TEACHING & EVALUATION SCHEME.										
Discipline: Mechanical									**SEMESTER-III**	
Sl. No.	Subject	Teaching Scheme			Evaluation Scheme.					Total Marks.
		L	T	P	Theory			Practical		
	Theory				End	Internal Assignment		End	Sessional	
					Exam	Class Test	Assignment	Exam		
1	Engg.Material	4	1		80	15	5			100
2	Thermal Engg.I	4	1		80	15	5			100
3	Strength of Material.	4	1		80	15	5			100
4	Manf.Tech-I	4	1		80	15	5			100
5	Hyd. & Fluid Mechanics.	4	1		80	15	5			100
	Practical									
1	Mech.Engg.Lab-I.			6				50	50	100
2	Workshop Pr-II.			6				50	50	100
3	Tech.Seminar			2					50	50
	Total	20	5	14	400	75	25	100	150	750

ENGINEERING MATERIAL

Periods / Week : 4+1 Examination : 3Hrs
Total period : 60 End exams : 80 marks
I.A.: 20 marks

Topic wise distribution of periods

Sl.No.	Topic	Periods
1.	Material classification	03
2.	Imperfection in crystal	10
3.	Iron carbon system	10
4.	Heat treatment	10
5.	Nonferrous metals & alloys	10
6.	Bearing material	04
7.	Spring material	03
8.	Polymers	05
9.	Composites & Ceramic	05

RATIONALE:

Entire field of engineering deals with use of host of materials for making products for human consumption. These materials include wide spectrum of element, metals, alloys, Polymers, Ceramics and composites with diverse properties. It is imperative that an engineer from any field should have a good knowledge of such materials and their properties.

COURSE CONTENTS (In terms of specific objectives):

1.0 Material classification
- 1.1 Classify material into ferrous and non-ferrous metals and alloys.
- 1.2 Understand factors affecting the selection of materials for engineering Purposes such as
  - a) Properties of materials
  - b) Performance requirements
  - c) Materials reliability
  - d) Safety
  - e) Physical attributes
  - f) Environmental conditions
  - g) Availability
  - h) Disposability
  - i) Economic factors

2.0 Imperfection in crystals
- 2.1 Explain crystal, ideal crystal and crystal imperfection
- 2.2 Classify crystal imperfections or defects such as point defects, line defects, surface or gain boundary defects and volume defects

2.3 Explain types of point defects such as vacancies, interstitialies and impurities
2.4 Explain types of line defects such as dislocation and screw dislocation
2.5 State various causes of dislocation
2.6 Explain effect of imperfection on metal properties
2.7 Explain deformation by slip
2.8 Explain deformation by twinning
2.9 Explain property changes by deformation.

3.0 Iron carbon system
3.1 Understand basic concept of phase diagram cooling curves.
3.2 Explain the iron – carbon equilibrium diagram with salient micro constituents of iron and steel

4.0 Heat Treatment
4.1 Explain purpose of heat treatment
4.2 Describe processes of heat treatment and elaborate the methods of Annealing, normalizing, hardening, tempering, mar tempering, age hardening and surface hardening methods.
4.3 List effects of heat treatment on the properties of steel
4.4 Explain hardenability of steel

5.0 Non ferrous alloys
5.1 Describe composition, properties and the use of
5.1.1 Aluminum alloys such as duralumin, y-alloy
5.1.2 Copper alloys such as
5.1.2.1 Copper-aluminum (the aluminum bronzes)
5.1.2.2 Copper-tin-antimony (Babbit metal)
5.1.2.3 Copper-tin (tin bronzes)
5.1.2.4 Copper-tin-phosphorous (phosphor bronzes)
5.1.2.5 Copper-zinc (brass)
5.1.2.6 Copper-nickel (the cupro-nickels)
5.1.3 Predominating elements of lead alloys
5.1.4 Predominating elements of zinc alloys
5.1.5 Predominating elements of nickel alloys
5.2 Name the alloys for high temperature services & metals for nuclear Power Plants.

6.0 Bearing Material
6.1 Classify bearing metals
6.2 Describe composition, properties and use of copper-base bearing metal, tin-base bearing metal, lead-base bearing metal and cadmium-base bearing metal

7.0 Spring Material

7.1 List types and properties of iron-base spring material

7.2 List types and properties of copper-base spring material

8.0 Polymers

8.1 List properties and application of thermo-plastic and Thermo setting plastics

8.2 List properties of elastomers

9.0 Composites and ceramics

9.1 Classify composite materials

9.2 Explain particle-reinforced & fiber reinforced composites and their properties

9.3 Classify and state application of ceramics

RECOMMENDED BOOKS

Text Books.

1. Material Science & Processes by S.K.Hazra Choudhury
2. Introduction to Engineering Materials by Chinmaya Mohapatra, JJPP.

Reference Books.

3. A textbook of material science and metallurgy by O.P.Khanna
4. A textbook of material science by G.B.S.Narang
5. Engineering materials and metallurgy by R. K. Rajput
6. Science of Engineering Materials by Srivastav and Srinivasan
7. Materials Science by P.K.Palanisamy.

Thermal Engineering - I

Periods / Week: 4+1
Total period : 60

Examination : 3Hrs
End exams: 80 marks
I.A. : 20 marks

Topic wise distribution of periods

Sl.No.	Topic	Periods
1.	Thermodynamic Concepts and Properties	08
2.	Laws of thermodynamics	10
3.	Properties & Process of ideal gas	08
4.	Heat transfer	06
5.	Internal Combustion engine	14
6.	Air Compressor	06
7.	Fuel and Combustion	08
	Total Periods	60

RATIONALE:

Thermal Engineering is the field of Applied Science which deals with energy possessed by heated gases and vapors and the Laws which govern the conversion of this energy into mechanical energy and vice versa. It is of paramount importance to an engineer to know the basic principles by which heat energy can be converted into mechanical energy. Understanding the working principles and features of various machines and plants in which either such heated gas/vapours are produced or conversion of heat to mechanical energy take place as of great importance.

COURSE CONTENT:

1.0 Thermodynamic concepts and properties
- 1.1 Define energy
- 1.2 Describe the sources of energy
  - 1.2.1 Conventional energy (thermal, mechanical)
  - 1.2.2 Non Conventional energy
- 1.3 Explain various thermodynamic systems
  - 1.3.1 Closed system
  - 1.3.2 Open system
  - 1.3.3 Isolated system
  - 1.3.4 Explain thermodynamic equilibrium condition
  - 1.3.5 Explain quasistatic process
  - 1.3.6 Define thermodynamic properties, process and cycle
- 1.4 Classify thermodynamic properties. (intensive, extensive)
- 1.5 Explain point function & path function

1.6 Define thermodynamic properties (Pressure, Volume, Temperature, Internal energy, Enthalpy)

1.7 Define heat, work and state their units

1.8 Explain mechanical equivalent of heat

1.9 Derive pdv work transfer on P-V diagram

1.10 Explain specific heat of gas

1.10.1 Specific heat at const. vol (Cv)

1.10.2 Specific heat at const. pr. (Cp)

1.11 Derive relationship between Cp and Cv

2.0 Laws of thermodynamics.

2.1 State and explain Zeroth law of thermodynamics

2.2 State and explain first law of thermodynamics

2.3 Explain the application of first law of thermodynamics to non-flow process and solve simple problems on:

2.3.1 Const. pr. Process

2.3.2 Const. Vol. Process

2.3.3 Adiabatic Process

2.3.4 Isothermal Process

2.4 Application of first law of thermodynamics to steady flow process and general energy equation applied to condenser, nozzle, and turbine.

2.5 Explain the limitation of first law of thermodynamics.

2.6 State and explain second law of thermodynamics

2.6.1 Define heat engine, efficiency heat pump, refrigerator & COP

2.6.2 State Kelvin-Planks statement

2.6.3 State Clausius statement

2.6.4 Show equivalence of two statements

2.7 Explain reversible and irreversible process and highlight causes of irreversibility

2.8 State Clausius inequality

2.9 Define entropy

2.10 Explain principle of increase of entropy

3.0 Properties, processes of ideal gas:

3.1 Explain difference between ideal gas and vapour

3.2 Explain difference between gas and vapour

3.3 State Boyl's law, Charle's law, guy lussac law and combination gas equation (with problems)

3.4 Derive and explain characteristic gas constant. Universal gas constant (with problems)

3.5 Explain various non-flow thermodynamic processes and solve problems on

3.5.1 Isothermal process

3.5.2 Isobaric process

3.5.3 Isochoric process
3.5.4 Isentropic process
3.5.6 Polytropic process
3.6 Explain free-expansion & throttling process

4.0 Heat transfer
4.1 Introduction
4.2 Basic idea on modes of heat transfer (No mathematical treatment)
4.2.1 Conduction
4.2.2 Convection
4.2.3 Radiation
4.3 Define and explain the basic concept of Fourier's law and thermal Conductivity
4.4 Explain the heat exchanger
4.5 Explain the free, forced heat convection
4.6 Describe the properties of heat radiation (no mathematical derivation)
4.6.1 Kirchoff law
4.6.2 Stefan Boltzman law

5.0 Internal Combustion engine
5.1 Explain Air standard cycle
5.1.1 Otto Cycle
5.1.2 Diesel Cycle
5.1.3 Dual _ Combustion Cycle
5.2 Derive the air standard efficiency of above cycles, solve simple Problem
5.3 Explain and classify IC engine
5.4 Identify various IC engine parts and their functions
5.5 Explain the terminology of I.C. Engine Such as bore, dead centers, stroke volume, piston speed and RPM.
5.6 Explain the working principle of 2-stroke, 4-stroke C.I. and S.I. engine with valve timing diagram
5.7 Differentiate between 2-stroke, 4-stroke engine, S.I. and C.I. engine
5.8 Explain the performance testing of I.C. engine
5.8.1 Describe the determination of I.H.P., B.H.P and F.H.P, Mechanical efficiency, indicated thermal efficiency brake thermal efficiency, specific fuel combustion
5.8.2 Draw heat balance sheet

6.0 Air Compressor
6.1 Explain the function of compressor and industrial use of compressed air
6.2 Classify air compressor and principle of operation
6.3 Describe the parts and working principle of Reciprocating air compressor
6.4 Explain the terminology of Reciprocating compressor such as bore, stroke, pressure ratio, free-air delivered and volumetric efficiency

6.5 Derive the work done of single stage and two stage compressor with and without clearance

6.6 Derive the volumetric efficiency of reciprocating compressor, and solve related simple problem

7.0 Fuel and Combustion

7.1 Define Fuel

7.2 Types of Fuel

7.2.1 Solid

7.2.2 Liquid

7.2.3 Gaseous

7.3 Application of different types of fuel

7.4 Define Calorific value of fuels

7.5 Calculate minimum air requirement for the complete combustion of unit mass / unit volume of fuel

7.6 Conversion of volumetric analysis to gravimetric analysis & vice-versa

7.7 Describe Orsat apparatus

7.8 Application of Orsat apparatus

Recommended Book:

Text Books.

1. Thermal Engineering by A.R.Basu
2. Thermal Engineering by R. S. Khurmi, S.Chand & Co.ltd.
3. Thermal Engineering by A.S. Sarao

Reference Books.

4. Engineering Thermodynamics by P.K.Nag
5. Thermal Engineering by P.L. Ballaney

STRENGTH OF MATERIALS

Periods / Week : 4+1
Total period : 60

Examination : 3Hrs
End exams TH: 80 marks
I.A. : 20 marks

Topic wise distribution of periods

Sl. No.	Topic	Periods
1.	Simple stress and strain	06
2.	Two dimensional Stress system	06
3.	Stress in composite section	06
4.	Thin cylindrical and spherical shells	06
5.	Bending moments and shear force	08
6.	Theory of simple bending	08
7.	Combined axial and bending stress	08
8.	Torsion	07
9.	Testing of materials	05
	Total	60

RATIONALE:

Strength of Materials deals with the internal behavior of solid bodies under the action of external forces. The subject focuses on mechanical properties of material, analysis of stress, strain and deformations. Therefore, it is an important basic subject for students for mechanical and automobile engineering.

COURSE CONTENTS (in terms of specific objectives):

1.0 Simple stress and strain
- 1.1 Explain types of loads, stresses, strain, elastic constants, Poisson's ratio
- 1.2 Establish the relation Between three elastic constants (E, G, K)

2.0 Two dimensional stress systems
- 2.1 Determine normal stress, shear stress and resultant stress on oblique plane
- 2.2 Define principal plane
- 2.3 Define principal stress
- 2.4 Determine principal plane, principle stress analytically
- 2.5 Determine principal stresses from Mohr's circle.

3.0 Axially loaded members(Stress in composite section)
- 3.1 Determine stresses in composite bar
- 3.2 Define temperature stress
- 3.3 Determine temperature stress in composite bar (single core only)
- 3.4 Define strain energy and resilience

8.0 Torsion

- 8.1 Define torsion
- 8.2 State the assumption of pure torsion
- 8.3 Derive the relation $T/Ip = fs/r = C\theta/L$
- 8.4 Differentiate between the strength of hollow and solid shaft
- 8.5 Solve simple problem on above

9.0 Testing of material

- 9.1 Destructive Testing
  - 9.1.1 Tensile testing
  - 9.1.2 Hardness testing
  - 9.1.3 Torsion testing
  - 9.1.4 Creep and fatigue testing
  - 9.1.5 Impact testing

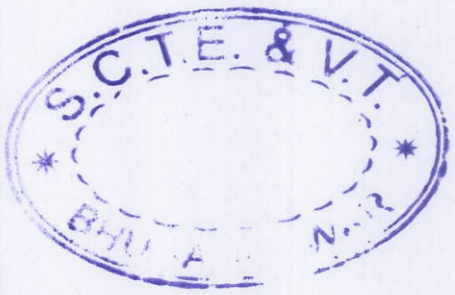
RECOMMENDED BOOKS:

Text Books.

1. Strength of material by S. Ramamrutham, Dhanpat Rai Pub.Co.
2. Strength of Material by R. S. Khurmi

Reference Books.

3. Strength of material by I.B Prasad.
4. Element of strength of Materials by S.P.Timoshenko and D.H. Young, Affiliated East West Press Private Ltd. .
5. Theory and problems of Strength of materials by W.A.Nash, Shaum's Outline Series, Mc Graw Hill Inc.
6. Mechanical testing of materials (Theory and Practice) : C. Mohapatra
7. Strength of Materials by Sadhu Singh, Khanna Publishers, New Delhi.
8. Engineering Mechanics of solids by Egor P.Popor, Prentice Hall Private Ltd., New Delhi.
9. Strength of Material, Dongre, SCITECH.



MANUFACTURING TECHNOLOGY - I

Periods / Week : 4+1
Total period : 60

Examination : 3Hrs
End exams TH : 80 marks
I.A. : 20 marks

Topic wise distribution of periods

Sl.No.	Topic	Periods
1.	Forging	08
2.	Metal forming	10
3.	Foundry	16
4.	Welding	15
5.	Soldering & brazing	05
6.	Sheet metal works	06
	Total	60

RATIONALE:

Engineering basically means production of goods and services for human consumption. The major function of mechanical engineering is to manufacture various products using machineries, production processes and production management techniques. Therefore, this is one of the important subjects to be learned by a mechanical and automobile engineer.

COURSE CONTENTS (in terms of specific objectives):

1.0 Forging
- 1.1 Describe open and closed hearth heating furnaces.
- 1.2 Explain different forging hand tools with size, specification and uses
- 1.3 Describe various forging process such as hand forging, machine forging, drop forging, stamping, bending.

2.0 Metal Forming.
- 2.1 Explain fundamentals of rolling & extrusion
- 2.2 Describe various rolling process and specify the field application with limitation.
- 2.3 Describe different types of extrusion process such as direct, indirect and impact extrusions with field of application

3.0 Foundry
- 3.1 Describe various foundry tools and their uses.
- 3.2 Describe construction of core and core boxes.
- 3.3 Classify different types of pattern and state various pattern allowances.
- 3.4 Describe different methods of moulding and core making.
- 3.5 Explain different types of moulding sands with their composition and properties and specify different binding material.

3.6 Describe construction and working of cupola furnace and induction furnace.
3.7 Describe construction and working of furnaces such as crucible and pit furnace.
3.8 Explain different methods of pouring with pouring equipment such as ladle and lifting tackles.
3.9 List various casting defects with their causes and remedies.

4.0 Welding
4.1 Define welding, classify various welding processes and explain fluxes in welding.
4.2 Describe oxy acetylene welding process with equipments required
4.3 Explain various types of flames, their adjustments and precautions in flame cutting
4.4 Specify arc welding electrodes
4.5 Explain welding current and voltage rating
4.6 Describe arc welding equipments such as welding transformer and welding generator set
4.7 Classify resistance welding process
4.8 Describe various resistance welding process such as butt welding, spot welding, flash welding, projection welding and seam welding
4.9 List various safety measures to be taken in welding
4.10 State different welding defects with causes and remedies
4.11 Explain TIG and MIG welding process and elaborate their specific field of application

5.0 Soldering and Brazing:
5.1 Define soldering.
5.2 Classify solders.
5.3 Explain different procedure of soldering.
5.4 Define brazing
5.5 State different filler materials.
5.6 Explain different procedure of brazing.

6.0 Sheet Metal Works
6.1 Describe different metals used in a sheet metal works with their engineering application.
6.2 Describe various sheet operations in sheet metal working like Bending, Drawing, Spinning.
6.3 State different types of joints and allowances.
6.4 Describe press works like Blanking, Piercing, Trimming.

RECOMMENDED BOOKS:

Text Books.

1. Workshop Technology (Part-1) by Hazra Choudhury, Media Promoters and Publications Pvt.Ltd.

Hydraulics & Fluid mechanics

Periods / Week: 4+1
Total periods : 60

Exam : 3hr
End exams : 80 marks
IA : 20 marks
Total 100 marks

Topic wise distribution of periods

Sl. no	Topic	Periods
01	properties of fluids	8
02	flotation & buoyancy	8
03	Hydrostatic pressure	8
04	Types of flow	4
05	Bernoulli's equation & its application	8
06	flow through orifices & notches	8
07	flow through pipes	8
08	Impact of jet	8
	TOTAL	60 Periods

RATIONALE:

Use of fluids in various engineering field is of great importance. It is therefore necessary to study the physical properties & characteristics and governing principles of fluids which have very important use & application in mechanical & automobile engineering.

1.0 Properties of a fluid

1.1 Define a fluid

1.2 Classify fluid

1.3 Define various fluid properties such as density, specific weight, specific gravity, viscosity & surface tension & state the units

1.4 Define fluid pressure

1.5 Classify fluid pressure

1.6 Explain working of various measuring devices for pressure

1.7 Solve numerical problem involving the principle of manometers of simple, differential & inverted types

2.0 Floatation and Buoyancy.

2.1 Floatation: its meaning

2.2 Archimedes' principles

2.3 Buoyancy & Centre of Buoyancy

2.4 Tilting of a floating body in a liquid through slight angular displacement

2.5 Metacentre & metacentric height

2.6 Analytical determination of metacentric height.

3.0 Hydrostatic pressure

3.1 Meaning of hydrostatic pressure