New Delhi, 2021.
3. Paul Degarma E, Black J T. and Ronald A Kosher, "Materials and Processes in Manufacturing", 8th edition, Hall of India, 2018.
4. Sharma P C., "A Textbook of Production Technology", S. Chand and Co., Ltd., 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**

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

| MT23405 | MACHINE DYNAMICS LABORATORY | 0 | 0 | 4 | 2 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1 | understand the characteristics of various governors. |
| 2 | draw the cam for given conditions. |
| 3 | learn the critical speed of shaft with concentrated loads. |
| 4 | acquire knowledge on balancing of reciprocating masses in machines. |

**LIST OF EXPERIMENTS**

1. Governor - Determination of characteristics of Watt, Porter, Proell, Hartnell governors.
2. Motorized Gyroscope - Determination of gyroscopic couple.
3. Whirling of shaft - Determination of critical speed of shaft with concentrated loads.
4. Balancing of reciprocating masses.
5. Determination of Moment of inertia by oscillation method for connecting rod and flywheel.
6. Vibrating system spring mass - Determination of damping coefficient of single degree of freedom system.
7. Determination of influence coefficient for multi degree freedom suspension system
8. Determination of transmissibility ratio using vibrating table
9. Determination of torsional natural frequency of single and Double Rotor systems Undamped and Damped Natural frequencies.
10. Transverse vibration of beam with and without concentrated masses.

**TOTAL PERIODS** 60

| **COURSE OUTCOMES** Upon the completion of the course, students will be able to | | **BT MAPPED** (Highest Level) |
|---|---|---|
| **CO1** | analyze the characteristics of various governors. | Understanding (K2) |
| **CO2** | learn about the cam jump phenomenon. | Remembering (K1) |
| **CO3** | perform different types of vibrations in machines and based on the requirement. | Applying (K3) |
| **CO4** | identify the transmissibility ratio of machine. | Analyzing (K4) |

**CO PO MAPPING:**

**Mapping of Course Outcomes with Programme Outcomes:**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| COs | Programme Outcomes (POs) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 1 | 2 | 3 | 2 | - | - | - | - | - | 1 | - | 2 | - |
| CO2 | 3 | 2 | 2 | 1 | 2 | - | - | - | - | - | 1 | - | 2 | - |
| CO3 | 3 | 1 | 1 | 3 | 2 | - | - | - | - | - | 1 | - | 2 | - |
| CO4 | 3 | 1 | 2 | 1 | 2 | - | - | - | - | - | 1 | - | 2 | - |

| MT23406 | MICROPROCESSOR AND MICROCONTROLLER LABORATORY | 0 | 0 | 4 | 2 |
|---|---|---|---|---|---|

**COURSE OBJECTIVES**

To enable the students to

| | |
|---|---|
| 1 | learn the program using arithmetic operations of microprocessors. |
| 2 | know about the sorting of number series and code conversion. |
| 3 | understand various IC interfacing with 8085. |
| 4 | learn the arithmetic operations of 8051 microcontrollers. |

**LIST OF EXPERIMENTS**

**Program using 8085**

1. Addition of two 8-bit numbers.
2. Subtraction of two 8-bit numbers.
3. Arrange a series of numbers in ascending order.
4. Arrange a series of numbers in descending order
5. Decimal to hexadecimal conversion and hexadecimal number to decimal number conversion.
6. Interfacing with analog to digital conversion.
7. Interfacing with digital to analog conversion.
8. Interfacing with stepper motor controller.

**Program using 8051**

1. 16-bit addition.
2. 16-bit subtraction.

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

**COURSE OUTCOMES**

| At the end of this course, students will be able to | | **BT Mapped (Highest Level)** |
|---|---|---|
| **CO1** | write the assembly level of programming in 8085 microprocessors. | Apply (K3) |
| **CO2** | implement number sorting and code conversion. | Analysis (K4) |
| **CO3** | interface stepper motor, ADC, DAC with 8085 microprocessors. | Analysis (K4) |
| **CO4** | write the assembly level of programming in 8051 microcontroller. | Apply (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 | Programme Outcomes PO's | | | | | | | | | | | | PSO's | |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 2 | 2 | - | 1 | 2 | - | - | - | - | 1 | 2 | - | - |
| CO2 | 2 | 2 | 1 | - | 1 | 2 | - | - | - | - | 1 | 2 | - | - |
| CO3 | 3 | 1 | 1 | - | 1 | 1 | - | - | - | - | 1 | 1 | - | - |
| CO4 | 3 | 2 | 1 | - | 1 | 1 | - | - | - | - | 1 | 1 | - | - |

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

**COURSE OBJECTIVES**

To enable students to

| | |
|---|---|
| 1 | enhance their own behavioral skills to survive in corporate world. |
| 2 | evaluate their listening and speaking skills to face the interviews in a successful way. |
| 3 | solve the quantitative aptitude problems and improve their problem-solving skills. |
| 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 II - JAM Level - 4.

| UNIT III | QUANTITATIVE APTITUDE | 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<br>At the end of this course, the students will be able to | | BT MAPPED<br>(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) |

**TEXTBOOKS**

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

**REFERENCES**

- Abhijit Guha, "Quantitative Aptitude ", Tata-Mcgraw Hill., 2023.
- Agarwal, R.S." A Modern approach to Verbal & Non Verbal Reasoning", S.Chand & Co Ltd, newdelhi., 2021.
- 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)**
**(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**

| CO's | Programme Outcomes (PO's) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | - | - | - | - | - | - | 3 | 3 | 2 | 3 | - | 3 | 1 | 1 |
| CO2 | - | - | - | - | - | - | 2 | 3 | 2 | 3 | - | 3 | 1 | 1 |
| CO3 | 3 | 2 | 2 | 2 | - | - | 1 | - | - | - | - | - | 2 | 2 |
| CO4 | 2 | 3 | 3 | 2 | - | 3 | 3 | 1 | - | 1 | 2 | - | 1 | 1 |

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