

**NATIONAL INSTITUTE OF TECHNOLOGY, HAMIRPUR (HP) – 177 005**

**B.Tech. Mechanical Engineering, First Year [2<sup>nd</sup> Semester]**

<b>Sr. No.</b>	<b>Course No.</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Hours</b>	<b>Credits</b>
1.	[AP-101]	Engineering Physics	3	1	0	4	4
2.	[AM-121]	Engineering Mathematics – II	3	1	0	4	4
3.	[ME-102]	Engineering Mechanics & Strength of Materials	4	2	0	6	5
4.	[EE-101]	Basic Electrical Engineering	3	1	0	4	4
5.	[MSS-101]	Communication Skills	2	1	0	3	3
	[CS-101 ]	Computer Fundamentals & Programming	3	1	0	4	4
6.	[AP-101 P]	Engineering Physics Lab	0	0	2	2	1
7.	[EE-101 P]	Basic Electrical Engineering Lab.	0	0	2	2	1
8.	[MSS-101 P]	Communication Skills Lab.	0	0	2	2	1
9.	[CS-101 P]	Computer Fundamentals & Programming	0	0	2	2	1
10.	[WS-111]	Workshop – I	1	0	3	4	3
<b>Total =</b>						<b>37</b>	<b>31</b>

# ENGINEERING MECHANICS AND STRENGTH OF MATERIALS

ME-102

L T P Cr  
4 2 0 5

- 1. FORCE, MOMENT, C. G & MOMENT OF INERTIA:** Idealisation of Mechanics, Concept of Rigid Body and Elastic Body, Laws of Mechanics, Forces & System of Forces, Composition, Resolution & resultant of Forces, Laws of Forces, Lami's Theorem, Moment & Couples, Varignon's Theorem, Free Body Diagram, Centre of Gravity of a Lamina, Centroids of various Geometric Shapes, Moment of Inertia, Radius of Gyration, Parallel and Perpendicular Axis Theorem.
- 2. FRAMES AND TRUSSES:** Introduction, Perfect Frame, Redundant Frame, Reactions of Supports, Plane Trusses, Space Trusses, Method of Joints, Method of Section, Graphical Method- Maxwell Diagram.
- 3. SHEAR FORCE AND BENDING MOMENT:** Introduction, Types of Load – Concentrated, uniformly distributed, uniformly varying load and Combination of loads. Types of beams – Cantilever beam, simply supported beam, overhanging beam; Shear force and bending moment diagrams for the above beams with one type of loading and combination of loading. Point of contra flexure Relationship between load, Shear force and bending moment.
- 4. RECTILINEAR AND CURVILINEAR TRANSLATION:** Kinematics and Kinetics of Rectilinear Motion, Differential Equation of Rectilinear Motion, Motion of a Particle acted upon by a constant and continuously varying Force, Impulse and Momentum, Work and Energy, Differential Equation of Curvilinear Motion, Moment of Momentum, Work and Energy in Curvilinear Motion, D'Alembert's Principle.
- 5. ROTATION OF A RIGID BODY ABOUT A FIXED AXIS:** Kinematics of Rotation, Equation of Motion for a Rigid Body Rotating about a Fixed axis, Rotation under the Action of Constant Moment, Resultant, Inertia Force in Rotation, The Principle of Angular Momentum in Rotation, Energy Equation for Rotating Bodies.
- 6. PLAIN MOTION OF A RIGID BODY AND RELATIVE MOTION:** Kinematics of Plain Motion, Instantaneous Centre, Equation of Plain Motion, D'Alembert's Principle in Plain Motion, Principle of Angular Momentum in Plain Motion, Energy Equation for Plain Motion, Kinematics of Relative Motion, Equation of Relative Motion, D'Alembert's Principle in Relative Motion.
- 7. SIMPLE STRESSES AND STRAINS:** Stress & strain; Types of stresses and strains Elastic limit; Hooks law; Stress – strain diagram for ductile and brittle material, Factor of safety; Poisson's Ratio; Elastic constants; Young's modulus, Shear modulus & Bulk modulus. Relationship between elastic constants-Derivation, Thermal Stress & Strain.
- 8. TORSION OF CIRCULAR SHAFT:** Pure Torsion, Theory of Pure torsion, Derivation of Torsion equation for a circular shaft subject to torsion, assumptions, Maximum torque transmitted by a Solid shaft and hollow shaft-derivations, Polar modulus, torsion rigidity, Shear stress produced in the members, Comparison of hollow and solid shaft, Power transmitted by a shaft, Close coiled helical spring subjected to axial load and axial torque.

## TEXT BOOKS:

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|--------------------------|---|
| 1. Engineering Mechanics | Timoshenko & Young, Mc Graw Hill          |
| 2. Applied Mechanics     | I B Prasad, Khanna Publishers, New Delhi. |
| 3. Engineering Mechanics | Bhavikatti & Rajshekhappa.                |
| 4. Engineering Mechanics | D. P. Mandal, SK Kataria & Sons, Delhi.   |
| 5. Strength of Materials | R.K.Bansal                                |
| 6. Strength of Materials | Gupta & Malhotra                          |
| 7. Strength of Materials | Sadhu Singh                               |

## REFERENCE BOOKS:

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| 1. Engineering Mechanics | Meriam                                   |
| 2. Engineering Mechanics | Beer P Johnson.                          |
| 3. Engineering Mechanics | E. J. Hearn, Schaum Series Publications  |
| 4. Engineering Mechanics | R. K. Bansal, Luxmi Publications, Delhi. |
| 5. Engineering Mechanics | Basu, Tata McGraw Hill                   |