SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

Mechanical Engineering Department

Semester/Year		III/II	Program		B.Tech.
Subject Category	**DC**	Subject Code:	**ME-301**	Subject Name:	**Fundamentals of Thermodynamics**

	Maximum Marks Allotted						Contact Hours			Total Credits
	Theory			Practical		Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work		L	T	P	
60	20	10	10	-	-	100	3	1	0	4

Prerequisites:(Only for open electives)

Course Objective:

. The objective of this subject is toprovidesunderstanding of basics of thermal engineering and the relationships of the properties of substances for their use in determining the changes of properties in physical processes performed by the substances.

Course Outcomes:

After completion of the course, students would be able to -

1. Understand the basic concept and fundamental laws of thermodynamics
2. Apply knowledge to identify applications on Heat Engines, Refrigerator and Heat Pump based on Carnot Cycle
3. Analyse thebehaviour of an ideal gas and real gas
4. Evaluate the phase transformation and properties ofpure substances.
5. Analysethe thermodynamics relations

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3					1						1
CO2	3	2	2				1					

CO3	3	3	3	2								
CO4	3	3	3	3		1						
CO5	3	2				1	2					1

Contents:

UNITs	Descriptions	Hrs.	CO's
I	Basic Concepts: Thermodynamic, Property, Equilibrium, State, Process, Cycle, Zeroth Law of thermodynamics, statement and significance, Heat and work transfer, First law of thermodynamics: statement of first law of thermodynamics, first law applied to closed system, first law applied to a closed system undergoing a cycle, processes analysis of closed system, flow process, flow energy, steady flow process, relations for flow processes, and limitations of first law of thermodynamics.	8	1
II	Second law of thermodynamics: Heat engine, heat reservoir, refrigerator, heat pump, COP, EPR, Available energy, Carnot's theorem, Carnot's cycle, efficiency of Carnot's cycle, statement of second law reversible and irreversible processes, consequence of second law, Entropy: Entropy change for ideal gas, T-S diagrams, Availability and Irreversibility.	8	2
III	Concept of an ideal gas: Gas laws, Avogadro's hypothesis, Real Gas, Deviation with ideal gas, Vander-wall's equation, evaluation of its constants, limitations of the equation. The law of corresponding states compressibility factor, generalized compressibility chart, P-V-T surface of a real gas, Non-reactive gas mixture, PVT relationship, mixture of ideal gases, properties of mixture of ideal gases, internal energy, enthalpy and specific heat of gas mixtures, enthalpy of gas mixtures.	8	3
IV	Pure substances: Phase, Phase- transformations, formation of steam, properties of steam, PVT surface, HS,TS,PV,PH,TV diagram, processes of vapor measurement of dryness fraction, use of steam table and mollier chart.	8	4
V	Thermodynamics Relations: Gibb's function, Helmholtz function, Maxwell relations, and their applications. TdS equations. Relationship between specific heats, Clapeyron equations, Joule-Thomson coefficient, Coefficient of volume expansion, adiabatic and isothermal compressibility.	8	5
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

Text Books-

1. R. K. Rajput, Engineering Thermodynamics, LP
2. Sonntag, Fundamentals of Thermodynamics, Wiley
3. Moran, Shapiro, Principles of Engineering Thermodynamics, Wiley

Reference Books-

1. P. K. Nag; Engineering Thermodynamics, McGraw Hills
2. CengelY;Thermodynamics: An Engineering Approach; McGraw Hills
3. Arora CP Thermodynamics, McGraw Hills

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. Subjects where laboratory work is prescribed, the practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1.Dr.Mangal Singh Lodhi Name 2:Dr G Deshmukh
Checked and approved by	Name 1. Dr Sanjay Katarey

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

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Mechanical Engineering Department

Semester/Year		III / II	Program		B.Tech.
Subject Category	**DC**	Subject Code:	**ME-302**	Subject Name:	**Strength & Mechanics of Material**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End-Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:(Only for open electives)

Course Objective:

To give an ability to apply the knowledge of strength of materials on engineering applications and design problems

Course Outcomes:

After completion of the course, students would be able to -

1.Identity the theory of elasticity including strain/displacement and Hooke’s law relationship

2.Compute solid mechanics problems using classical methods and energy methods.

3.Detecttheories of elastic failures &analyze the stress and strain through Mohr's circle.

4.Determinethe stresses and deflections of beams under unsymmetrical loading.

5.Analyze torsion problems in bars and thin walled members.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1								
CO2	3	2	3	2								
CO3	3	2	2	2								
CO4	3	2	2	2								
CO5	3	2	2	2								

Contents:

UNITs	Descriptions	Hrs.	CO's
I	**Stress and Strain:** Elementary definition of stress and strain, stress- strain relationship, elastic, plastic and visco-elastic behavior of common materials in tension and compression test, stress-strain curves, Hooke's law, Poisson's ratio, elastic constants and their relations for an isotropic hookean material, anisotropic and orthotropic materials. Tension, compression, shearing stress and strain, thermal stresses, composite bars, equations of static equilibrium, concept of free body diagram, Strain energy due to axial loading.	8	CO1
II	**Members Subjected to Flexural Loads:** Theory of simple bending, bending moment and shear force diagrams for different types of static loading and support conditions on beams, Bending stresses, section modulus and transverse shear stress distribution in circular, hollow circular, I, Box, T, angle sections etc. Strain energy due to bending.	8	CO2
III	**Principal Planes, Stresses and Strains:** Members subjected to combined axial, bending and torsional loads, maximum normal and shear stresses, concept of equivalent bending and equivalent twisting moments, Mohr's circle of stress and strain. **Theories of Elastic Failures:** The necessity for a theory, different theories, significance and comparison, applications.	8	CO3
IV	**Torsion:** Torsional shear stress in solid, hollow and stepped circular shafts, angular deflection and power transmission capacity. Strain energy due to torsional loads, **Stability of Equilibrium:** Instability and elastic stability, long and short columns, ideal strut, Euler's formula for crippling load for columns of different ends, concept of equivalent length, eccentric loading, Rankine formulae and other empirical relations.	8	CO4

V	**Transverse Deflection of Beams:** Relation between deflection, bending moment, shear force and load, transverse deflection of beams and shaft under static loading, area moment method, direct integration method. **Thin-walled Pressure Vessels:** Stresses in cylindrical and spherical vessels	8	CO5
Guest Lectures (if any)			
Total Hours		**40**	

Suggestive list of experiments:

1. To find Modulus of Elasticity 'E' of Mild Steel and Wood by Deflection method.
2. To find Modulus of Rigidity 'N' of Mild Steel by Barton's vertical torsion apparatus.
3. To find Modulus of Rigidity 'N' of spring material by Spring test apparatus.
4. To verify Shear Force at a given section of a Simply Supported Beam.
5. To verify Bending Moment at a given section of a Simply Supported Beam.
6. To verify Maxwell's Theorem of Reciprocal Deflection.
7. To perform Tensile Test on M.S. and C.I. specimen and draw stress strain curve.
8. To perform Compression test on Teak and Jungle wood and R.C.C. C.I. cubes and compare their results.
9. To determine Ultimate Shear Strength of M.S., C.I. and Brass.
10. To determine Modulus of Rupture of Teak and Sal wood beam by FlexureTest

Text Books-

1. R. K.Bansal, "A Textbook of Strength of Materials Laxmi Publications.
2. Dr. Sadhu Singh,A Textbook of Strength of Materials, Khanna Publications

Reference Books-

1. Timoshenko, S.P., and Gere, J.M., "Mechanics of Materials", 2nd Ed., CBS Publishers
2. Crandall, S.H., Dahl, N.C., and Lardner, T.J., "An Introduction to the Mechanics of Solids", Tata McGraw-Hill
3. Pytel and Kiusalaas, "Mechanics of Materials" Cengage Learning
4. Punmia, Jain and Jain, "Mechanics of Materials", Laxmi Publication
5. Popov, E.P., Nagarajan, S., and Lu, Z. A., "Mechanics of Materials", 2ndEd., Prentice-Hall of India

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester –

End examination as per the norms of AICTE.	
Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name **1. Dr.GauravBajpai**
Checked and approved by	Name 1.Dr Pradeep Singh

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Mechanical Engineering Department

Semester/Year		III / II	Program		B.Tech.
Subject Category	**DC**	Subject Code:	**ME-303**	Subject Name:	**Machine Drawing and Design**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:(Only for open electives)

Course Objective:

Objective of this course is to give students basic understanding and conceptual knowledge of machine drawing and design.

Course Outcomes:

After completion of the course, students would be able to -

1. Illustrate various design consideration for machine component design
2. Judge failure modes and compute factor of safety
3. Design various joints subjected to static load indifferent working conditions
4. Analyse suitability of various joints
5. understand the concept of geometric modeling

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1								
CO2	3	2	3	1								
CO3	3	3	3	1								

CO4	2	2	3	1								
CO5	2	3	2	1	2							

Contents:

UNITs	Descriptions	Hrs.	CO's
I	Basic Design concepts, design process, stages/phases in design, design considerations (strengths manufacturing, maintenance, environment, economics and safety): design for recycle and reuse, Design and safety factors for steady and variable loads, impact and fatigue considerations, Surface Finish, limits, fits and tolerance.	8	CO1 & CO2
II	Threaded Joints: Thread Nomenclature, Forms of Screw Threads, Designation of Indian Standard Thread, Designation of Bolts, Screws and Nuts, Common Screw Fasteners, representation of internal thread and external threads, Bolts Supporting Tensile Loads Only, static Stress in Screw Fastening, Eccentric Loading of Threaded Joints.	8	CO3 & CO4
III	Welded Joints**:** Representation of welds, strength of Welded Steel Joints, Design of Welded Joints for Static Loads, Strengths of Welds at Varying Loads, Initial Stress, Exercises Eccentric Loading of welded Joints.	8	CO3 & CO4
IV	Design of Cotter Joint and knuckle joint. Design of Keys and Coupling	8	CO3 & CO4
V	Basic fundamentals of CAD and Application of computer for design, CAD data exchange, Graphics standards, modes of graphics operation, Geometric Modeling. Types of mathematical representation of curves, parametric representation wire frame modeling	8	CO5
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

1. Prepare Orthographic views of given object
2. Prepare Isometric view of given object
3. Convert isometric view in orthographic views and vice versa
4. CAD initial setting commands-Snap, grid, Ortho, Osnap. Limits. Units, Object tracking. Opening, saving and closing a new and existing drawing/template
5. Identify various tools/commands for sketching.
6. Prepare 2D CAD drawing of given object
7. Identify various tools/commands for solid modelling
8. Prepare 3D parts of flange coupling
9. Prepare assembly of flange coupling

10. Prepare assembly of cotter joint
11. Prepare assembly of knuckle joint

Text Books-

1. Design of machine elements by V B. Bhandari Tata McGraw-Hill Education
2. Mechanical Engineering Design by Joseph Edward'Shigley, McGraw-Hill
3. Machine Design by Robqrt. L., Norton
4. Design of Machine Elements: Volurrte, I by T. KrishñaRao, IK International
5. Machine Drawing by N. D. Bhatt.
6. CAD/CAM: Computer-Aided Design and ManufacturingGrooverPearson Education India

Reference Books-

1. Mechanical Design of Machine Elements and Machines by Jack A.Collins, Henry Busby, George Staab, Wiley
2. Machine Design by P.C. Sharma and D. K. Agarwal, S.K.Kataria& Sons.
3. Principles of Computer Graphics William M Neumann and Robert F.Sproul McGraw Hill Book Co. Singapore

Modes of Evaluation and Rubric

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Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1. Dr. Chandra Pal Singh
Checked and approved by	Name 1. Prof Sandeep Jain

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Mechanical Engineering Department

Semester/Year		III / II	Program		B.Tech.
Subject Category	**DC**	Subject Code:	**ME-304**	Subject Name:	**Materials Science**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:(Only for open electives)

Course Objective:

To provide an ability to apply the knowledge and distinguish between a variety of materials based on their structure and properties in engineering applications

Course Outcomes:

After completion of the course, students would be able to -

1. IdentifyMicro structural arrangements, phases, properties and defects of engineering materials
2. Infer the Phase Diagram of Materials
3. Comparevarious heat treatment processes.
4. EvaluateDestructive and non-destructive testing methods
5. Analyze various properties of Polymers & ceramics material

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1								
CO2	3	3	1	1								
CO3	3	2	2	2								

CO4	3	2	2	2								
CO5	3	2	1	1								

Contents:

UNITs	Descriptions	Hrs.	CO's
I	Introduction of materials, Classification of materials, Engineering requirements of material, Solidification of metals, Crystallization, Crystal and amorphous, different types of bonds in different metals, Crystallography, Different mechanical properties of metals and other engineering materials like strength, hardness, elasticity, plasticity, Malleability, Ductility, Creep, Fatigue etc. Point and line defects in crystal, their relation to mechanical properties, Crystallographic directions and planes, deformation of metal by slip and twinning, Strengthening mechanism in metals, Hall-Petch effect.	**8**	CO1
II	Stability and metastability of metals, Cooling curves, Isomorphous, Utectic, Eutectoid , Eutectoid solid solution, Peritectic and other phase diagrams, Alloying , Characteristics of alloying elements, Iron-Carbon phase diagram, T-T-T diagrams, Types of Cast Iron. Types of Stainless Steels, Elastic, inelastic and Viscoelastic behaviour	**8**	CO2
III	Heat treatment of metals, Based on phase diagram and T-T-T-Diagram the heat treatment of various metals, Bulk heat treatments, surface heat treatments, Case carburizing, Types of Annealing, normalizing, Spherodising, Phase Transformations like Pearlite, Cementite, Austenite, Troostite, Bainite,Hard and soft Martensite etc. Laser hardening, Cyaniding, Boriding, Nitriding, Flame hardening, Ion implantation, etc. Heat treatment cycles	**8**	CO3
IV	Destructive and non-destructive testing methods, Tensile test, Compression test, shear test, bend test, Different types of Hardness tests, Impact tests, Fatigue tests, Hardenability test, Fracture analysis, NDT Methods. Different properties of Steels, Aluminum and it's alloys, Copper and it's alloys, Manganese and it's alloys, Chromium and it's alloys, Nickel and it's alloys.	**8**	CO4
V	Non-Metallic Materials- Polymers – types of polymer, commodity and engineering polymers -Properties and applications, Composites Materials, Solid solutions - Substitutional and interstitial. Ferrous and Non Ferrous Metals- Effect of alloying additions on steel (Mn, Si, Cr, Mo, V, Ti & W) - stainless and tool steels – HSLA steel.	**8**	CO5
Guest Lectures (if any)			
Total Hours		**40**	

Suggestive list of experiments:

Text Books-

1. Material Science and Engineering An Introduction, William D.Callister, John Wiley and Sons, 2003
2. Material Science, Raghvan V., Prentice Hall India, 2012

Reference Books-

1. Principles of Material Science and Engineering, William F.Smith, Tata McGraw-Hill Publications.
2. Engineering Physical Metallurgy, Lakhtin Y., Mir Publisher.
3. Introduction to Engineering materials Tata McGraw-Hill Publications.
4. Engineering materials properties and selection Budinski and Budinski, PHI

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1. **Dr.GauravBajpai**
Checked and approved by	Name 1.Dr PankajAgrawal