Mandsaur

Diploma: Electrical Engineering

Semester - II

L-2 T-1 P-0 C-3

BSDEE0500A: Engineering Mathematics-II

Course Objective:

- To gain knowledge about coordinate geometry and their system
- To solve systems of linear differential equations and application problems
- To apply the knowledge of differential calculus in the field of engineering
- To Evaluate vector calculus and integral calculus in various fields of engineering

Course Outcomes:

1. Understand the concept of coordinate geometry and their system
2. Understand the concept of differentiation and differential equations by using the methods – direct integration, separation of variables and integrating factor method, variation of parameter
3. Apply the concept of Leibnitz and Euler's theorem for derivatives of the product of two functions
4. Apply the concept of vector algebra for volume of parallelepiped and directional derivatives
5. Evaluate the concept of Beta and Gamma function

Articulation Matrix

(Program Articulation Matrix is formed by the strength of correlation of COs with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high), 2 for moderate (medium) correlation, and 1 for slight (low) correlation).

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	2	3	1	1	1	1	1	1	1	2	3	1
CO2	2	3	1	1	1	1	1	1	1	2	3	1
CO3	2	3	1	1	1	1	1	1	1	2	3	1
CO4	2	3	1	1	1	1	1	1	1	2	3	1
CO5	2	3	1	1	1	1	1	1	1	2	3	1

High-3 Medium-2 Low-1

Unit-I: COORDINATE GEOMETRY AND COORDINATE SYSTEM **12 Hour**

Cartesian and Polar, Distance, Division, Area of a triangle, Locus of a point and its equation, Slope of Straight Line, Angle between two Straight Line, Parallel and Perpendicular Straight Line, Standard and general equation of Straight Line, Point of intersection of two Straight Line

Unit-II: DIFFERENTIAL EQUATION **12 Hours**

Concept of formation of Differential Equation, Solution of first order differential equation (Variables Separation, Homogeneous differential Equation, Linear Differential Equation)

Unit-III: DIFFERENTIAL CALCULUS **12 Hours**

Successive Differentiation (nth order derivatives), Leibnitz theorem, Partial derivatives, Euler's Theorem for homogeneous functions, Total derivative, Change of variables

Unit-IV: VECTOR ALGEBRA **12 Hours**

Concept of Vector and Scalar Quantities, Different types of Vectors, Addition and Subtraction of Vectors, Components of a Vector Multiplication of two Vectors, Scalar Product of Vectors, Applications (Work done, power & reactive power). , Directional derivatives

Unit-V: INTEGRAL CALCULUS **12 Hours**

Double integral, Triple integral, change order of integration, Change of variable, Beta and Gamma functions and their properties, Drichlet's integral and its applications

Total: 60 Hours

References

1. Loney, S. L. (1896) The Elements of Coordinate Geometry Macmillan and Company

2. Apostol, T. M. (1991) Calculus, Volume 1. John Wiley & Sons
3. Kellaway, F. W. (1969) Advanced Engineering Mathematics. ByErwin Kreyszig. Pp. xx, 899. 68s. (Wiley.) The Mathematical Gazette, 53(386), 444-444

List of e-Learning Resources:

1. https://nptel.ac.in/
2. https://www.coursera.
3. https://www.youtube.com/watch?v=tffrrtzUhmw&list=PL7oBzLzHZ1wXBSiJEgqz_iwVoLiY8qhbv
4. https://www.youtube.com/watch?v=ksS_yOK1vtk&list=PLbRMhDVUMngfIrZCNOyPZwHUU1pP66vQW
5. https://www.edx.org/course/maths-1a?index=product&queryID=9ac85574895e097b81a880647550b7c6&position=4&v=1&linked_from=autocomplete&c=autocomplete

Subject Expert	Academic Coordinator	HoD	Appointed Senior Faculty by DoAA

Mandsaur

Diploma: Electrical Engineering

Semester-II

L-2 T-1 P-2 C-2

ESDEE0200A: Applied Mechanics

Course Objectives

- To familiarize with different branches of mechanics, Static equilibrium of particles, Properties of surfaces and volumes and fundamental concepts of dynamics and lifting machines
- To introduce the fundamental principles of mechanics, including statics, dynamics, and kinematics
- To understand stress and strain concepts and their relationship to material properties, deformation, and failure of structural components
- To explore the effects of friction in mechanical systems and equip students with methods for analyzing frictional forces and their influence on motion and stability

Course Outcomes (COs)

1. Understand the basic concepts of equilibrium in statics & principles of kinematics and kinetics in dynamics
2. Apply principles of kinetics to study the motion of objects
3. Analyze the effects of external forces on different materials
4. Evaluate the structural integrity and safety of mechanical systems
5. Create solutions for complex engineering problems in Applied Mechanics

Articulation Matrix

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CO1	3	2	1	1	1	1	1	1	1	2	3	1
CO2	3	2	1	1	1	1	1	1	1	2	3	1
CO3	3	2	1	1	1	1	1	1	1	2	3	1
CO4	3	2	1	1	1	1	1	1	1	2	3	1
CO5	3	2	1	1	1	1	1	1	1	2	3	1

High-3 Medium-2 Low-1

UNIT I: Force and its application **9 Hours**

Definition , Effect, characteristics of force, Principle of Transmissibility of Forces, Concept of Resultant Force, Law of, Parallelogram of Forces, Triangle of Forces - Polygon of Forces - Determination of Resultant of two or more concurrent forces, Classification of Parallel Forces, Methods of finding resultant Force of parallel forces- analytically & graphically, Position of resultant force of parallel forces, Definition, Classification and characteristics of a force Couple, moment of couple, Moment and application, Varignon's Theorem, Beams and support reaction, Equilibrium of forces, Lami's Theorem Leaver

UNIT II: Center of gravity and centroid **9 Hours**

Difference between Centroid and Center of Gravity (CG), Centroid of standard plane figures and CG of simple solid bodies, Method of finding out Centroid of composite plane laminas and cut sections - Method of finding out CG of Composite solid bodies

UNIT III: Friction **9 Hours**

Concept and types of friction, Limiting Friction, coefficient of friction, angle of friction, angle of repose, Laws of friction (Static and Kinetic) - Analysis of equilibrium of Bodies resting on Horizontal and inclined Plane, Numerical problems

UNIT IV: Lifting Machines **9 Hours**

Concept of lifting Machines, Definition of Mechanical Advantage, Velocity Ratio and Efficiency of Machines and their relation, Reversibility of Machines and condition for self-locking machine, Law of Machines, Maximum mechanical advantage and maximum efficiency of machine, Friction in machine (In terms of Load and effort), Calculation of M.A., V.R. and efficiency of Simple wheel and axle , Differential wheel and axle, Single purchase crab, Double purchase crab, Simple screw jack, Different System of simple pulley blocks

UNIT V: Work, Power and Energy **9 Hours**

Definition unit and graphical representation of work, Definition and unit of power and types of engine power and efficiency of an engine, Definition and concept of Impulse, Definition, unit and types of energies, Total energy of a body falling under gravity

Total 45 Hours

PRACTICALS

1.Create diagrams and explanations illustrating the laws of parallelogram of forces and their practical applications

2.Create force diagrams and experimental setups to demonstrate the laws of polygon of forces
3.Verification of laws of moments

4.Determination of forces in the members of Jib Crane

5.Determination of coefficient of friction for surfaces of different materials on horizontal plane

6. Determination of coefficient of friction for surfaces of different materials on an inclined plane

7.Create comparisons and recommendations for selecting the most suitable lifting machine for specific application

8.Create scenarios and problems involving moments and equilibrium for further analysis

9.Determination of mechanical advantage, velocity ratio and efficiency of the following lifting machines

- Simple wheel and axle
- Differential wheel axle
- Single purchase crab
- Simple pulley block Simple
- Screw jack

Total: 75 Hours

Reference(s)

1. R.S. Khurmi (2018-19) a text book of Applied Mechanics –S.C. Chand & Co., New Delhi
2. I.B. Prasad (2021), Applied Mechanics –Khanna Publishers, New Delhi
3. R.S. Jog, (2011) Applied Mechanics (Hindi) – Anand Publishers, Gwalior
4. A.R. Page, (2009) Applied Mechanics (Hindi) –Deepak Prakashan, Gwalior

List of e-Learning Resources:

1. https://nptel.ac.in/
2. https://www.coursera.org/

Subject Expert **Academic Coordinator** **HoD** **Appointed Senior Faculty by DoAA**

Mandsaur University

Diploma: Electrical Engineering

Semester: II

L-2 T-0 P-4 C-4

ESDEE0300A: Engineering Graphics

Course objective:

- To impart the principles of orthographic and techniques.
- To develop skills to prepare engineering drawings.
- To develop understanding of the geometrical shapes 2D objects
- To learn the applications of engineering drawings in industries.
- To develop innovative drawing solutions for specific purposes.

Course outcomes:

1. Understand the principles of 2D / 3D projection techniques
2. Apply the concepts to prepare technical drawings
3. Analyze the significance of projection techniques in the drawing of a solid
4. Evaluate engineering drawings for different types of solids in different position
5. Create innovative drawings for specific engineering challenges

Articulation Matrix:

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CO1	3	2	1	1	1	1	1	1	1	1	3	2	1
CO2	3	2	1	1	1	1	1	1	1	1	3	2	1
CO3	3	2	1	1	1	1	1	1	1	1	3	2	1
CO4	3	2	1	1	1	1	1	1	1	1	3	2	1
CO5	3	2	1	1	1	1	1	1	1	1	3	2	1

High-3 Medium-2 Low-1

UNIT1: Introduction **06 Hours** Introduction of drawing instruments, materials and their uses. Planning, lay-out of drawing sheet, Introduction to lines, types of lines and their applications in engineering drawing, Introduction of scales and their applications, types of scales, representative fraction, construction of plain and Diagonal scales

UNIT 2: Curves used in Engineering Practice **06 Hours** Introduction of conic section: Construction methods of ellipse, parabola, and hyperbola. Construction of cycloid, epicycloid and hypocycloid and involute

UNIT 3: Theory of Projection **06 Hours**

Concept of orthographic and isometric projection techniques, projection of points in all the four quadrants, projection of lines, line parallel to HP and VP both, line perpendicular to one plane and parallel to other, line inclined to one plane and parallel to another line inclined to both the planes

UNIT 4: Projections of Planes and Solids **06 Hours**

Projection of planes, perpendicular to HP and VP both, perpendicular to one plane and parallel to other, inclined to one plane and perpendicular to other , oblique planes, Projection of cylinder, cone, prism and pyramid for conditions, axis parallel to HP and VP, axis perpendicular to HP and parallel to VP, axis perpendicular to VP and parallel to HP, axis inclined to HP and parallel to VP and axis inclined to VP and parallel to HP, Axis inclined to both planes

UNIT 5: Section Of Solids And Development Of Surfaces **06 Hours** Section of cone, cylinder, prism and pyramid with different orientation, development of lateral surface of solids, cone, cylinder, prism and pyramids. Concept of isometric projection and isometric views

Total: 30 hours

Practical's

1. Prepare a Drawings of Lines used in Engineering Drawings on the sheet
2. Construct various types of scales (Plain and Diagonal Scales)
3. Construct ellipse, parabola and hyperbola on the sheet
4. Construct Cycloidal curves and involute on the sheet
5. Draw orthographic projections of points , lines on the sheet

6. Draw orthographic projections of planes and solids on the sheet
7. Draw sectional views of solids and development of surfaces on the sheet
8. Draw isometric views of solids on the drawing sheet

Total: 75 hours

References:

1. Bhatt N.D (2014 53 ed.) Engineering Drawing Charotar Publishing House Pvt Ltd
2. Dhawan R.K(2019) Engineering Drawing. S Chand Publishing
3. Gill P.S. (2013) Engineering Drawing S.K. Kataria & Sons

List of e-Learning Resources:

1. https://nptel.ac.in/courses/112103019

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Subject Expert	**Academic Coordinator**	**HoD**	**Appointed Senior Faculty by DoAA**

Mandsaur

Diploma Electrical Engineering

Semester-II

L-2 T-1 P-2C-4

ESDEE0400A Fundamental of Electrical & Electronics Engineering

Course Objectives

Following are the objectives of this course:

- To obtain resultant of various forces
- To calculate support reactions through conditions of equilibrium for various structures
- To understand role of friction in equilibrium problems
- To know fundamental laws of machines and their applications to various engineering problems

Course Outcomes (COs)

1. Understand the basic elementary concepts of electrical engineering.
2. Apply Op-Amp configurations as amplifiers, adders, differentiators, and integrators in analog circuits.
3. Analysis of Three Phase AC Circuits, the representation of alternating quantities and determining the power in these circuits.
4. Analyze the performance of transformers under all load conditions and draw the equivalent circuit of transformer.
5. Explain the concepts of electromechanical energy conversion, Principle of operation of DC and AC Machine and classify various.

Articulation Matrix

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CO1	3	2	1	2	-	1	1	-	-	1	1	1
CO2	2	3	1	2	-	1	1	-	-	2	2	2
CO3	2	3	1	2	-	1	1	-	-	2	2	2
CO4	3	2	1	1	-	1	1	-	-	1	1	1
CO5	3	2	1	1	-	1	1	-	-	1	1	1

High-3 Medium-2 Low-1

UNIT I Overview of Electronic Components & Signals **9 Hours**

Passive Active Components: Resistances, Capacitors, Inductors, Diodes, Transistors, FET, MOS and CMOS and their Applications. Signals: DC/AC, voltage/current, periodic/non-periodic signals, average, rms, peak values, different types of signal waveforms, Ideal/non-ideal voltage/current sources, independent/dependent voltage current sources

UNIT II Overview of Analog Circuits **9 Hours**

Operational Amplifiers-Ideal Op-Amp, Practical op amp, Open loop and closed loop configurations, Application of Op-Amp as amplifier, adder, differentiator and integrator

Overview of Digital Electronics:

Introduction to Boolean Algebra, Electronic Implementation of Boolean Operations, Gates-Functional Block Approach, Storage elements-Flip Flops-A Functional block approach, Counters: Ripple, Up/down and decade, Introduction to digital IC Gates (of TTL Type).

Unit III Electric and Magnetic Circuits **9 Hours**

EMF, Current, Potential Difference, Power and Energy; M.M.F, magnetic force, permeability, hysteresis loop, reluctance, leakage factor and BH curve; Electromagnetic induction, Faraday's laws of electromagnetic induction, Lenz's law; Dynamically induced emf; Statically induced emf; Equations of self and mutual inductance; Analogy between electric and magnetic circuits.

Unit IV Transformer and Machines **9 Hours**

General construction and principle of different type of transformers; Emf equation and transformation ratio of transformers; Auto transformers; Construction and Working principle of motors; Basic equations and characteristic of motors.

Unit V A.C. Circuits **9 Hours**

Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor Peak Factor, impedance, phase angle, and power factor; Mathematical and phasor representation of alternating emf and current; Voltage and Current relationship in Star and Delta connections; A.C in resistors, inductors and capacitors; A.C in R-L series, R-C series, R-L-C series and parallel circuits; Power in A. C. Circuits, power triangle.

Total: 45 Hours

List of Experiment:

1. The Study of R-L-C Series Circuit and Draw its Phasor Diagram.
2. Perform Experiment to Measure Active and Reactive Power Consumed by Single Phase Inductive Load While Connected to Single Phase AC Supply.
3. Performing Experiment to Measure Line Voltage, Line Current, Phase Voltage, Phase Current and Total Power Consumed by the Balanced 3- Phase Resistive Load.
4. To Verify the Voltage and Current Relations in Star Connected Systems.
5. To Verify the Voltage and Current Relations in Delta Connected Systems.
6. To Perform O.C. Test on 1-Ph Transformer and Determine Equivalent Circuit Parameters.
7. To Perform S.C. Test on 1-Ph Transformer and Determine Equivalent Circuit Parameters.
8. Study of Construction and Working Principle of 3-Phase Induction Motor.
9. Study of Construction and Working Principle of DC Motor.
10. Study of Construction and Working Principle of DC Generator.

Total: 75 Hours

References:

1. D.P. Kothari & I.J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill, Latest Edition.
2. S.N. Singh , Basic Electrical Engineering, P.H.I.,2013
4. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall,2014
5. M.S. Sukhija, T. K. Nagsarkar, Basic Electrical and Electronics Engineering, Oxford University Press,2012
6. C.L. Wadhwa, Basic Electrical Engineering. New Age International.

List of e-Learning Resources:

1. https://nptel.ac.in/
2. https://www.coursera.org/

Subject Expert	**Academic Coordinator**	**HoD**	**Appointed Senior Faculty by DoAA**

Mandsaur

Diploma Electrical Engineering

Semester-II

L-2 T-1 P-0C-3

PCDEE0100A: Electrical & Electronics Material

Course Objectives

The primary objective of the course is to introduce concepts about the properties, characteristics, applications and limitations of Electrical & Electronics engineering materials.

Course Outcomes (COs)

- Understand the hardening, annealing, and properties of low and high resistive materials like copper and aluminum for their applications in electrical conductors.
- Understand of intrinsic and extrinsic semiconductors, and differentiate between 'P' and 'N' type materials.
- Apply knowledge of insulation resistance, factors influencing it, classification of insulation materials, their properties, and applications.
- Understanding the permittivity, polarization, dielectric loss, application of dielectrics, and color codes.
- Apply a comprehensive understanding of magnetic materials, B-H curves, hysteresis loop, hysteresis loss, Steinmetz constant, eddy current loss, Curie point, and magnetostriction.
- Apply the knowledge about protective materials, thermocouples, bi-metals, soldering, fuses, galvanizing and impregnating techniques, and nanomaterials.
- Analysis the comprehensive understanding of primary and secondary cells, chemical reactions during charging and discharging, battery charging methods, capacity, efficiency, and maintenance of batteries.

Articulation Matrix

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CO2	3	1	2	1	1	3	3	3	3	1	2	2	1
CO3	2	2	1	-	-	3	3	2	2	-	2	2	2
CO4	3	1	-	-	1	2	3	2	3	1	1	1	1
CO5	2	-	1	1	2	2	1	3	2	2	1	3	1
CO6	3	1	-	-	1	3	2	2	2	-	-	2	2
CO7	3	-	1	1	1	3	2	3	3	-	-	2	3

High-3 Medium-2 Low-1

UNIT I: Conducting Materials **12 Hours**

Hardening, Annealing - Low Resistive Materials – Requirements – Properties and Applications of Copper and Aluminum - Comparison Between Copper and Aluminum - ACSR Conductors, AAAC, - High Resistive Materials – Requirements- Properties and Applications.

UNIT II: Semi Conducting Materials **12 Hours**

Semi-Conductors - Intrinsic and Extrinsic Semi- Conductors-`P' and `N' Type Materials.

UNIT III: Insulating Materials **12 Hours**

Properties -Insulation Resistance - Factors Affecting Insulation Resistance - Classification of Insulation Materials - Properties – Applications.

UNIT IV: Di- Electric Materials **12 Hours**

Permittivity of Di - Electric Materials- Polarisation - Dielectric Loss – Application of Dielectrics – Colour Codes.

UNIT V: Magnetic Materials **12 Hours**

Classification of Magnetic Materials - Soft & Hard Magnetic Materials- B-H Curves - Hysteresis Loop - Hysteresis Loss - Steinmetz Constant - Eddy Current Loss -- Curie Point – Magnetostriction.

UNIT VI: Special Purpose Materials **12 Hours**

Protective Materials – Thermocouple - Bi-Metals- Soldering- Fuses -Galvanizing and Impregnating - Nano Materials.

UNIT VII: Batteries **12 Hours**

Primary Cell and Secondary Cells-Lead Acid, Nickel Iron and Nickel – Cadmium- Chemical Reactions During Charging and Discharging – Charging of Batteries- Constant Current Method and Constant Voltage Method-Trickle Charging - Capacity of Battery - Ampere-Hour Efficiency and Watt-Hour Efficiency - Maintenance Free Batteries.

Reference(s)

1. Electronic Components -Dr. K.Padmanabham
2. Electronic Components -D.V.Prasad
3. Electrical Engineering Materials – N.I T.T.T.R Publications
4. Introduction to EngineeringMmaterials – B.K.Agarwal.
5. TTTI Madras; Electrical Engineering Materials; TMH.

List of e-Learning Resources:

1. https://nptel.ac.in/courses/108105155

Subject Expert	**Academic Coordinator**	**HoD**	**Appointed Senior Faculty by DoAA**