

SEMESTER 3

MATERIAL TESTING LAB

Course Code	PCAOL308	CIE Marks	50
Teaching Hours/Week (L: T:P: R)	0:0:3:0	ESE Marks	50
Credits	2	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	NIL	Course Type	Practical

Course Objectives:

1. To introduce various material testing techniques and equipments used for it.
2. To evaluate the tensile strength, compressive strength, hardness, toughness, ductility, and impact resistance of various materials.

Details of Experiment

Expt. No	Experiment
1	Tension test on mild steel/ tor-steel/ high strength steel and cast iron using Universal Testing Machine
2	Compression test on spring
3	Torsion pendulum (mild steel, aluminium, and brass wires)
4	Hardness test (Brinell, Vickers and Rockwell)
5	Impact test (Izod and Charpy)
6	Torsion test on mild steel rods.
7	Shear test on mild steel rods
8	Bending test on wooden beams.
9	Verification of Clerk Maxwell's law of reciprocal deflection and determination of Young's modulus of steel.
10	Measurement using strain gauges
11	Deflection Test on steel and timber beam
12	Determination of moment of inertia of rotating bodies
13	Photo elastic methods for stress measurements.
14	Fatigue test – Study of testing machine.
15	Strut test (Column buckling experiment)

Note: A minimum of 10 experiments are mandatory.

Course Assessment Method
(CIE: 50 Marks, ESE 50 Marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work, experiments, Viva and Timely completion of Lab Reports / Record. (Continuous Assessment)	Internal Exam	Total
5	25	20	50

End Semester Examination Marks (ESE):

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

Mandatory requirements for ESE:

- Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified record.
- Endorsement by External Examiner: The external examiner shall endorse the record.

Course Outcomes (COs)

At the end of the course the student will be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Evaluate the mechanical properties of materials such as tensile strength, compressive strength, hardness, ductility, toughness, and impact resistance.	K3
CO2	Perform bending and deflection tests.	K3
CO3	Evaluate the elastic constants, do torsion and flexural tests.	K3

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table

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

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), : No Correlation

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Mechanics of Materials	Russell C Hibbeler	Pearson	9 th edition, 2013
2	Mechanical Metallurgy	G E Dieter	McGraw Hill	2013
3	Experimental Stress analysis	Dally J W, Railey W P	McGraw Hill	1991

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Mechanics of Materials	Timoshenko and Gere	CBS Publishers	1996
2	Theory of Elasticity	Jay sankar V P	Vedalekshmi publications	2016
3	Practical Non destructive testing	Baldev Raj, Jayakumar T, Thavasimuthu M	Narosa Book Distributors,	2015

Video Links (NPTEL, SWAYAM...)	
Sl. No.	Link ID
1	https://archive.nptel.ac.in/courses/105/106/105106172/

Continuous Assessment (25 Marks)

1. Preparation and Pre-Lab Work (7 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

2. Conduct of Experiments (7 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

3. Lab Reports and Record Keeping (6 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

4. Viva Voce (5 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

Evaluation Pattern for End Semester Examination (50 Marks)

6. Procedure/Preliminary Work/Design/Algorithm (10 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
- Creativity and logic in algorithm or experimental design.

7. Conduct of Experiment/Execution of Work/Programming (15 Marks)

- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

8. Result with Valid Inference/Quality of Output (10 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.
- Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

9. Viva Voce (10 Marks)

- Ability to explain the experiment, procedure results and answer related questions
- Proficiency in answering questions related to theoretical and practical aspects of the subject.

10. Record (5 Marks)

- Completeness, clarity, and accuracy of the lab record submitted