

6th Semester	Mechanical Working and Testing of Materials	L-T-P 3-0-0	3 CREDITS
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Module I:**(12 Hours)**

Classification of forming processes.

Fundamentals of metal working – Effect of temperature, strain rate, metallurgical structure, friction & lubrication, workability and residual stress.

Rolling - Classification & processes, load, torque, power, variables controlling process, forward slip. Fundamentals of roll pass design, mill type. Rolling defects and their control.

Forging - Classification & processes, load for circular & rectangular plate.

Extrusion - Classification & processes, force & variables affecting it.

Module II:**(12 Hours)**

Drawing of Wires and Tubes- Processes, drawing stress.

Sheet Metal Forming- Forming methods, Forming limit criterion, Special Forming techniques and defects in formed products National and International Standards for Mechanical tests

Hardness Tests- Brinell, Rockwell, Vickers, Meyer, Knoop, etc., relationship with flow curve.

Compression Test- Comparison with tension, phenomenon of buckling & barreling.

Torsion Test- Stresses for elastic & plastic strain, Torsion vs. Tension.

Bend Test- Pure bending & flexure formula.

Impact Test- Notched bar impact tests, transition temperature & metallurgical factors affecting it.

Module III:**(7 Hours)**

Fracture- Energy based criterion, Strain energy release rate, stress intensity factor, fracture toughness estimation and design of engineering component.

Fatigue – Stress cycles & S-N curve, effect of mean stress, stress concentration, surface, size, metallurgical factors etc. on endurance limit, Cyclic stress-strain curve, Low cycle fatigue, Paris law.

Module IV:**(7 Hours)**

Creep- Creep & Stress rupture tests, Mechanism of creep deformation, Deformation mechanism Maps, Development of creep resistant alloys, Prediction of long time properties.

Non Destructive Testing: Scope and significance of non destructive testing. Principles, equipment, specifications and limitations of liquid penetrant, Magnetic particle, Eddy current, Ultrasonic and Acoustic emissions, and Radiography (X-Ray and Gamma Ray).

Books:

- [1] Mechanical Metallurgy by G. E. Dieter, McGraw-Hill
- [2] Roll Pass Design, The United Steel Companies Ltd., U.K
- [3] Testing of Metallic materials by C. Suryanarayana.
- [4] Principles of Industrial Metal Working Processes by C. Russak, G. W. Rowe.
- [5] Practical Non Destructive Testing by Baldev Raj.

Digital Learning Resources:

Course Name: Mechanical Working and Testing of Materials
 Course Link: <https://nptel.ac.in/courses/113/106/113106098/>

<https://nptel.ac.in/courses/113/106/113106070/>

Course Instructor: