

# Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat

Department of Mechanical Engineering  
B.Tech. –I Mechanical Engineering (As per NEP)

| Sr. No.                                            | Subject                                                                       | Code           | Scheme L-T-P | Credits (Min.) | Notional hours of Learning (Approx.) |
|----------------------------------------------------|-------------------------------------------------------------------------------|----------------|--------------|----------------|--------------------------------------|
| <b>First Semester (1<sup>st</sup> year of UG)</b>  |                                                                               |                |              |                |                                      |
| 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                                   |
|                                                    |                                                                               |                | <b>Total</b> | <b>22</b>      | <b>435</b>                           |
| 7.                                                 | Vocational Training / Professional Experience (Optional) (Mandatory for Exit) | MEv01<br>MEP01 | 0-0-10       | 5              | 200 (20 x 10)                        |
| <b>Second Semester (1<sup>st</sup> year of UG)</b> |                                                                               |                |              |                |                                      |
| 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                                   |
|                                                    |                                                                               |                | <b>Total</b> | <b>22</b>      | <b>487</b>                           |
| 7.                                                 | Vocational Training / Professional Experience (Optional) (Mandatory for Exit) | MEv02<br>MEp02 | 0-0-10       | 5              | 200 (20 x 10)                        |
|                                                    |                                                                               |                |              |                |                                      |

04 AUG 2026



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|                                                                                          |               |          |          |          |               |
|------------------------------------------------------------------------------------------|---------------|----------|----------|----------|---------------|
| <b>B.Tech. I (DoME) Semester – 1<br/>ELEMENTS OF THERMAL AND FLUID SYSTEMS<br/>ME101</b> | <b>Scheme</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>Credit</b> |
|                                                                                          |               | <b>3</b> | <b>0</b> | <b>2</b> | <b>04</b>     |

**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                    |

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>2.</b> | <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |
|           | <b>INTRODUCTION TO THERMODYNAMICS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>(12 Hours)</b> |
|           | 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 |                   |
|           | <b>INTRODUCTION TO FLUID MECHANICS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>(07 Hours)</b> |
|           | Classification of fluids, Properties of fluids, Types of fluid flow, Static forces on surfaces, buoyancy and metacenter, Numerical, Layout of Hydropower Plant.                                                                                                                                                                                                                                                                                                                                                                      |                   |
|           | <b>FUELS AND LUBRICANTS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>(04Hours)</b>  |
|           | 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.                                                                                                                                                                                                                                                                                      |                   |
|           | <b>STEAM GENERATORS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>(09 Hours)</b> |
|           | Steam generators, Definition, Classification, General study of Cochran, Babcock Wilcox, Lancashire and Benson boilers, boilers mountings and accessories, Types of draught,                                                                                                                                                                                                                                                                                                                                                          |                   |





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|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
|  | Calculation of chimney height, boiler efficiency and Numericals, Layout of thermal power plant, study of heat recovery system including economizers, superheaters and air preheaters.                                                    |                   |
|  | <b>INTERNAL COMBUSTION ENGINES</b>                                                                                                                                                                                                       | <b>(07 Hours)</b> |
|  | 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. |                   |
|  | <b>REFRIGERATION AND AIR-CONDITIONING</b>                                                                                                                                                                                                | <b>(06 Hours)</b> |
|  | 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.    |                   |
|  | <b>(Total Contact Time: = 45 Hours)</b>                                                                                                                                                                                                  |                   |

### 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, Laxmi Publications, 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.                                      |



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|-----------------------------------------------------------------|--------|---|---|---|--------|
| B.Tech. I (DoME) Semester – 1<br>ENGINEERING MECHANICS<br>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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |
|    | <b>EQUILIBRIUM OF RIGID BODY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>(04 Hours)</b> |
|    | 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. |                   |
|    | <b>CENTRE OF GRAVITY AND MOMENT OF INERTIA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>(05 Hours)</b> |
|    | 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.                                                                                                                           |                   |
|    | <b>TRUSS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>(05Hours)</b>  |
|    | 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,                                                                                                                                                                                                 |                   |
|    | <b>FRICTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>(04 Hours)</b> |





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|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
|  | 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                   |
|  | <b>SIMPLE STRESSES AND STRAINS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>(15 Hours)</b> |
|  | 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: Linear strain, Poisson'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 |                   |
|  | <b>SHEAR FORCE AND BENDING MOMENT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>(07 Hours)</b> |
|  | 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 shafts Deflection of beams                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
|  | <b>BENDING AND SHEAR STRESSES IN BEAMS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>(04 Hours)</b> |
|  | 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
|  | <b>(Total Contact Time: = 45 Hours)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |

|          |                                                               |
|----------|---------------------------------------------------------------|
| <b>3</b> | <b>Tutorials</b>                                              |
| 1        | Numerical related to the topics covered in the theory classes |

|          |                  |
|----------|------------------|
| <b>4</b> | <b>Practical</b> |
|          | Not applicable   |

|           |                                                                                                                       |
|-----------|-----------------------------------------------------------------------------------------------------------------------|
| <b>5.</b> | <b>Books Recommended</b>                                                                                              |
| 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                                      |



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|-----------------------------------------------------------------------------------------|--------|---|---|---|--------|
| B.Tech. I (DoME) Semester – 1<br>COMPUTER PROGRAMMING FOR MECHANICAL ENGINEERS<br>ME105 | Scheme | L | T | P | Credit |
|                                                                                         |        | 3 | 0 | 2 | 04     |

|     |                                                                                                    |
|-----|----------------------------------------------------------------------------------------------------|
| 1.  | <b>Course Outcomes (COs):</b><br>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. | <b>Syllabus</b>                                                                                                                                                                                                                   |            |
|    | <b>INTRODUCTION TO PROGRAMMING LANGUAGE</b>                                                                                                                                                                                       | (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                                   |            |
|    | <b>PROGRAMMING FUNDAMENTALS</b>                                                                                                                                                                                                   | (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. |            |
|    | <b>VECTORS AND MATRICES</b>                                                                                                                                                                                                       | (06 Hour)  |
|    | Creating and manipulating vectors; Creating and manipulating matrices; Matrix operations; Linear algebra with programming; Solving systems of linear equations.                                                                   |            |
|    | <b>DATA VISUALIZATION</b>                                                                                                                                                                                                         | (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.                                                 |            |
|    | <b>FUNCTIONS AND FILE I/O</b>                                                                                                                                                                                                     | (03 Hours) |
|    | Writing and calling functions; Function handles and anonymous functions; Reading from and writing to files.                                                                                                                       |            |
|    | <b>NUMERICAL METHODS</b>                                                                                                                                                                                                          | (07 Hours) |





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

### 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, 2 <sup>nd</sup> 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                   |



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| B.Tech. I (ME) Semester – 1<br>ENERGY AND ENVIRONMENTAL ENGINEERING<br>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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                   |
|    | <b>ENVIRONMENT AND ECOSYSTEMS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>(10 Hours)</b> |
|    | <p>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</p> <p>Componentsofenvironmentandtheirrelationship,impactoftechnologyonenvironment,environmental degradation, environmental planning of urban network services such as water supply, sewerage, solid waste management; closed loop cycle, concepts of sustainability</p> |                   |
|    | <b>ENVIRONMENTAL POLLUTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>(10 Hours)</b> |
|    | <p>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</p>                                                                                                                                                                                                                                                                                 |                   |
|    | <b>GLOBAL ENVIRONMENTAL ISSUES AND ITS MANAGEMENT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>(10 Hours)</b> |
|    | <p>Engineering aspects of climate change, concept of carbon credit, CO<sub>2</sub> sequestration, concepts of environmental impact assessment and environmental audit, lifecycle assessment</p>                                                                                                                                                                                                                                                                                                                                        |                   |
|    | <b>BASICS OF ENERGY AND ITS CONSERVATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>(07 Hours)</b> |





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|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| B.Tech. –I Mechanical Engineering (As per NEP) |                                                                                                                                                                                                                                                                                                                                 |
|                                                | 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.                           |
|                                                | <b>INTRODUCTION TO ENERGY CONVERSION SYSTEMS</b> <b>(08 Hours)</b>                                                                                                                                                                                                                                                              |
|                                                | 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. |
|                                                | <b>(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)</b>                                                                                                                                                                                                                                                                     |

### 3. Tutorials (Not Applicable)

|                                                                        |
|------------------------------------------------------------------------|
| <b>4. Practical</b>                                                    |
| 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                              |

|                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------|
| <b>5. Books Recommended</b>                                                                                       |
| 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 – 1<br>ENGINEERING MATHEMATICS<br>MA117 | Scheme | L | T | P | Credit |
|                                                                   |        | 3 | 1 | 0 | 04     |

|                                                    |                                                                              |
|----------------------------------------------------|------------------------------------------------------------------------------|
| <b>1. Course Outcomes (COs):</b>                   |                                                                              |
| 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              |

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>2.</b> | <b>SYLLABUS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |
|           | <b>LINEAR ALGEBRA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>(06 Hours)</b> |
|           | Matrix algebra, systems of linear equations, eigen values and eigen vectors                                                                                                                                                                                                                                                                                                                                                                                                        |                   |
|           | <b>CALCULUS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>(08 Hours)</b> |
|           | 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 |                   |
|           | <b>DIFFERENTIAL EQUATIONS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>(08Hours)</b>  |
|           | 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.                                                                                                                                                                                                                              |                   |
|           | <b>COMPLEX VARIABLES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>(10 Hours)</b> |
|           | Analytic functions; Cauchy-Riemann equations; Cauchy's integral theorem and integral formula; Taylor and Laurent series                                                                                                                                                                                                                                                                                                                                                            |                   |





# Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat

Department of Mechanical Engineering  
B.Tech. –I Mechanical Engineering (As per NEP)

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

|                     |                                         |
|---------------------|-----------------------------------------|
| <b>3. Tutorials</b> |                                         |
|                     | Numerical based on the respective units |

|                             |                                                                                                       |
|-----------------------------|-------------------------------------------------------------------------------------------------------|
| <b>3. Books Recommended</b> |                                                                                                       |
| 1                           | Kreyszig E., "Advanced Engineering Mathematics", John Wiley & Sons, Singapore, Int. Student Ed. 2015. |
| 2                           | James Stewart 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 – 2<br>ENGINEERING THERMODYNAMICS<br>ME102 | Scheme | L | T | P | Credit |
|                                                                      |        | 3 | 1 | 0 | 04     |

|                                                    |                                                                                           |
|----------------------------------------------------|-------------------------------------------------------------------------------------------|
| <b>1. Course Outcomes (COs):</b>                   |                                                                                           |
| 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              |

|           |                                                                                                                                                                                                                                               |                   |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>2.</b> | <b>Syllabus</b>                                                                                                                                                                                                                               |                   |
|           | <b>INTRODUCTION</b>                                                                                                                                                                                                                           | <b>(02 Hours)</b> |
|           | Thermodynamic system and processes, Zeroth and First law of thermodynamics, Calculation of work and heat in various processes                                                                                                                 |                   |
|           | <b>PROPERTIES OF PURE SUBSTANCE</b>                                                                                                                                                                                                           | <b>(06 Hours)</b> |
|           | 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 |                   |
|           | <b>PROPERTIES OF GAS AND GAS MIXTURE</b>                                                                                                                                                                                                      | <b>(05Hours)</b>  |
|           | 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                                |                   |
|           | <b>SECOND LAW OF THERMODYNAMICS</b>                                                                                                                                                                                                           | <b>(07 Hours)</b> |
|           | 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                              |                   |





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|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
|  | <b>ENTROPY</b>                                                                                                                                                                                                                                                                                  | <b>(08 Hours)</b> |
|  | 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 |                   |
|  | <b>AVAILABILITY AND IRREVERSIBILITY</b>                                                                                                                                                                                                                                                         | <b>(09 Hours)</b> |
|  | 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                     |                   |
|  | <b>THERMODYNAMIC RELATIONS &amp; EQUILIBRIUM</b>                                                                                                                                                                                                                                                | <b>(08 Hours)</b> |
|  | The Maxwell relations, Clausius–Clapeyron equation, Joule –Thomson coefficient, Relationships involving specific heats, enthalpy, entropy.                                                                                                                                                      |                   |
|  | <b>(Total Contact Time: = 45 Hours)</b>                                                                                                                                                                                                                                                         |                   |

|                     |                                                       |
|---------------------|-------------------------------------------------------|
| <b>2. Tutorials</b> |                                                       |
|                     | Numerical based on the topics covered in theory class |

|                             |                                                                                                                 |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>3. Books Recommended</b> |                                                                                                                 |
| 1                           | W. Van, R.E. Sonntag 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                                                     |



# Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat

Department of Mechanical Engineering  
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|-------------------------------------------------------------|--------|---|---|---|--------|
| B.Tech. I (DoME) Semester – 2<br>WORKSHOP PRACTICE<br>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. | <b>Syllabus</b>                                                                             |                   |
|    | <b>UNIT 1</b>                                                                               | <b>(15 Hours)</b> |
|    | Introduction of the tools used in carpentry shop and skill development in carpentry works.  |                   |
|    | <b>UNIT 2</b>                                                                               | <b>(15 Hours)</b> |
|    | Introduction of the tools used in Fitting shop and skill development in fitting works       |                   |
|    | <b>UNIT 3</b>                                                                               | <b>(15 Hours)</b> |
|    | Introduction of the tools used in smithy shop, and skill development in smithy works        |                   |
|    | <b>UNIT 4</b>                                                                               | <b>(15 Hours)</b> |
|    | Introduction of the tools used in pipe fittings, plumbing and skill development in assembly |                   |
|    | <b>(Total Contact Time: = 60 Hours)</b>                                                     |                   |

|    |                                                                                                       |
|----|-------------------------------------------------------------------------------------------------------|
| 3. | <b>Books Recommended</b>                                                                              |
| 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                        |





# Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat

Department of Mechanical Engineering  
B.Tech. –I Mechanical Engineering (As per NEP)

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

|                                                                                        |                                                                                                                      |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>1. Course Outcomes (COs):</b><br>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 |

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>2.</b> | <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |
|           | <b>ENGINEERING MATERIALS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>(14 Hours)</b> |
|           | <p>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.</p> <p>Crystalline structure, Nano-crystalline structure, Types of crystal systems, Crystal lattice, Lattice parameters, Metallic structures, Miller indices, Atomic radius &amp; atomic packing factors for various crystal systems, Crystalline materials, Amorphous materials, Structure determination by X-ray diffraction, Bragg's law.</p> |                   |
|           | <b>METAL CASTING PROCESSES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>(10 Hours)</b> |
|           | <p>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.</p>                                                                                                                                                                                                                                                                                              |                   |
|           | <b>METAL FORMING PROCESSES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>(09Hours)</b>  |
|           | <p>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.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |



# Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat

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|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
|  | <b>WELDING AND ALLIED PROCESSES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>(12 Hours)</b> |
|  | 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. |                   |
|  | <b>(Total Contact Time: 45Hours)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |

|           |                                                                                              |
|-----------|----------------------------------------------------------------------------------------------|
| <b>3.</b> | <b>Practical</b>                                                                             |
| 1         | Testing of clay and moisture content of moulding sand.                                       |
| 2         | Determination of grain fineness number of moulding sand.                                     |
| 3         | Practice on permanent mould casting process.                                                 |
| 4         | Demonstration of the solidification behaviour of metallic alloys using cooling curves.       |
| 5         | Testing and evaluation of mechanical properties of metallic alloys.                          |
| 6         | Demonstration and practice on manual metal arc welding.                                      |
| 7         | Demonstration and practice on oxy-acetylene gas welding.                                     |
| 8         | Study and demonstration of the effects of welding parameters for a selected welding process. |
| 9         | Demonstration and practice on gas cutting.                                                   |
| 10        | Practice on soldering of galvanized steel.                                                   |
| 11        | Demonstration of selected Bulk deformation forming operations.                               |
| 12        | Demonstration of the extrusion process of polymers.                                          |
| 13        | Demonstration of sheet metal bending operation.                                              |

**\*Only 08 Number of Experiments are to be conducted out of above list.**

|           |                                                                                                                                    |
|-----------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>5.</b> | <b>Books Recommended</b>                                                                                                           |
| 1         | M. P. Groover, Fundamentals of Modern Manufacturing, Materials, Processes, and Systems, 4 <sup>th</sup> Edition, John Wiley, 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

Department of Mechanical Engineering  
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|----------------------------------------------------------------|--------|---|---|---|--------|
| B.Tech. I (DoME) Semester – 2<br>ENGINEERING DRAWING<br>ME 110 | Scheme | L | T | P | Credit |
|                                                                |        | 2 | 0 | 4 | 04     |

|                                                    |                                                                                                                                                                                                                   |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. Course Outcomes (COs):</b>                   |                                                                                                                                                                                                                   |
| 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                                                                                                                           |

|           |                                                                                                                                                                                                                                                                                                                                                                                                  |                   |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>2.</b> | <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                  |                   |
|           | <b>INTRODUCTION</b>                                                                                                                                                                                                                                                                                                                                                                              | <b>(01 Hours)</b> |
|           | Introduction: Importance of Engineering Drawing, drawing instruments and materials, B.I.S. and IS Conventions, First angle and third angle projection method.                                                                                                                                                                                                                                    |                   |
|           | <b>ENGINEERING CURVES</b>                                                                                                                                                                                                                                                                                                                                                                        | <b>(03 Hours)</b> |
|           | Classification of engineering curves, construction of conics, cycloidal, Involute and spirals curves.                                                                                                                                                                                                                                                                                            |                   |
|           | <b>PROJECTION OF POINTS, LINES AND PLANES</b>                                                                                                                                                                                                                                                                                                                                                    | <b>(04Hours)</b>  |
|           | 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. |                   |
|           | <b>PROJECTION AND SECTION OF SOLIDS</b>                                                                                                                                                                                                                                                                                                                                                          | <b>(03 Hours)</b> |
|           | 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                                                                                                                                                                                                |                   |
|           | <b>DEVELOPMENT OF THE LATERAL SURFACES</b>                                                                                                                                                                                                                                                                                                                                                       | <b>(03 Hours)</b> |
|           | Method of development, parallel line development, radial line development, developments of cylinder, cone, prism, pyramid, true length of edges – oblique surface.                                                                                                                                                                                                                               |                   |
|           | <b>PENETRATION CURVE</b>                                                                                                                                                                                                                                                                                                                                                                         | <b>(04 Hours)</b> |



# Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat

Department of Mechanical Engineering

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|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
|  | Classification, line of intersection, line/generator method and section plane method; intersection of two prisms, two cylinders, intersection of cone and cylinder, pyramid with prism, surface development. |                   |
|  | <b>ORTHOGRAPHIC PROJECTIONS</b>                                                                                                                                                                              | <b>(04 Hours)</b> |
|  | 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                                            |                   |
|  | <b>ISOMETRIC PROJECTIONS</b>                                                                                                                                                                                 | <b>(04 Hours)</b> |
|  | Terminology, isometric scale, construction of isometric view and isometric projection, isometric axes, and lines                                                                                             |                   |
|  | <b>INTRODUCTION TO COMPUTER-AIDED DRAFTING</b>                                                                                                                                                               | <b>(04 Hours)</b> |
|  | Introduction of the drafting and modeling software and demonstration of its application on the latest machines.                                                                                              |                   |
|  | <b>(Total Contact Time: 30 Hours)</b>                                                                                                                                                                        |                   |

|           |                                                                                                       |
|-----------|-------------------------------------------------------------------------------------------------------|
| <b>4.</b> | <b>Practical:Practice with drawing sheets</b>                                                         |
| 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               |

|           |                                                                                                       |
|-----------|-------------------------------------------------------------------------------------------------------|
| <b>5.</b> | <b>Books Recommended</b>                                                                              |
| 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                             |





# Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat

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

|     |                                                                                                                              |
|-----|------------------------------------------------------------------------------------------------------------------------------|
| 1.  | <b>Course Outcomes (COs):</b><br><b>At the end of the course, the students will be able to</b>                               |
| 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. | <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |
|    | <b>DC and AC Circuits</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>(10 Hours)</b> |
|    | 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.<br>AC Circuits: Phasor representation and its applications to network elements (R, L, C), series RL, RC and RLC circuits.<br>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). |                   |
|    | <b>Magnetic Circuits:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>(04 Hours)</b> |
|    | 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.                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |
|    | <b>Electrical Machines:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>(08 Hours)</b> |
|    | Transformers: Construction, Principle, OC and SC Test for determining its equivalent circuit, efficiency and Losses.<br>Single-Phase and Three-Phase Induction Motors: Construction, Principle, Torque equations, Speed-Torque characteristics, Calculation of Losses and Efficiency.                                                                                                                                                                                                                                                                                                                                                                     |                   |
|    | <b>Electrical Wiring, Instruments and Safety:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>(06 Hours)</b> |
|    | Circuits in domestic wiring, simple control circuit in domestic installation and some applications.<br>Working principle of PMMC, MI, EDM and Induction instruments for measurement of voltage, current, power and energy.<br>Basics of electrical safety, Grounding and Earthing.                                                                                                                                                                                                                                                                                                                                                                        |                   |
|    | <b>Introduction to Semiconductor devices:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>(06 Hours)</b> |
|    | PN Junction Diode: Principle of operation, VI characteristics, Avalanche Breakdown.<br>Bipolar Junction Transistors: PNP and NPN transistors, Principle of operation, Current gain, Input and output characteristics of Common Emitter configuration.                                                                                                                                                                                                                                                                                                                                                                                                     |                   |





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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Zener diode as voltage regulator and Basics of PV cells and PV panels.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| <b>Electronic Instrumentation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>(05 Hours)</b> |
| 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.                                                                                                                                                                                                                                                                                                                                                           |                   |
| <b>MECHATRONICS AND ROBOTICS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>(04 Hours)</b> |
| Microprocessors and Microcontrollers: Architecture, programming, I/O, Computer interfacing, Programmable logic controller. Sensors and actuators, Piezoelectric accelerometer, Hall effect sensor, Optical Encoder, Resolver, Inductosyn, Pneumatic and Hydraulic actuators, stepper motor, Control Systems- Mathematical modeling of Physical systems, control signals, controllability and observability.<br>Robotics, Robot Classification, Robot Specification, notation; Direct and Inverse Kinematics; Homogeneous Coordinates and Arm Equation of four Axis SCARA Robot. |                   |
| <b>Few applications</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>(02 Hours)</b> |
| Block diagram of washing machine, microwave oven etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |
| <b>Practical will be based on the coverage of the above topics separately</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>(30 Hours)</b> |
| <b>(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |

|                      |                                                                                               |
|----------------------|-----------------------------------------------------------------------------------------------|
| <b>3. Practicals</b> |                                                                                               |
| 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                                                      |

|                             |                                                                                                                                        |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>4. Books Recommended</b> |                                                                                                                                        |
| 1                           | Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electrical Circuits, 7 <sup>th</sup> Edition, Tata Mc Graw Hill Publisher. |
| 2                           | Kothari and Nagrath, Basic Electrical Engineering, Tata McGraw Hill Education, 2 <sup>nd</sup> 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, 6 <sup>th</sup> Edition, Elsevier Publisher.                                  |





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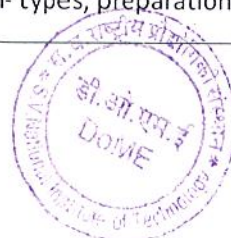
Department of Mechanical Engineering  
B.Tech. –I Mechanical Engineering (As per NEP)

**Department of Humanities and Social Sciences****ENGLISH & PROFESSIONAL COMMUNICATION**

|                                                                                        |        |   |   |   |        |
|----------------------------------------------------------------------------------------|--------|---|---|---|--------|
| B.Tech. I (DoME) Semester 2<br><br>ENGLISH AND PROFESSIONAL COMMUNICATION<br><br>HS110 | Scheme | L | T | P | Credit |
|                                                                                        |        | 3 | 1 | 0 | 04     |

|     |                                                                                                    |
|-----|----------------------------------------------------------------------------------------------------|
| 1.  | <b>Course Outcomes (COs):</b><br><br><b>At the end of the course, the students will be able to</b> |
| 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. | <b>Syllabus</b>                                                                                                                                                                                                                                                          |                   |
|    | <b>Communication</b>                                                                                                                                                                                                                                                     | <b>(05 Hours)</b> |
|    | Introduction to Communication, Different forms of Communication, Barriers to Communication and some remedies, Non-Verbal Communication – Types, Non-Verbal Communication in Intercultural Context.                                                                       |                   |
|    | <b>Vocabulary and usage of words</b>                                                                                                                                                                                                                                     | <b>(05 Hours)</b> |
|    | Common Errors, Synonyms, Antonyms, Homophones, and Homonyms; One Word Substitution; Misappropriations; Indianisms; Redundant Words.                                                                                                                                      |                   |
|    | <b>Language through literature</b>                                                                                                                                                                                                                                       | <b>(09 Hours)</b> |
|    | Selected short stories, essays, and poems to discuss nuances of English language.                                                                                                                                                                                        |                   |
|    | <b>Listening and Reading skills</b>                                                                                                                                                                                                                                      | <b>(06 Hours)</b> |
|    | Types of listening, Modes of Listening-Active and Passive, Listening and note taking practice, Practice and activities<br><b>Reading Comprehension (unseen passage- literary /scientific / technical)</b> Skimming and scanning, fact vs opinion, Comprehension practice |                   |
|    | <b>Speaking Skills</b>                                                                                                                                                                                                                                                   | <b>(10 Hours)</b> |
|    | Effective Speaking, JAM, Presentation Skills- types, preparation and practice. Interviews- types, preparation and mock interview; Group Discussion- types, preparation and practice                                                                                      |                   |



# Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat

Department of Mechanical Engineering  
B.Tech. –I Mechanical Engineering (As per NEP)

|  |                                                                                                                                                             |                   |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
|  | <b>Writing Skills</b>                                                                                                                                       | <b>(10 Hours)</b> |
|  | Prerequisites of effective writing, Memo-types, Letter Writing- types, Email etiquette and Netiquette, Résumé-types, Report Writing and its types, Editing. |                   |
|  | <b>Tutorials will be based on the coverage of the above topics separately</b>                                                                               | <b>(15 Hours)</b> |
|  | <b>(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)</b>                                                                                                 |                   |

|           |                                               |
|-----------|-----------------------------------------------|
| <b>3.</b> | <b>Tutorials</b>                              |
| 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                                           |

|           |                                                                                                                                                                                          |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>4.</b> | <b>REFERENCE BOOKS</b>                                                                                                                                                                   |
| 1         | Kumar, Sanjay and Pushp, Lata. <i>Communication Skills</i> , 2 <sup>nd</sup> Edition, OUP, New Delhi, 2015.                                                                              |
| 2         | Raman, Meenakshi & Sharma Sangeeta. <i>Technical Communication Principles and Practice</i> , 3 <sup>rd</sup> Edition, OUP, New Delhi, 2015.                                              |
| 3         | Raymond V. Lesikar and Marie E Flatley. <i>Basic Business Communication skills for Empowering the Internet generation</i> . 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.                                                                             |

