

Objectives:

1. Study of electronic amplifier
2. Study of interfacing
3. Time domain analysis of systems

Outcomes: Learner will be able to...

1. Characterize op-amp
2. Design and test of various op amp circuits.
3. Do time domain characterization of system.

List of Experiments:

1	Experiment on op amp parameters
2	Experiment on design of application using op amp like amplifiers, integrator, differentiators, and active filters
3	Experiment on implementation of op amp application e.g. oscillator
4	Experiment on Voltage comparator and zero crossing detectors
5	Experiment to determine capture range; lock in range and free running frequency of PLL
6	Experiment on Astable and monostable multivibrator using timer IC 555.
7	Experiment on Voltage Regulator
8	Simulation experiment based on time domain analysis of continuous time systems
9	Simulation experiment on Laplace/z-Transform
10	Simulation experiment on CTFT and DTFT

Term Work:

Term work consists of performing minimum 08 practical mentioned as above. Final certification and acceptance of the term work ensures satisfactory performance of laboratory work.

The distribution of marks for term work shall be as follows:

- Laboratory work (Experiment/journal) : 20 marks
- Attendance: 05Marks

End Semester Examination:

Pair of Internal and External Examiner should conduct Practical & Oral examination based on entire syllabus.

Practical Performance:	15 Marks
Oral:	10 Marks

Course Code	Course Name	Credits
MTL402	Material Testing Laboratory	01

Objectives:

1. To know the use of metallurgical microscope for study of metals
2. To understand the microstructures of ferrous (steel and cast iron) metals
3. To get exposure of material testing by performing experiment related to Hardness , Fatigue, Tension, Torsion, Impact and Flexural Test

Outcomes: Learner will be able to...

1. Understand the procedure used to prepare metallic samples for studying its microstructure
2. Identify effects of heat treatment on microstructure of medium carbon steel and hardenability of steel using Jominy end Quench test
3. Perform Fatigue Test and draw S-N curve
4. Perform Tension test to analyse the stress - strain behaviour of materials
5. Measure torsional strength, hardness and impact resistance of the material
6. Perform flexural test with central and three point loading conditions

a) List of Experiments: Total eight experiments are required to be performed. Four Experiments from each group

Experiment Number	Detailed Contents	Laboratory Sessions
Group A		
11.	Study of Characterization techniques and Metallographic sample preparation and etching	2 Hrs
12.	Comparison of Microstructures and hardness before and after Annealing, Normalizing and Hardening in medium carbon steel	Any two 2 Hrs
13.	Study of tempering characteristics of hardened steel	
14.	Determination of hardenability of steel using Jominy end Quench Test (Using different hardness testers to measure the Hardness)	
15.	Fatigue test – to determine number of cycles to failure of a given material at a given stress	2 Hrs
Group B		
16.	Tension test on mild steel bar (stress-strain behaviour, determination of yield strength and modulus of elasticity)	2 Hrs
17.	Torsion test on mild steel bar / cast iron bar	2 Hrs
18.	Impact test on metal specimen (Izod/Charpy Impact test)	2 Hrs
19.	Hardness test on metals – (Brinell/ Rockwell Hardness Number	2 Hrs
20.	Flexural test on beam (central loading)	2 Hrs

b) Assignments: At least one problem on each of the following topics:

1. Simple stress strain
2. SFD and BMD
3. Stresses in beams
4. Torsion and deflection.
5. Thin cylinder and strain energy
6. Buckling of Columns

Note: Preferably, the assignments shall be based on live problems. **Project Based Learning may be Incorporated by judiciously reducing number of assignments.**

Assessment:

Term Work: Including Part a and b both

Distribution of marks for Term Work shall be as follows:

Part a: 15 Marks.

Part b: 05 Marks

Attendance: 05 marks.

End Semester Practical/Oral Examination:

Pair of Internal and External Examiner should conduct practical examination followed by Oral

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