Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat

Department of Mechanical Engineering

B.Tech. Mechanical Engineering

Sr. No.	Subject	Code	Scheme L-T-P	Credits (Min.)	Notional hours of Learning (Approx.)
First Semester (1st year of UG)					
1.	Elements of Thermal and Fluid Systems	ME101	3-0-2	4	85
2.	Engineering Mechanics	ME103	3-1-0	4	70
3.	Computer Programming for Mechanical Engineers	ME105	3-0-2	4	85
4.	Energy and Environmental Engineering	EG110	3-0-2	4	85
5.	Engineering Mathematics	MA117	3-1-0	4	70
6.	Indian Value System and Social Consciousness	HS120	2-0-0	2	40
			Total	**22**	**435**
7.	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	MEv01 MEP01	0-0-10	5	200 (20 x 10)
Second Semester (1st year of UG)					
1.	Engineering Thermodynamics	ME102	3-1-0	4	70
2.	Workshop Practice	ME104	0-0-4	2	70
3.	Elements of Materials and Manufacturing	ME106	3-0-2	4	85
4.	Engineering Drawing	ME110	2-0-4	4	100
5.	Applied Electrical and Electronics Engineering	EE106	3-0-2	4	85
6.	English and Professional Communication	HS110	3-1-0	4	77
			Total	**22**	**487**
7.	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	MEv02 MEp02	0-0-10	5	200 (20 x 10)

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स.व. राष्ट्रीय प्रौद्योगिकी संस्थान * डी.ओ.एम.ई DoME * S.V. National Institute of Technology

Subject Code: ##nXX; ##: Department Identity, n: Year, XX: Subject Sequence number XX: last digit 0 (subject offered in both ODD and EVEN semesters, XX: 01 to 30 – last digit ODD and EVEN for ODD and EVEN semesters (Mandatory Core), XX: 31 to 50 (Optional Core), XX: 51 to 99 (Elective), Subjects list for Minor and Honor (M/H#1-4), Subjects list for Specialization track (#1-4) EG: Engineering Subject, SC: Science Subject (offered combinedly by departments) (SVNIT Surat)

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat

B.Tech. I (DoME) Semester – I ELEMENTS OF THERMAL AND FLUID SYSTEMS ME101	Scheme	L	T	P	Credit
		3	0	2	04

1. Course Outcomes (COs): At the end of the course, students will be able to	
CO1	Explain the basic concepts of thermodynamics, thermodynamic processes and apply the first law of thermodynamics to non-flow and flow processes
CO2	Explain the properties of fluids and fluid flows and determine the hydrostatic forces on surfaces, buoyancy and floatation
CO3	Describe the types and properties of fuels and lubricants and calculate the calorific values based on analysis
CO4	Classify and compare the working of boilers and their performances parameters
CO5	Calculate the efficiencies of air standard cycles and differentiate between the types and working of internal combustion engines
CO6	Identify the refrigerants and their applications and illustrate the operation of refrigeration and air conditioning systems

2.	Syllabus	
	INTRODUCTION TO THERMODYNAMICS	**(12 Hours)**
	Classical thermodynamics & statistical thermodynamics, Thermodynamic system, properties, states, processes, cycle, equilibrium, Zeroth law of thermodynamics, Definition of work & heat and their evaluation for various thermodynamics processes, Equation of state for ideal gas, change in internal energy, change in enthalpy of gas in various thermodynamics processes. First law of thermodynamics for flow and non-flow processes, Application of first law of thermodynamics to boilers, engines, turbines, and compressors	
	INTRODUCTION TO FLUID MECHANICS	**(07 Hours)**
	Classification of fluids, Properties of fluids, Types of fluid flow, Static forces on surfaces, buoyancy and metacenter, Numerical, Layout of Hydropower Plant.	
	FUELS AND LUBRICANTS	**(04Hours)**

	Classification of fuels, Calorific values of fuels, Dulong's formula, Proximate and ultimate analysis of fuel, Types of lubricants, Properties of lubricants, flash point, fire point, viscosity, vapor pressure, cloud point, pour point, etc.	
	STEAM GENERATORS	**(09 Hours)**
	Steam generators, Definition, Classification, General study of Cochran, Babcock Wilcox, Lancashire and Benson boilers, boilers mountings and accessories, Types of draught, Calculation of chimney height, boiler efficiency and Numericals, Layout of thermal power plant, study of heat recovery system including economizes, superheaters and air preheaters.	
	INTERNAL COMBUSTION ENGINES	**(07 Hours)**
	Air standard cycles: Otto cycle, Diesel cycle, and Dual cycle with Numericals, Classification of internal combustion engines, Spark ignition and compression ignition engines, two-stroke and four-stroke engines, various efficiencies.	
	REFRIGERATION AND AIR-CONDITIONING	**(06 Hours)**
	Unit of refrigeration, Coefficient of performance, Refrigerants, Vapour Compression refrigeration system, Domestic refrigerator, Psychrometric terms, Window and split air conditioners, Central air conditioning systems, Ice plant.	
		(Total Contact Time: = 45 Hours)

3.	**Tutorials (Not Applicable)**

4.	**Practical**
1	Determination of calorific value of solid fuels by Bomb Calorimeter
2	Determination of flash point and fire point of a given sample of oil.
3	Determination of viscosity of oil by viscometer (Redwood or Saybolt).
4	Study of working of 2-stroke and 4-stroke SI and CI engines
5	Study of different types of steam generators
6	Study of mountings and accessories of steam generators
7	Study of working of refrigerator and air conditioner
8	Study and determination of COP of ice plant
9	Determination of different types of flow patterns by Reynolds's experiment.
10	Determination of metacentric height of floating body.

5.	Books Recommended
1	P. K. Nag. Engineering Thermodynamics, 6th Edition, McGraw Hill, 2017.
2	R. K. Rajput. Thermal Engineering, 10th Edition, LaxmiPubications, 2018.
3	G. Rogers and Y. Mayhew. Engineering Thermodynamics: Work and Heat Transfer, 4th Edition, Pearson Education India, 2002.
4	S. K. Som, G. Biswas and S. Chakraborty. Introduction to Fluid Mechanics and Fluid Machines, 3rd Edition, McGraw Hill, 2017.
5	D. S. Kumar. Fluid Mechanics and Fluid Power Engineering, S. K. Kataria and Sons, 2013.

B.Tech. I (DoME) Semester – I ENGINEERING MECHANICS ME103	Scheme	L	T	P	Credit
		3	1	0	04

1. **Course Outcomes (COs):**

At the end of the course, students will be able to

CO1	Correlate real-life problems with engineering mechanics and determine the resultant & moment of various force system acting in 2-Dimension & 3- Dimension.
CO2	Evaluate centroid and Moment of inertia of different sections.
CO3	Analyse the internal and external forces in truss
CO4	Analyse the concepts of stress and strain in structures and understand the material properties.
CO5	Apply the knowledge of mechanical/elastic/thermal properties of materials and constitutive relationships to solve elementary level determinate and indeterminate problems.
CO6	Analyze the response of structural elements subjected to axial force, bending and shear or in combination and graphically represent the distribution.

2.	Syllabus	
	EQUILIBRIUM OF RIGID BODY	**(04 Hours)**
	Principle of superposition and Transmissibility of forces, Resultant forces, condition for equilibrium, types of equilibrium, Parallelogram law of forces, Triangular law of forces, Resolution of forces, orthogonal and non-orthogonal components of forces, Resultant of more than two concurrent forces, Polygon law of forces, Graphical method, Free body diagram, Lamis theorem, Coplanar Non-Concurrent Force Systems, Varignon's principle of moments, Condition for equilibrium.	
	CENTRE OF GRAVITY AND MOMENT OF INERTIA	**(05 Hours)**
	Centre of gravity – Centre of area, volume, mass, weight, Centre of gravity of composites, Theorem of Pappus, Second moment of areas. Definition of a moment of inertia. Determination of the moment of the area by integration, Parallel and perpendicular axis theorem for Moment of Inertia. MI of composite area. Concept of Mass moment of inertia of body.	
	TRUSS	**(05Hours)**
	Trusses: definition, stability, and determinacy, types, Determination of reactions at supports and internal resistance for planar trusses, zero force members, Analysis of plane trusses by method of joint. Concept of zero force member. Analysis of plane trusses by method of section,	
	FRICTION	**(04 Hours)**

	Friction: Limiting friction, types of friction, friction angle, coefficient of friction, angle of repose, Cone of friction, Variation of friction with applied load – Static friction, dynamic friction, Ladder friction, Wedge friction, Screw friction	
	SIMPLE STRESSES AND STRAINS	**(15 Hours)**
	Stress, Strain and Elasticity, Deformation and Stresses in Statically determined structure, Principle of superposition, Deformation in statically indeterminate structures, Deformation and stresses in composite structures, stress strain diagram for mild steel, Thermal stress and strain, Thermal stresses in composite bars, Elastic constants: Linier strain, Poison's ratio, Volumetric strain of a rectangular body subjected to three mutually perpendicular forces, Bulk modulus, Relation between, young's modulus, bulk modulus and Modulus of rigidity. Mechanical Properties and test of metals, Principal planes and principal stresses, Analytical and graphical method for finding principal stresses	
	SHEAR FORCE AND BENDING MOMENT	**(07 Hours)**
	Classification of beams, loads, and supports; Support reaction, Relation between shear force and bending moment, point of contra flexure, shear force and bending moment diagrams for simply supported beam and cantilever beam,Torsion of circular shaftsDeflection of beams	
	BENDING AND SHEAR STRESSES IN BEAMS	**(04 Hours)**
	Pure bending stress, Theory of pure bending, Equation of bending stress, Maximum bending moment, Flitch beam, Shear stress distribution for a beam section, Distribution of shear stresses in standard section.	
		(Total Contact Time: = 45 Hours)

3	**Tutorials**
1	Numerical related to the topics covered in the theory classes

4	**Practical**
	Not applicable

5.	**Books Recommended**
1	Beer, F.P. and Johnston, E.R., Vector mechanics for engineers: Statics and Dynamics, Tata McGraw-Hill, New Delhi.
2	Desai,J.A. and Mistry, B.B., Engineering Mechanics: Statics and Dynamics, Popular, Prakashan, Surat.
3	Meriam, J.L. and Kraige, L.G. "Engineering Mechanics: Statics and Dynamics", John Wiley and sons, New York
4	Hibbeler, R.C. "Engineering Mechanics: Statics and Dynamics", Prentice Hall of India, New Delhi
5	F. P. Beer and Johnston S J , John DeWolf , David Mazurek, "Mechanics of Materials", Tata McGraw Hill, New Delhi, 2020.
6	S Timoshenko and D H Young, "Elements of Strength of Materials", Tata McGraw Hill, New Delhi, 2006
7	S SBhavikatti, "Strength of Materials", Vikas Publication House, New Delhi, 2007

B.Tech. I (DoME) Semester – I COMPUTER PROGRAMMING FOR MECHANICAL ENIGNEERS ME105	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, students will be able to
CO1	Identify the basic commands and operations in the programming environment
CO2	Classify the syntax and roles of variables, control structures, and file I/O operations
CO3	Describe the principles and applications of vector and matrix operations
CO4	Identify and create different types of plots and graphs to represent data
CO5	Explain the principles of numerical methods for solving equations and data analysis
CO6	Apply programming skills and numerical methods to solve engineering problems in given case studies

2.	Syllabus	
	INTRODUCTION TO PROGRAMMING LANGUAGE	**(06 Hours)**
	Overview of programming language environment; Basic commands and operations; Variables and assignment operations; Data types and type conversions; Arithmetic operations and built-in functions	
	PROGRAMMING FUNDAMENTALS	**(09 Hours)**
	Script files and functions; Input and output operations; Control structures: Conditional statements (if-else), Switch-case structures, Logical operations and expressions, For loops, While loops, Nested loops and control flow.	
	VECTORS AND MATRICES	**(06 Hour)**
	Creating and manipulating vectors; Creating and manipulating matrices; Matrix operations; Linear algebra with programming; Solving systems of linear equations.	
	DATA VISUALIZATION	**(09 Hours)**
	Basic 2D plotting; Customizing plots: titles, labels, and legends; Plotting multiple data sets; Subplots and figure properties; 3D plotting basics; Advanced plotting techniques.	
	FUNCTIONS AND FILE I/O	**(03 Hours)**
	Writing and calling functions; Function handles and anonymous functions; Reading from and writing to files.	

	NUMERICAL METHODS	**(07 Hours)**
	Solving equations numerically; Root finding methods; Numerical differentiation; Numerical integration; Curve fitting and interpolation; Polynomial fitting; Spline interpolation and least squares fitting.	
	APPLICATIONS IN MECHANICAL ENGINEERING	**(05 Hours)**
	Solving Problems: Thermal analysis of boilers, engines, turbines, and compressors; Fluid mechanics problems; Internal combustion engine problems; Engineering mechanics problems.	
	(Total Contact Time: 45 Hours)	

3.	**Practicals:**
1	Create a program to manipulate vectors and matrices, including operations like addition, subtraction, scalar multiplication, and transposition.
2	Write a program to solve systems of linear equations using matrix inversion and matrix multiplication.
3	Write a program that uses conditional statements (if-else) to determine the roots of a quadratic equation based on user input coefficients.
4	Develop a program to plot 2D graphs of mathematical functions, customize the plots with titles, labels, and legends, and plot multiple data sets on the same graph.
5	Create a program that generates a 3D plot of a mathematical function, such as a surface plot or a contour plot, and visualize it with appropriate labels and color mapping.
6	Develop functions to read data from text files, perform operations on the data (e.g., sorting, filtering), and write the results back to new files.
7	Develop a program to simulate and analyze thermal systems, such as boilers, engines, turbines, or compressors, based on the principles of the first law of thermodynamics.
8	Develop a program to solve fluid mechanics problems and/or engineering mechanics problems

These programs cover various aspects of computer programming and problem-solving techniques relevant to mechanical engineering applications. They provide hands-on experience in utilizing programming for data manipulation, visualization, and numerical analysis in mechanical engineering contexts

4.	**Books Recommended:**
1.	C Programming: A Modern Approach" by K. N. King, W. W. Norton & Company, 2nd edition, 2008
2.	"MATLAB for Engineers" by Holly Moore, Pearson Education Inc, 2022
3.	"MATLAB: A Practical Introduction to Programming and Problem Solving" by Stormy Attaway, Butterworth-Heinemann, 2022
4.	"Python Crash Course" by Eric Matthes, No Starch Press; 2nd edition, 2019
5.	"Automate the Boring Stuff with Python" by Al Sweigart, No Starch Press; 1st edition, 2015
6.	"Introduction to Scilab: For Engineers and Scientists" by Sandeep Nagar, APress; 1st edition, 2017

B.Tech. I (ME) Semester – I ENERGY AND ENVIRONMENTAL ENGINEERING EG110	Scheme	L	T	P	Credit
		3	0	2	04

1. Course Outcomes (COs): At the end of the course, students will be able to	
CO1	Explain the components of ecosystems, various biogeochemical cycles and importance of different urban network services
CO2	Differentiate between various types of environmental pollution along with their impacts and regulatory standards
CO3	Examine various global environmental issues and their management
CO4	Discuss the fundamental principles of energy, including classification, conservation and related policy frameworks and regulations.
CO5	Analyse a given energy systems and their components

2.	Syllabus	
	ENVIRONMENT AND ECOSYSTEMS	**(10 Hours)**
	Introduction: Concept of an ecosystem - structure and functions of ecosystem; Components of ecosystem - producers, consumers, decomposers; Food chains, food webs, ecological pyramids, energy flow in ecosystem; Bio-geochemical cycles, hydrologic cycle Componentsofenvironmentandtheirrelationship,impactoftechnologyonenvironment,environmental degradation, environmental planning of urban network services such as water supply, sewerage, solid waste management; closed loop cycle, concepts of sustainability	
	ENVIRONMENTAL POLLUTION	**(10 Hours)**
	Water, air, soil, noise, thermal and radioactive, marine pollution - sources, effects and engineering control strategies; Centralized and decentralized treatment system, Drinking water quality and standards, ambient air and noise standards	
	GLOBAL ENVIRONMENTAL ISSUES AND ITS MANAGEMENT	**(10 Hours)**
	Engineering aspects of climate change, concept of carbon credit, CO_2 sequestration, concepts of environmental impact assessment and environmental audit, lifecycle assessment	
	BASICS OF ENERGY AND ITS CONSERVATION	**(07 Hours)**

	Classification of energy sources, Global and national energy scenario, Fossil and alternate fuels and its characterization. General aspects of energy conservation and management; Energy conservation act, Energy policy of company; Need for energy standards and labelling; Energy building codes.	
	INTRODUCTION TO ENERGY CONVERSION SYSTEMS	**(08 Hours)**
	Energy conversion systems: Working principle, Basic components, General functioning and normal rating specifications of various energy conversion systems like Power plant, Pump, Refrigerator, Air-conditioner, Internal combustion engine, Solar PV cell, Solar water heating system, Biogas plant. Wind turbine, Fuel cells.	
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	**Tutorials (Not Applicable)**

4.	**Practical**
1	Performance Test on a computerised single cylinder diesel engine
2	Performance Test on Three-cylinder petrol engine
3	Determination of COP of vapor compression refrigeration system
4	Study of General Motors Cruze Vehicle Automotive System
5	Study of MG Hector Vehicle Automotive Systems
6	Measurement of direct and diffused Solar radiation using pyranometer
7	Determination of I-V Characteristics of solar PV Panel
8	Study of electricity and or gas bill
9	Study of pollutants from diesel Engine
10	Study of pollutants from petrol Engine

5.	**Books Recommended**
1	Daniel B Botkin & Edward A Keller, Environmental Sciences, John Wiley & Sons, 2010
2	R. Rajagopalan, Environmental Studies, Oxford University Press, 2015
3	Benny Joseph, Environmental Studies, McGraw Hill publishers, 2017
4	B. H. Khan, Nonconventional Energy resources, Second Edition, Tata McGraw Hill publishers, 2009
5	P. V. Bhale, National Mission Project on pedagogy main phase course on Energy Management and Energy Audit, 2018
6	C S Rao, Environmental Pollution Control Engineering, New Age International Publishers, 2018

B.Tech. I (DoME) Semester – I ENGINEERING MATHEMATICS MA117	Scheme	L	T	P	Credit
		3	1	0	04

1. Course Outcomes (COs): At the end of the course, students will be able to	
CO1	Solve a system of linear algebraic equations
CO2	Expand the periodic functions in the form of Fourier series
CO3	Obtain higher order differential equations
CO4	Explain the use of complex variable for conformal transformation
CO5	Demonstrate probability and statistical analysis to Engineering applications
CO6	Apply numerical methods to solve partial differential equations

2.	SYLLABUS	
	LINEAR ALGEBRA	(06 Hours)
	Matrix algebra, systems of linear equations, eigen values and eigen vectors	
	CALCULUS	(08 Hours)
	Functions of single variable, limit, continuity and differentiability, mean value theorems, indeterminate forms; evaluation of definite and improper integrals; double and triple integrals; partial derivatives, total derivative, Taylor series (in one and two variables), maxima and minima, Fourier series; gradient, divergence and curl, vector identities, directional derivatives, line, surface and volume integrals, applications of Gauss, Stokes and Green's theorems	
	DIFFERENTIAL EQUATIONS	(08Hours)
	First order equations (linear and nonlinear); higher order linear differential equations with constant coefficients; Euler-Cauchy equation; initial and boundary value problems; Laplace transforms; solutions of heat, wave and Laplace's equations.	
	COMPLEX VARIABLES	(10 Hours)
	Analytic functions; Cauchy-Riemann equations; Cauchy's integral theorem and integral formula; Taylor and Laurent series	

	PROBABILITY AND STATISTICS	**(05 Hours)**
	Definitions of probability, sampling theorems, conditional probability; mean, median, mode and standard deviation; random variables, binomial, Poisson and normal distributions	
	NUMERICAL METHODS	**(08 Hours)**
	Numerical solutions of linear and non-linear algebraic equations; integration by trapezoidal and Simpson's rules; single and multi-step methods for differential equations	
		(Total Contact Time: = 45 Hours)

3.	**Tutorials**
	Numerical based on the respective units

3.	**Books Recommended**
1	Kreyszing E., "Advanced Engineering Mathematics", John Wiley & Sons, Singapore, Int. Student Ed. 2015.
2	James Steward De, "Calculus", Thomson Asia, Singapore, 2003
3	O'Neel Peter., "Advanced Engg. Mathematics", Thompson, Singapore, Ind. Ed. 2002.
4	Wiley C. R., "Advanced Engineering Mathematics", McGraw Hill Inc., New York Ed. 1993
5	Michael D. Greenber, "Advance Engineering Mathematics", Pearson (Singapore) Indian Edition, 2007

B.Tech. I (DoME) Semester – II ENGINEERING THERMODYNAMICS ME102	Scheme	L	T	P	Credit
		3	1	0	04

1. Course Outcomes (COs): At the end of the course, students will be able to	
CO1	Relate the thermodynamic laws to engineering systems and processes
CO2	Describe the second law of thermodynamics in analysing performance of engineering systems
CO3	Apply the entropy concept to various thermal systems
CO4	Evaluate the various thermal systems based on exergy concepts and thermodynamic relations
CO5	Solve thermodynamic problems of pure substance and ideal gas and gas mixture

2.	Syllabus	
	INTRODUCTION	**(02 Hours)**
	Thermodynamic system and processes, Zeroth and First law of thermodynamics, Calculation of work and heat in various processes	
	PROPERTIES OF PURE SUBSTANCE	**(06 Hours)**
	Definition of pure substance, Phases of a pure substance, P-V-T behavior of a pure substance, Critical & triple point of a pure substance, Mollier diagram, steam table & dryness fraction of steam, Measurement of dryness fraction of steam	
	PROPERTIES OF GAS AND GAS MIXTURE	**(05Hours)**
	Equation of state for ideal gas, Change in entropy, internal energy, enthalpy of gas in various thermodynamics processes, Dalton's law of partial pressure & properties of gas mixture, Compressibility factor	
	SECOND LAW OF THERMODYNAMICS	**(07 Hours)**
	Statements of second law of thermodynamics. - The Carnot cycle & Carnot's theorem, Corollary of Carnot's theorem, Efficiency of reversible engine, Causes of irreversibility, C.O.P. of heat pump & refrigerator	
	ENTROPY	**(08 Hours)**

	Inequality of Clausius theorem, Entropy as a property, Change in entropy in reversible and irreversible processes, Principle of increase of entropy, Entropy change of an ideal gas in various thermodynamics processes, Second law of thermodynamics for steady flow process & its application	
	AVAILABILITY AND IRREVERSIBILITY	**(09 Hours)**
	Basic concepts, Available and unavailable energy for a cycle, Different form of Exergy, Exergy balance for closed system and open system, Decrease of Exergy principle, Difference between first law & second law efficiency, Second law efficiency for steady flow devices	
	THERMODYNAMIC RELATIONS & EQUILIBRIUM	**(08 Hours)**
	The Maxwell relations, Clausis–Clapeyron equation, Joule –Thomson coefficient, Relationships involving specific heats, enthalpy, entropy.	
	(Total Contact Time: = 45 Hours)	

2.	**Tutorials**
	Numerical based on the topics covered in theory class

3.	**Books Recommended**
1	W. Van, R.E. Sonnetag and C. Borgnakke, Fundamental of Classical Thermodynamics, John Wiley & sons, 2005.
2	P K Nag, Engineering Thermodynamics, McGraw Hill Education Private Limited, 2013
3	Y.A. Cengel and M.A. Boles, Thermodynamics, Tata McGraw Hill, 2004
4	C.P. Kothandaraman, P.R. Khajuria and S. Domkundrar, A Course in Thermal Engineering, Dhanpat Rai & Sons,2004.
5	P.L. Ballaney, Thermal Engineering, Khanna Publishers, 2000

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B.Tech. I (DoME) Semester – II WORKSHOP PRACTICE ME104	Scheme	L	T	P	Credit
		0	0	4	02

1. Course Outcomes (COs): **At the end of the course, students will be able to**	
CO1	Observe safety precaution in workshop
CO2	Identify and operate various carpentry, smithy and fitting tools
CO3	Perform the wood working assignment
CO4	Create the assigned smithy component
CO5	Prepare fitting and assembly job

2.	**Syllabus**	
	UNIT 1	**(15 Hours)**
	Introduction of the tools used in carpentry shop and skill development in carpentry works.	
	UNIT 2	**(15 Hours)**
	Introduction of the tools used in Fitting shop and skill development in fitting works	
	UNIT 3	**(15 Hours)**
	Introduction of the tools used in smithy shop, and skill development in smithy works	
	UNIT 4	**(15 Hours)**
	Introduction of the tools used in pipe fittings, plumbing and skill development in assembly	
	(Total Contact Time: = 60 Hours)	

3.	**Books Recommended**
1	H.S. Bava, "Workshop Technology", Tata McGraw Hill Publishing Co. Ltd., 1995.
2	S.K. Hajra Chaudhary, "Elements of Workshop Technology Vol. I", Asia Publishing House, 1988
3	W.A.J. Chapman, "Workshop Technology", ELBS Low Price Text, Edward Donald Pub. Ltd., 1961
4	Gupta K.N. & Kaushish J.P., "Workshop Technology Vol. I, II", New Delhi Heights Pub., New Delhi,1991
5	Raghuvanshi B. S., "Course in Workshop Technology", Dhanpat Rai & Sons, New Delhi,1991
6	Tejwani V. K. "Basic Machine Shop Practice Vol. I, II", Tata McGraw Hill Pub. Co., New Delhi, 1989.
7	Arora B. D." Workshop Technology Vol. I, II", Satya Prakashan, New Delhi, 1981

B.Tech. I (DoME) Semester – II ELEMENTS OF MATERIALS AND MANUFACTURING ME106	Scheme	L	T	P	Credit
		3	0	2	04

1. Course Outcomes (COs): At the end of the course, students will be able to	
CO1	Classify and compare various engineering materials and identify their properties and applications
CO2	Describe different types of crystal systems and determine the crystal structures
CO3	Differentiate between different casting processes and identify a suitable casting process for a given application
CO4	Differentiate between different forming processes and identify a suitable forming process for a given application
CO5	Differentiate between different welding and allied processes and identify a suitable process for a given application

2.	Syllabus	
	ENGINEERING MATERIALS	**(14 Hours)**
	Introduction: Classification of engineering materials, Metals (ferrous and non-ferrous) and alloys, Ceramics, Polymers (thermosets and thermoplastics), Composites (metal-matrix, ceramic-matrix, polymer- matrix), Semi-conductors, Bio-materials, Nano-materials, and Advance materials, Engineering properties of materials, Stress- Strain relationship, Effect of temperature on properties of materials. Crystalline structure, Nano-crystalline structure, Types of crystal systems, Crystal lattice, Lattice parameters, Metallic structures, Miller indices, Atomic radius & atomic packing factors for various crystal systems, Crystalline materials, Amorphous materials, Structure determination byX-ray diffraction, Bragg's law.	
	METAL CASTING PROCESSES	**(10 Hours)**
	Overview of casting processes, Applications – materials and products, Sand casting process – types of patterns, pattern allowances, core and mould making, molding materials, types of cores, elements of riser and gating system, melting and pouring, cleaning of castings, casting defects, Special casting techniques such as – permanent mould casting, shell mould casting, die casting, investment casting, continuous casting and centrifugal casting.	
	METAL FORMING PROCESSES	**(09Hours)**

	Overview of metal forming processes, Applications - materials and products, Nature of plastic deformation, Temperature in metal forming, forming processes - Rolling, Forging, Extrusion, Drawing (wire, bar and tube), and Sheet metal forming (Shearing, Deep drawing, Bending) with load estimation.	
	WELDING AND ALLIED PROCESSES	**(12 Hours)**
	Overview of welding processes, Weld joints, Gas welding (Principles of gas welding, types of gases used, types of flames, welding techniques, equipment used, filler rods), Gas cutting, Electric arc welding processes - manual metal arc welding, flux cored arc welding, gas tungsten arc welding (GTAW), gas metal arc welding (GMAW), submerged arc welding, Electric resistance welding processes – spot welding, seam welding, projection welding, upset welding, flash welding, Solid state welding processes – friction welding, friction stir welding, ultrasonic welding, Weld defects, Allied processes like brazing, soldering and adhesive bonding.	
	(Total Contact Time: 45Hours)	

3.	**Practical**
1	Testing of clay content of moulding sand.
2	Determination of grain fineness number of moulding sand.
3	Determination of moisture content of moulding sand.
4	Demonstration of permanent mould casting process
5	Demonstration and practice on manual metal arc welding
6	Demonstration of the effects of the welding parameters on GTAW process
7	Demonstration and practice on oxy-acetylene gas welding
8	Demonstration of the effects of the welding parameters on oxy-acetylene gas welding
9	Demonstration and practice on gas cutting
10	Practice on soldering of galvanized steel
11	Demonstration of selected forming operations

5.	**Books Recommended**
1	M. P. Groover, Fundamentals of Modern Manufacturing, Materials, Processes, and Systems, 4th Edition, John Willey, 2010.
2	S. Kalpakijan and S. R. Schmid, Manufacturing Processes for Engineering Materials, 6th Edition, Pearson Education, 2018.
3	P. N. Rao, Manufacturing Technology – Vol. 1, 5th Edition, McGraw Hill, 2018.
4	V. Raghavan, Materials Science and Engineering: A First Course, 6th Edition, Prentice Hall India,2015.
5	J. T. Black and R. A. Kohser, DeGarmo's Materials and Processes in Manufacturing, Wiley India, 2017.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat

B.Tech. I (DoME) Semester – II ENGINEERING DRAWING ME 110	Scheme	L	T	P	Credit
		2	0	4	04

1. Course Outcomes (COs): **At the end of the course, students will be able to**	
CO1	To read, understand and apply the knowledge of orthographic projections (production-related features and instructions) in the manufacturing industry, process industry and other allied engineering applications.
CO2	To communicate with globally recognized engineers of different disciplines of engineering for research and development activities.
CO3	To get knowledge of projections and sections of different solid objects
CO4	To perceive the idea of sectional view and its advantages of it.
CO5	To apply the concept of intersections of solids for various engineering applications
CO6	To create the image of three-dimensional figures with the help of isometric projections

2.	**Syllabus**	
	INTRODUCTION	**(01 Hours)**
	Introduction: Importance of Engineering Drawing, drawing instruments and materials, B.I.S. and IS Conventions, First angle and third angle projection method.	
	ENGINEERING CURVES	**(03 Hours)**
	Classification of engineering curves, construction of conics, cycloidal, Involutes and spirals curves.	
	PROJECTION OF POINTS, LINES AND PLANES	**(04Hours)**
	Introduction to principal planes of projection, Projections of the points located in the same and different quadrants, projection of lines with its inclination to the reference planes, true length of the lines and its inclination with reference planes, projection of planes with its inclination with two reference planes, concept of an auxiliary plane method for projection of planes.	
	PROJECTION AND SECTION OF SOLIDS	**(03 Hours)**

	Classification of the solids, projections of the solids like cylinder, cone, pyramid and prism with its inclination to two reference planes, Section of such solids and true shape of the section	
	DEVELOPMENT OF THE LATERAL SURFACES	**(03 Hours)**
	Method of development, parallel line development, radial line development, developments of cylinder, cone, prism, pyramid, true length of edges – oblique surface.	
	PENETRATION CURVE	**(04 Hours)**
	Classification, line of interaction, line/generator method and section plane method; intersection of two prisms, two cylinders, interaction of cone and cylinder, pyramid with prism, surface development.	
	ORTHOGRAPHIC PROJECTIONS	**(04 Hours)**
	Projections from a pictorial view of the object on the principal planes for view from front, top, and side using a first and third angle of the projection method	
	ISOMETRIC PROJECTIONS	**(04 Hours)**
	Terminology, isometric scale, construction of isometric view and isometric projection, isometric axes, and lines	
	INTRODUCTION TO COMPUTER-AIDED DRAFTING	**(04 Hours)**
	Introduction of the drafting and modeling software and demonstration of its application on the latest machines.	
		(Total Contact Time: 30 Hours)

4.	**Practical:Practice with drawing sheets**
1	Orthographic views
2	Isometric views
3	Engineering curves
4	Projection of points and planes
5	Projection of solids
6	Section of solids
7	Penetration curve and surface development
8	Demonstration of computer-aided drafting and demonstration of its application in the latest machines.
9	Determination of cloud point and pour point of biodiesel and its comparison with diesel

5.	**Books Recommended**
1	Bhatt, N.D.,2023. Engineering Drawing. Charotar Publishing House Pvt. Limited
2	Shah P. J., 2013, Engineering Graphics, S. Chand and Company.
3	Basant Agrawal, C M Agrawal, 2019, Engineering Drawing, McGraw Hill Education (India) Private Limited
4	S.R. Singhal, O. P. Saxena, 2014, Engineering Drawing, Asian Publisher
5	R. K. Dhawan, 2019, A Textbook of Engineering Drawing, S Chand Publishing

B. Tech. I (DoME) Semester – II APPLIED ELECTRICAL AND ELECTRONICS ENGINEERING EE106	Scheme	L	T	P	Credit
		3	0	2	4

1.	**Course Outcomes (COs):** **At the end of the course, the students will be able to**
CO1	Apply the basic concepts like Mesh Analysis, Nodal analysis, Theorems, Phasors to electrical circuits for analysis purposes.
CO2	Explain the basics of magnetic circuits and apply them for electrical machines.
CO3	Classify Electrical wiring and instruments
CO4	Differentiate various semi-conductor devices and identifying their use in various applications.
CO5	Explain the Instrumentation systems, sensors, few appliances and electrical safety.

2.	**Syllabus**	
	DC and AC Circuits	**(10 Hours)**
	DC circuits: Basic Terminology (voltage, current, power, resistance, EMF); Ohms Law and Kirchhoff's laws, Resistances in series and parallel; Current and Voltage Division Rules; Star-delta conversion, Nodal Analysis, Mesh Analysis, Thevenin's Theorem, Norton's Theorem. AC Circuits: Phasor representation and its applications to network elements (R, L, C), series RL, RC and RLC circuits. Definitions of single Phase AC (Frequency, Average value, RMS value, Harmonics, Power and Power factor) and Three-Phase AC system (star-delta connections, phase voltage, line voltage, phase currents and line currents and their relations).	
	Magnetic Circuits:	**(04 Hours)**
	Analogy between electrical and magnetic circuits, Amperes circuital law, Faraday's laws of electromagnetic induction, Lenz's Law, Self-Inductance, Mutual Inductance, Dot convention and Co-efficient of coupling.	
	Electrical Machines:	**(08 Hours)**
	Transformers: Construction, Principle, OC and SC Test for determining its equivalent circuit, efficiency and Losses. Single-Phase and Three-Phase Induction Motors: Construction, Principle, Torque equations, Speed-Torque characteristics, Calculation of Losses and Efficiency.	

	Electrical Wiring, Instruments and Safety:	**(06 Hours)**
	Circuits in domestic wiring, simple control circuit in domestic installation and some applications. Working principle of PMMC, MI, EDM and Induction instruments for measurement of voltage, current, power and energy. Basics of electrical safety, Grounding and Earthing.	
	Introduction to Semiconductor devices:	**(06 Hours)**
	PN Junction Diode: Principle of operation, VI characteristics, Avalanche Breakdown. Bipolar Junction Transistors: PNP and NPN transistors, Principle of operation, Current gain, Input and output characteristics of Common Emitter configuration. Zener diode as voltage regulator and Basics of PV cells and PV panels.	
	Electronic Instrumentation	**(05 Hours)**
	Concepts of Rectifiers (Half and full wave), Rectifier based volt meters, Block diagram of electronic instrumentation, Sensors: Introduction to R, L, C sensors and their applications, Sensors for smoke and gasses.	
	MECHATRONICS AND ROBOTICS	**(04 Hours)**
	Microprocessors and Microcontrollers: Architecture, programming, I/O, Computer interfacing, Programmable logic controller. Sensors and actuators, Piezoelectric accelerometer, Hall effect sensor, Optical Encoder, Resolver, Induct osyn, Pneumatic and Hydraulic actuators, stepper motor, Control Systems- Mathematical modeling of Physical systems, control signals, controllability and observability. Robotics, Robot Classification, Robot Specification, notation; Direct and Inverse Kinematics; Homogeneous Coordinates and Arm Equation of four Axis SCARA Robot.	
	Few applications	**(02 Hours)**
	Block diagram of washing machine, microwave oven etc.	
	Practical will be based on the coverage of the above topics separately	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	**Practicals**
1	Study of Ammeter and voltmeters for measurement of voltage and current.

2	Verification of Kirchoff's laws.
3	Verification of Thevenin's Theorem for a given electrical network.
4	Verification of Norton's Theorem for a given electrical network.
5	Measurement of single phase Power in Series RL or RC circuit.
6	Open circuit and short circuit test for the transformers for efficiency calculation
7	To study Power measurement method for three phase Induction Motor using two-watt meter method
8	Study of Electrical Wiring
9	Study of the characteristics of PN diode, Zener Diode and Transistors
10	Study of Half wave rectifier with and without capacitor filter
11	Study of Full wave rectifier with and without capacitor filter
12	Measurement of strain using strain gauge

4.	**Books Recommended**
1	Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electrical Circuits, 7th Edition, Tata Mc Graw Hill Publisher.
2	Kothari and Nagrath, Basic Electrical Engineering, Tata McGraw Hill Education, 2nd Edition, 2007.
3	D C Kulshreshtha, Basic Electrical Engineering, Tata McGraw Hill, 2010.
4	M.S.Sukhija and T.K.Nagsarkar, Basic Electrical and Electronics Engineering, Oxford University Press, 2012.
5	ChinmoySaha, ArindhamHalder and DebaratiGanguly, Basic Electronics - Principles and Applications, Cambridge University Press, 2018.
6	Babu A K, Automotive Electrical and Electronics, Khanna Publisher.
7	William B Ribbens, Understanding Automotive Electronics, 6thEdition, Elsevier Publisher.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat

Department of Humanities and Social Sciences

ENGLISH & PROFESSIONAL COMMUNICATION

B.Tech. I (DoME) Semester II ENGLISH AND PROFESSIONAL COMMUNICATION HS110	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	Show enhanced reception towards the use of English language.
CO2	Choose and employ appropriate words for professional communication.
CO3	Develop sentences and text in English coherently and formally.
CO4	Demonstrate overall improvement in oral communication.
CO5	Analyze and infer from written and oral messages.

2.	Syllabus	
	Communication	**(05 Hours)**
	Introduction to Communication, Different forms of Communication, Barriers to Communication and some remedies, Non-Verbal Communication – Types, Non-Verbal Communication in Intercultural Context.	
	Vocabulary and usage of words	**(05 Hours)**
	Common Errors, Synonyms, Antonyms, Homophones, and Homonyms; One Word Substitution; Misappropriations; Indianisms; Redundant Words.	
	Language through literature	**(09 Hours)**
	Selected short stories, essays, and poems to discuss nuances of English language.	
	Listening and Reading skills	**(06 Hours)**
	Types of listening, Modes of Listening-Active and Passive, Listening and note taking practice, Practice and activities **Reading Comprehension (unseen passage- literary /scientific / technical)** Skimming and scanning, fact vs opinion, Comprehension practice	
	Speaking Skills	**(10 Hours)**
	Effective Speaking, JAM, Presentation Skills- types, preparation and practice. Interviews- types, preparation and mock interview; Group Discussion- types, preparation and practice	
	Writing Skills	**(10 Hours)**

	Prerequisites of effective writing, Memo-types, Letter Writing- types, Email etiquette and Netiquette, Résumé-types, Report Writing and its types, Editing.	
	Tutorials will be based on the coverage of the above topics separately	**(15 Hours)**
	(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)	

3.	**Tutorials**
1	Letter and Resume
2	Group Discussion
3	Presentation Skills (Individual)
4	Role Play on Nonverbal communication
5	Group Presentation
6	Debate
7	Body language and intercultural communication
8	Listening Activities
9	Editing
10	Report Writing
11	Mock interviews
12	JAM

4.	**REFERENCE BOOKS**
1	Kumar, Sanjay and Pushp, Lata. *Communication Skills*, 2nd Edition, OUP, New Delhi, 2015.
2	Raman, Meenakshi & Sharma Sangeeta. *Technical Communication Principles and Practice*, 3rd Edition, OUP, New Delhi, 2015.
3	Raymond V. Lesikar and Marie E Flatley.*Basic Business Communication skills for Empowering the Internet generation.* Tata McGraw Hill publishing company limited. New Delhi 2005.
4	Courtland L. Bovee, John V. Thill, and Mukesh Chaturvedi. "Business Communication Today." Ninth Edition. Pearson, 2009.
5	Mike Markel. "Practical Strategies for Technical Communication," Bedford/ St. Martin's Second Edition, 2016
6	Laura J. Gurak and John M. Lannon. "Strategies for Technical Communication in the Workplace," Pearson, 2013.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Humanities and Social Sciences

Annexure 4
Of the 58th Meeting of the Senate

B.Tech.1 /M.Sc. 1 Semester I/ II INDIAN VALUE SYSTEM AND SOCIAL CONSCIOUSNESS HS120	Scheme	L	T	P	Credit
		2	0	0	02

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	interpret the important values that need to be cultivated
CO2	analyse the cultures depicted in Ramayana, Mahabharata, Jainism and Buddhism
CO3	review the structure of Indian knowledge system
CO4	discuss the significance of constitution of India
CO5	demonstrate social responsibility

2.	Syllabus	
	HUMAN VALUES AND CONSCIOUSNESS	**(08 Hours)**
	Human Values Definition and Classification of Values; The Problem of Hierarchy of Values and their Choice; Self-Exploration; 'Basic Human Aspirations; Right understanding, Relationship and Physical Facility; fulfilment of aspirations; Understanding Happiness and Prosperity, Harmony at various levels. What Is Consciousness? ; Can We Build A Conscious Machine?; Levels Of Consciousness; Mind, Matter And Beyond; Holistic Lifestyle; Dealing With Anxiety; Connecting Mind To Brain; Minds, Brains, And Programs.	
	INDIAN CULTURE AND HERITAGE	**(07 Hours)**
	Culture and its salient features: The Vedic – Upanishadic Culture and society, Human aspirations in those societies; Culture in Ramayana and Mahabharata: The Ideal Man and Woman, Concepts Maitri, Karuna, Seela, Vinaya, Kshama, Santi, Anuraga – as exemplified in the stories and anecdotes of the Epics; The Culture of Jainism: Jaina conception of Soul, Karma and liberation, Buddhism as a Humanistic culture; The four Noble truths of Buddhism; Vedanta and Indian Culture;	
	INDIAN KNOWLEDGE SYSTEM	**(08 Hours)**
	Indian knowledge as a unique system, Place of Indian knowledge in mankind's evolution, Relevance of Indian knowledge to present day and future of mankind, Nature of Indian Knowledge; Structure of Indian Knowledge: Types of knowledge (para, apara), The scientific and the unscientific, Instruments for gaining and verifying knowledge, Knowledge traditions: Lineages, Instruments - debate, epistemology and pedagogy, The inverted tree – axiomatic, deductive, empirical knowledge, and evolution of knowledge; Disciplines of Study: A brief outline of the subjects, the major contributions and theories along with timelines where relevant: Mathematics; Astronomy; Physical Sciences; Cosmogony; Language studies; Astrology; Moral studies/righteousness; Statecraft and political philosophy	

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	INDIAN CONSTITUTION	**(04 hours)**
	History of Making of the Indian Constitution; Philosophy of the Indian Constitution: Preamble; Salient Features; Contours of Constitutional Rights & Duties; Organs of Governance: Parliament; Composition; Qualifications and Disqualifications; Powers and Functions	
	SOCIAL RESPONSIBILITY	**(03 Hours)**
	Social Responsibility: Meaning and Importance, Different Approaches of Social Responsibility. Social Responsibility of Business towards different Stakeholders. Evolution and Legislation of CSR in India.	
		(Total Contact Time: 30 Hours)

3.	**Books Recommended**
1	D. K. Chaturvedi, Professional Ethics Values and Consciousness, Ane Books Pvt. Ltd., 2023.
2	R.R. Gaur, R Sangal, G. P. Bagaria, Human Values and Professional Ethics, Excel Books, New Delhi, 2010.
3	A.N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004.
4	P R Rao, Indian Heritage and Culture, Sterling Publishers Pvt. Ltd, 1988.
5	D. Singh, Indian Heritage and Culture, APH Publishing Corporation, 1998.
6	Sri Prashant Pole, Treasure Trove of Indian knowledge, Prabhat Prakashan, 2021.
7	Sri Suresh Soni, Sources of our cultural heritage, Prabhat Prakashan, 2018.
8	D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.