Mandsaur

Diploma (Electrical Engineering)

Semester - I

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

BSDEE0100A: Engineering Mathematics-I

Course Objective:
- To provide the students with sufficient knowledge in Linear algebra, Statistics and Trigonometry this can be used in their respective fields.
- To provide detailed of matrices which is applied for solving system of linear equations and useful in various fields of technology.
- To understand how trigonometric functions relate to right triangles and solve word problems involving right triangles.
- To apply the formula of AP for solving daily life problems.
- To impart the knowledge of Statistics.

Course Outcomes:
1. Understand the concept of matrices and determinants.
2. Understand the basic concept of angles, triangles and trigonometric ratios and use right triangles to evaluate the six trigonometric functions.
3. Apply the concepts of algebra to solve engineering related problems.
4. Apply statistical data using measures of central tendency and solve the measure of dispersion.
5. Evaluate expressions and equations involving binomials and combinations (and/or factorials).

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	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	1	1	1	1	1	1	1	2	3	1
CO2	2	3	1	1	1	1	1	1	1	1	2	3	1
CO3	2	3	1	1	1	1	1	1	1	1	2	3	1
CO4	2	3	1	1	1	1	1	1	1	1	2	3	1
CO5	2	3	1	1	1	1	1	1	1	1	2	3	1

High-3 Medium-2 Low-1

Unit-I Matrix and Determinant   12 Hours
Definition, Types of Matrix, Operation on Matrix, Adjoint of a Matrix, Inverse of a Matrix. Concept & Principles of Determinants, Properties of Determinants.

Unit-II Trigonometry   12 Hours
Allied angles, Trigonometrical ratios of sum and difference of angles, (Only statement), Sum and difference of trigonometric ratios (C- D formula), Multiple angles (Only double angle and half angle), Properties of triangle (without proof).

Unit-III Algebra   12 Hours
Arithmetic Progression, its nth term and sum of n terms with their applications to engineering problems. Geometrical Progression, its nth term and sum of n terms and to infinity with application to engineering problems, Partial fractions, Complex numbers.

Unit-IV Statistics   12 Hours
Measures of Central tendency (Mean, Mode, Median), Measures of Dispersion (Mean deviation, standard deviation).

Unit-V Binomial Theorem and Permutation   12 Hours

Mandsaur

Diploma (Electrical Engineering)

Statement of the theorem for positive integer General term, Middle term, Constant term, Binomial theorem for any index (expansion without proof only), First and second Binomial approximation with application to engineering problems, Meaning of factorial n. Permutation of 'n' dissimilar thing taken 'r' at a time Combination: Combination of n dissimilar things taken 'r' at a time

Total: 60 Hours

References

1. Goyal, J. K., & Sharma, J. N. (1978). *Mathematical statistics*. Krishna Prakashan Media.
2. Grewal, B. S., & Grewal, J. S. (1996). Higher engineering mathematics. *2002, Khanna Publishers, New Delhi*.
3. Kumar, A., & Chaudhary, A. (2009). *Applied Statistics*. Krishna Prakashan Media.
4. Bird, J. (2014). *Engineering mathematics*. Routledge.
5. Gupta, S., Coelho, C. A., Mishra, S., Carpenter, M., Dass, B. K., & Gulati, C. M. Interdisciplinary Mathematical.

List of e-Learning Resources:

1. https://nptel.ac.in/
2. https://www.coursera.org/
3. https://www.edx.org/course/precalculus?index=product&queryID=e3c274000408d4939b01362a44d9a661&position=1&search_index=product&results_level=first-level-results&term=Trigonometry%09&campaign=Precalculus&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Fsea
4. https://www.youtube.com/watch?v=KaLA1cWhQlA&list=PLLy_2iUCG87BLKl8eISe4fHKdE2_j2B_T

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

Mandsaur

Diploma (Electrical & Electronics Engineering)
Semester-I

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

BSEEE0300A: Fundamentals of Computer Science

Course Objectives
- To familiarize students with the foundations of computers, its working and major components.
- To provide students with the core concepts of computer science.
- To provide an introduction to emerging trends in the domain of computer science.

Course Outcomes (COs)
1. Understand core computer components and their interconnection.
2. Apply computer networking fundamentals in developing a small network of computers and design a comparison matrix for emerging technologies' use cases.
3. Understand various types of operating system for various environments.
4. Understand various categories of software.
5. Create the basic programs related to control structures and array using C programming language.

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

High-3 Medium-2 Low-1

UNIT I: Introduction to Computers   9 Hours
History of development of computers , Computer system concepts, characteristics , capabilities and limitations, Generations of computers, Basic components of a computer system – Control Unit, ALU, I/ O Devices, memory – RAM, ROM, EPROM, PROM, Flash Memory and other types of memory.
Information concepts & processing: definition of information, data V/S information, introduction to information system, information representation, digital media, images, graphics, animation, audio, video etc.

UNIT II: Data communication & networks   9 Hours
Computer networks, networking of computers, introduction to LAN, WAN, MAN, network topologies, basic concepts in computer networks, ISO/OSI Model Introduction to internet technologies: HTML, DHTML, WWW, FTP, TELENET, web browser, Internet browsing, search engines, email.

UNIT III: Concepts in operating System   9 Hours
 Elementary concepts in operating system, GUI, introduction to DOS, MS windows, Unix/Linux.
Storage devices: storage fundamentals – primary V/S secondary, data storage and retrieval methods – sequential, direct and index sequential. Various storage devices – magnetic tape, magnetic disks, cartridge tape, data drives, hard disk drives, floppy (Winchester disk), disks, optical disks, CD, VCD, CD-R, CD-RW, zip drive, DVD, SVCD.

UNIT IV: Types of Software   9 Hours
System software, Application software, Utility Software, Demo ware, Shareware, Freeware, Firmware and Free Software.
Microsoft office/Excel: MS word, MS excel, MS Office standard tool bars.

UNIT V: Programming languages   9 Hours
Machine, assembly, high Level, 4 GL languages. Introduction to C: C Character Set, constants, variables and key words, decision and control Structure: if, if-else, forms of if-else statement, operators, types of Loops, case and switch Arrays, C functions – Call by values and Call by reference.

Total 45 Hours

PRACTICAL

1. Study and to understand the operating system overview.
2. Practice creating opening editing and saving the document using notepad.
3. Practice browsing of different websites using search engines.
4. Create a Resume or CV using Microsoft Word/Open Office.
5. Create a simple presentation using Power Point Tool.
6. Create a worksheet with four columns. Enter ten records and use the basic formula in sheet.
7. Introduction to C /C++. Print a hello word in C.
8. Write a program in C for addition of two values
9. Write a program in C/C++ to implement If- Else decision statement.
10. Write a program to print a pyramid using for loop.

Total: 75 Hours

Reference(s)

1. Balagurusamy E. (2009). Fundamentals of Computers. McGraw-Hill Technology Education, Boston.
2. Norton P. (2017). Introduction to Computers. 7th edition. McGraw-Hill Technology Education, Boston.
3. Silberschatz A., Galvin P.B. and Gagne G. (2018). Operating System Concepts. 10th edition. Wiley Publishing.

List of e-Learning Resources:

1. https://nptel.ac.in/
2. https://learn.microsoft.com/

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

Mandsaur University

Diploma Electrical Engineering

Semester-I
BSDEE0300A: Applied Physics

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

Course Objectives
- To provide students with a strong understanding of the fundamental principles of physics, including mechanics, thermodynamics, electromagnetism, and quantum mechanics
- To develop students' ability to solve problems using the principles of physics, including mathematical modeling and quantitative analysis
- To demonstrate how physics principles can be applied to real-world problems and situations, such as in engineering, medicine, materials science, and technology
- To develop hands-on laboratory skills, including experimental design,in order to reinforce theoretical concepts and enhance understanding
- To introduce students to research methods in applied physics, data analysis, and interpretation, and to prepare them for future research opportunities

Course Outcomes (COs)
1. Understand and describe fundamental laws and principles of physics
2. Understand motion and rotational motion and apply conservation of angular momentum principle to known problems
3. Apply the work, energy and power and their units. Drive relationships for work, energy and power and solve related problems
4. Analyze the principle of conservation of energy and transformations
5. Evaluate the phenomenon of surface tension, effects of temperature on surface tension and solve statics problems that involve surface tension related forces

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	PSO 2	PSO 3	PSO 4
CO1	3	2	1	1	1	1	1	1	1	1	2	1	1
CO2	3	2	1	1	1	1	1	1	1	1	2	1	1
CO3	3	2	1	1	1	1	1	1	1	1	2	1	1
CO4	3	2	1	1	1	1	1	1	1	1	2	1	1
CO5	3	2	1	1	1	1	1	1	1	1	2	1	1

High-3 Medium-2 Low-1

Unit 1: Physical world, Units and Measurements   10 Hours

Physical quantities; fundamental and derived, Units and systems of units (FPS, CGS and SI units), Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimensions, Dimensional equations and their applications (conversion from one system of units to other, checking of dimensional equations and derivation of simple equations), Limitations of dimensional analysis.
Measurements: Need, measuring instruments, least count, types of measurement (direct, indirect), Errors in measurements (systematic and random), absolute error, relative error, error propagation, error estimation and significant figures.

Unit 2: Force and Motion   10 Hours

Scalar and Vector quantities – examples, representation of vector, types of vectors. Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product, Resolution of a Vector and its application to inclined plane and lawn roller.

Force, Momentum, Statement and derivation of conservation of linear momentum, its applications such as recoil of gun, rockets, Impulse and its applications.

Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period, Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical), Centripetal and Centrifugal forces with live examples, Expression and applications such as banking of roads and bending of cyclist.

Unit 3: Work, Power and Energy   10 Hours

Work: Concept and units, examples of zero work, positive work and negative work

Friction: concept, types, laws of limiting friction, coefficient of friction, reducing friction and its engineering applications, Work done in moving an object on horizontal and inclined plane for rough and plane surfaces and related applications.

Energy and its units, kinetic energy, gravitational potential energy with examples and derivations, mechanical energy, conservation of mechanical energy for freely falling bodies, trans- formation of energy (examples).

Power and its units, power and work relationship, calculation of power (numerical problems).

Unit 4: Rotational Motion   10 Hours

Translational and rotational motions with examples, Definition of torque and angular momentum and their examples, Conservation of angular momentum (quantitative) and its applications.

Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid); (Formulae only).

Unit 5: Properties of Matter   10 Hours

Elasticity: definition of stress and strain, module of elasticity, Hooke's law, significance of stress-strain curve.

Pressure: definition, units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications.

Surface tension: concept, units, cohesive and adhesive forces, angle of contact, Ascent Formula (No derivation), applications of surface tension, effect of temperature and impurity on surface tension.

Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems.

Hydrodynamics: Fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem (only formula and numerical) and its applications.

Unit 6: Heat and Thermometry   10 Hours

Concept of heat and temperature, modes of heat transfer (conduction, convection and radiation with examples), specific heats, scales of temperature and their relationship, Types of Thermometer (Mercury thermometer, bimetallic thermometer, Platinum resistance thermometer, Pyrometer) and their uses.

Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them, Co-efficient of thermal conductivity, engineering applications.

Total: 45 Hours

List of Experiment:

1. To measure length, radius of a given cylinder, a test tube and a beaker using a Vernier caliper and find volume of each object.
2. To determine diameter of a wire, a solid ball and thickness of cardboard using a screw gauge.
3. To determine radius of curvature of a convex and a concave mirror/surface using a speedometer.
4. To verify triangle and parallelogram law of forces.
5. To find the co-efficient of friction between wood and glass using a horizontal board.
6. To determine force constant of a spring using Hook's Law.
7. To verify law of conservation of mechanical energy (PE to KE).
8. To find the moment of inertia of a flywheel.
9. To find the viscosity of a given liquid (Glycerin) by Stoke's law.
10. To find the coefficient of linear expansion of the material of a rod.
11. To determine atmospheric pressure at a place using Fortin's barometer.
12. To measure room temperature and temperature of a hot bath using mercury thermometer and convert it into different scales.

Total: 75 Hours

References:

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi.
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
5. Engineering Physics by DK Bhhatacharya & PoonamTandan; Oxford University Press, New Delhi.
6. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
7. Practical Physics by C. L. Arora, S. Chand Publication.

List of e-Learning Resources:

1. https://www.physicsclassroom.com/class/sound/u1l1c.cfm
2. https://www.britannica.com/science/thermoelectricity

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

Mandsaur University

Diploma Electrical Engineering

Semester-I

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

BSDEE0400A: Applied Chemistry

Course Objectives:
• Solve various engineering problems applying the basic knowledge of atomic structure and chemical bonding.

• Use relevant water treatment method to solve domestic and industrial problems.

• Solve the engineering problems using knowledge of engineering materials and properties.

• Use relevant fuel and lubricants for domestic and industrial applications

• Solve the engineering problems using concept of Electrochemistry and corrosion

Course Outcomes:
At the end of the course student will be able to
1. Understand the classification and general properties of engineering materials such as metal, alloys, glasses, cement, refractory and composite materials using knowledge of chemical bonding.
2. Understand and assess the suitability of water source for domestic and industrial application, effluents and minimize water pollution.
3. Qualitatively analyse the engineering materials and understand their properties and applications.
4. Choose fuel and lubricants suitable for economical industrial processing to obtain eco-friendly finished products.
5. a) Ascertain construction, mechanism efficiency of electrochemical cells, solar cell fuel cells
   b) Understand corrosion and develop economical prevention techniques.

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

High-3 Medium-2 Low-1

Unit 1: Atomic Structure, Chemical Bonding and Solutions   **9 Hours**
Rutherford model of atom, Bohr's theory (expression of energy and radius to be omitted), and hydrogen spectrum explanation based on Bohr's model of atom, Heisenberg uncertainty principle, Quantum numbers – orbital concept. Shapes of s,p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration.
Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding $(NaCl$ example), covalent bond (H_2, F_2, HF hybridization in $BeCl_2$, BF_2, CH, NH, $H O$), Coordination bond in NH^+, and anomalous properties of NH, H O due to hydrogen bonding, and metallic bonding.
Solution – idea of solute, solvent and solution, methods to express the concentration of solution-molarity (M = mole per liter), ppm, mass percentage, volume percentage and mole fraction.

Unit 2: Water   **9 Hours**
Graphical presentation of water distribution on Earth (pie or bar diagram). Classification of soft and hard water based on soap test, salts causing water hardness, unit of hardness and simple numerical on water hardness.

Cause of poor lathering of soap in hard water, problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc), and quantitative measure- ment of water hardness by ETDA method, total dissolved solids (TDS) alkalinity estimation.

i). Water softening techniques – soda lime process, zeolite process and ion exchange pro- cess.

ii). Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilization.

Water for human consumption for drinking and cooking purposes from any water sources and enlist Indian standard specification of drinking water (collect data and understand standards).

Unit 3: Engineering Materials   9 Hours

Natural occurrence of metals – minerals, ores of iron, aluminium and copper, gangue (matrix), flux, slag, metallurgy – brief account of general principles of metallurgy.

Extraction of - iron from haematite ore using blast furnace, aluminium from bauxite along with reactions. Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous with suitable examples, properties and applications.

General chemical composition, composition-based applications (elementary idea only details omitted):

Port land cement and hardening, Glasses Refractory and Composite materials.

Polymers – monomer, homo and co polymers, degree of polymerization, simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (using PVC, PS, PTFE, nylon – 6, nylon-6,6 and Bakelite), rubber and vulcanization of rubber.

Unit 4: Chemistry of Fuels and Lubricants   9 Hours

Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula.
Proximate analysis of coal solid fuel

petrol and diesel - fuel rating (octane and cetane numbers),

Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas.

Lubrication – function and characteristic properties of good lubricant, classification with examples, lubrication mechanism – hydrodynamic and boundary lubrication, physical proper- ties (viscosity and viscosity index, oiliness, flash and fire point, could and pour point only) and chemical properties (coke number, total acid number saponification value) of lubricants.

Unit 5: Electro Chemistry   9 Hours
Electronic concept of oxidation, reduction and redox reactions.
Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of electrolysis and simple numerical problems. Industrial Application of Electrolysis –
• Electrometallurgy
• Electroplating
• Electrolytic refining.
Application of redox reactions in electrochemical cells –
• Primary cells – dry cell,
• Secondary cell - commercially used lead storage battery, fuel and Solar cells.
Introduction to Corrosion of metals –
•   definition$O$types of corrosion (chemical and electrochemical), H_2 liberation and O_2 absorption mechanism of electrochemical corrosion, factors affecting rate of corrosion.
Internal corrosion preventive measures –
• Purification, alloying and heat treatment and
External corrosion preventive measures:
a) metal (anodic, cathodic) coatings, b) organic inhibitors.

Total 45 Hours

PRACTICALS:
Volumetric and Gravimetric analysis:

1. Preparation of standard solution of oxalic acid or potassium permanganate.
2. To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid

solution using phenolphthalein indicator.

3. Standardization of $KMnO_4$ solution using standard oxalic acid and Determine the percentage of iron present in given Hematite ore by KMnO solution.
4. Iodometric estimation of copper in the copper pyrite ore.
5. Volumetric estimation of total acid number (TAN) of given oil.
6. Volumetric estimation of

a) Total hardness of given water sample using standard EDTA solution.

b) Alkalinity of given water sample using 0.01M sulphuric acid

7. Proximate analysis of coal

a) Gravimetric estimation moisture in given coal sample

b) Gravimetric estimation ash in given coal sample

Instrumental analysis

8. Determine the conductivity of given water sample.
9. Determination of the Iron content in given cement sample using colorimeter.
10. Determination of calorific value of solid or liquid fuel using bomb calorimeter.
11. Determination of viscosity of lubricating oil using Redwood viscometer.
12. Determination of flash and fire point of lubricating oil using Able's flash point apparatus.
13. To verify the first law of electrolysis of copper sulphate using copper electrode.
14. Construction and measurement of emf of elector chemical cell (Daniel cell).
15. To study the effect of dissimilar metal combination.

Total 75 Hours

References:
1) Text Book of Chemistry for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
2) Agarwal, & Shikha, Engineering Chemistry, Cambridge University Press; New Delhi, 2015.
3) C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
4) Dara, S. S. & Dr.S.S.Umare, Engineering Chemistry, S.Chand. Publication, New Delhi, New Delhi, 2015.
5) Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.
6) Dr. Vairam, S., Engineering Chemistry, Wiley India Pvt.Ltd., New Delhi, 2013.
7) Dr. G. H. Hugar & Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
8) Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.

List of e-Learning Resources:

1. www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2. www.visionlearning.com (Atomic structure and chemical bonding)
3. www.chem1.com (Atomic structure and chemical bonding)
4. https://www.wastewaterelearning.com/elearning/ (Water Treatment)
5. www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)

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

Semester-I

ESDEE0100A: Workshop Practice

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

Course Objectives:
- To acquire an understanding of skills associated with the tools and inventory associated with the different kinds of engineering workshops.
- To recall the useful Mechanical and Electronic fabrication processes.
- To implement optimization algorithms to solve real-world problems
- To learn measurement techniques of Mechanical, Electronics & electrical quantities
- To innovate ways of design PCB layout   of a suitable circuit, fabrication and testing of the circuit.

Course Outcomes (COs)
1. Understand   the basics of workshop technology and operating principles of different tools
2. Apply engineering concepts   to solve technical   problems of workshops.
3. Analyze   the performance characteristics of different machines   under varying conditions.
4. Evaluate the   reliability and sustainability   of machines used in workshops.
5. Create innovative solutions for different engineering challenges.

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)

SNo	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PS01	PSO2	PSO3
C01	2	1	2	1	2	2	2	1	1	2	1	1
C02	2	1	2	1	2	2	2	1	1	2	1	1
C03	2	1	2	1	2	2	2	1	1	2	1	1
C04	2	1	2	1	2	2	2	1	1	2	1	1
C05	2	1	2	1	2	2	2	1	1	2	1	1

High-3 Medium-2 Low-1

Module I: Manufacturing Methods- casting, machining
Pattern Making: Study of Pattern materials, pattern allowances and various types of patterns molding, Properties of good mold, Molding material, Casting develop various types of casted object machining, conduct practical's in machine shop, prepare jobs on lathe, shaper, milling machines.

Module II: CNC machining
Additive manufacturing. To learn the concept of G code, M code for CNC Machines To Prepare the jobs on CNC Milling and Lathe Trainer. Additive manufacturing prepares the jobs on 3D Printing Machine

Module III: Welding (arc welding & gas welding), brazing
Introduction to different types of welding techniques, introduction to different types of welded

joints. Introduction to different types of welding equipment's and their use and safety precautions, brazing and soldering techniques.

Module IV: Electrical & Electronics

Electronic component familiarization, understanding electronic system design flow, schematic design and PCB layout and Gerber creation using Eagle CAD basic 2D and 3D designing using CAD tools such as Free CAD, Sketch up, Prusa Slicer, Flat CAM, Ink space, Open BSP and Veri CUT Familiarization and use of basic measurement instruments DSO including various triggering modes, DSO probes, DMM, LCR bridge

Module V: Electrical & Electronics.

Schematic and PCB layout design of a suitable circuit, fabrication and testing of   the   circuit. Machining of 3D geometry on soft material such as soft wood or modeling wax. 2D profile cutting of press fit box/casing in acrylic (3 or 6 mm thickness)/cardboard, MDF (2 mm) board using laser cutter & engraver. 2D profile cutting on plywood /MDF (6-12 mm) for press fit designs.

Total: 60 Hours

Reference(s)
1- Chaudhary S.K , Automobile Engg; Laxmi Publications, 2006
2-Dr. Sabrie Soloman 3D Printing & Design Khanna Book Publishing Company, New Delhi, 2010

List of e-Learning Resources:
1. https://nptel.ac.in/
2. https://www.coursera.org/

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