



Lok Jagruti Kendra University
University with a Difference

Diploma in Automobile Engineering



Course Code: 025010203

**Engineering Materials and
Mechanics of Solids**

Programme / Branch Name			Diploma in Automobile Engineering			
Course Name	Engineering Materials and Mechanics of Solids				Course Code	025010203
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
 ESC: Engineering Science Courses PCC: Program Core Courses
 OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week					Evaluation Scheme				
L	T	P	Total Teaching Hours	Total Credit	CA	CCE	SEE (TH)	SEE (PR)	Total
4	0	0	4	4	10	40	50	-	100

Legends: L: Lectures T: Tutorial P: Practical
 CA: Continuous Assessment (Attendance + Activity)
 CCE: Continuous & Comprehensive Evaluation
 SEE (Th): Semester End Evaluation (Theory)
 SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisite

- ✓ Physics and Mathematics (Pre-university level)

3. Rationale

Engineers need to be updated with the latest materials to meet the challenges of developing cost-effective technologies. This subject, therefore, highlights advance in engineering materials, also this subject is conceptual applications of principles of mechanics of rigid and deformable bodies in Engineering.

4. Objectives

- ✓ To develop the knowledge of the structure of materials including crystallography, microstructure, defects and phase diagrams.
- ✓ To provide an understanding to students on the correlation between structure, processing, mechanical properties and performance of materials.
- ✓ To develop the knowledge on mechanical properties of materials and strengthening mechanism.
- ✓ Study about stresses, strains and deformation of various simple mechanical components under load.
- ✓ To study theories of failure and the criteria for failure.

5. Contents

Unit No.	Unit Name	Topics	Learning Outcome	% Weightage	Hours
1.	Engineering Metals and Alloys	1.1. Introduction to Metals and Alloys 1.2. Classification and Selection of Materials 1.3. Mechanical, Thermal & Physical Properties of Materials 1.4. Ferrous Metals and Alloys: Classification, Composition, Properties & Uses of Alloy Steel Iron-Carbon Diagram 1.5. Non-Ferrous Metals and Alloys: Classification, Composition, Properties and Uses of Aluminum and Magnesium Alloys	<ul style="list-style-type: none"> Evaluate Properties of Alloying Elements. Identify Properties and Application of Ferrous & Non-Ferrous Metals. 	15	9
2.	Heat Treatment Process	2.1. Theory of Heat Treatment 2.2. Purpose of Heat Treatment 2.3. Principle of Heat Treatment 2.4. Heat Treatment Process: Annealing, Normalizing, Tempering, Hardening, Induction Hardening, Case Hardening Carburizing, Nitriding	<ul style="list-style-type: none"> Explain Concepts of Heat Treatment Process. Application of Suitable Heat Treatment Process Based on Material Properties. 	25	14
3.	Fundamentals of Engineering Mechanics	3.1. Composition and Resolution of Forces: Characteristics of Force, System of Forces, Resultant Force and Methods. 3.2. Simple Stress and Strain: Classification of Loads, Terminologies related to Stress and Strain, Hooke's Law	<ul style="list-style-type: none"> Compute Various Forces, Stress and Strain. 	15	9

4.	Shear Force and Bending Moment	<p>4.1. Introduction to: Types of Beams, Loads & Supports, Shear Force & Bending Moment, Relation Between S.F and B.M</p> <p>4.2. Simply Supported Beam: Simply Supported Beam with a Point Load, Simply Supported Beam with Uniformly Distributed Load & Uniformly Varying Load</p> <p>4.3. Cantilever Beam: Cantilever Beam with a Point Load, Cantilever Beam with Uniformly Distributed Load & Uniformly Varying Load</p>	<ul style="list-style-type: none"> • Understand Shear Force and Bending Moment Diagrams for Various Beams. • Compute Bending Stress, and Shear Stress at Various Points in Beams. 	25	13
5.	Centre of Gravity and Moment of Inertia	<p>5.1. Centre of Gravity: Centroid and Centre of Gravity, Centre of Gravity by Geometrical Considerations</p> <p>5.2. Moment of Inertia: Moment of Inertia of Plane Area, Theorem of Parallel Axis, Radius of Gyration, Moment of Inertia of Symmetric and Composite Section</p>	<ul style="list-style-type: none"> • Evaluate Centre of Gravity and Moment of Inertia of Various Structures. 	20	11

**Total
Hours**

56

6. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	App %	C %	E %	An %
1.	Engineering Metals and Alloys	30	40	10	00	10	10
2.	Heat Treatment Process	25	50	25	00	00	00
3.	Fundamentals of Engineering Mechanics	30	50	10	00	00	10
4.	Shear Force and Bending Moment	20	20	30	00	10	20
5.	Centre of Gravity and Moment of Inertia	20	40	20	00	10	10

Legends: R: Remembering U: Understanding
 App: Applying C: Creating
 E: Evaluating An: Analyzing

7. Textbooks

- 1) Material Science and Engineering by R.K.Rajput, Ketson Books.
- 2) Strength of Materials by R.S.Khurmi, S.Chand Publication.

8. Reference Books

- 1) A Text Book on Production Technology Vol.1 by O.P.Khanna, Dhanpat Rai Publication
- 2) Strength of Materials by R.K.Rajput, S.Chand Publication
- 3) Strength of Materials by S.Ramamrutham, Dhanpat Rai Publication
- 4) Materials Science and Metallurgy by K. I. Parashivamurthy, Pearson Education
- 5) Mechanics of Materials by R.C. Hibbler, Pearson
- 6) An Introduction to Mechanics of Solids by S.H.Crandall, Tata McGraw Hill
- 7) Material Science by G.Rangarajan, Tata McGraw Hill
- 8) Engineering Materials: Properties and Selection by Budinski, Pearson

9. Open Sources (Website, Video, Movie)

- 1) <https://www.youtube.com/c/TheAutomotives>
- 2) <https://www.youtube.com/channel/UC4la8Cf7-DxaxsfMhaWpHiQ>
- 3) <https://theautomobileengineers.blogspot.com/>
- 4) <http://nptel.ac.in/>
- 5) <https://www.youtube.com/c/LearnEngineering>
- 6) <http://www.learnerstv.com/>
- 7) <http://auto.howstuffworks.com/>