25UMEL306	MECHANICAL AND MATERIAL TESTING LAB	Category	L	T	P	Credit	Year of Introduction
		PCL	0	0	3	2	2025

Preamble: The Mechanical and Material Testing Lab provides students with practical exposure to the behavior and properties of engineering materials under various loading conditions. In this lab, fundamental tests such as tensile, compression, hardness, impact, and torsion are conducted to determine mechanical properties like strength, ductility, toughness, and stiffness.

Prerequisite: 25UMEL306 Mechanical and Material Testing Lab

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcome	Knowledge Level
CO1	Determine the tensile, compressive, and shear properties of engineering materials using suitable testing machines and standard procedures.	K3 Apply
CO2	Evaluate the hardness, torsional rigidity, and flexural stiffness of different materials using appropriate experimental methods..	K3 Apply
CO3	Analyse the impact strength, notch toughness, and fracture toughness of materials under different loading conditions.	K4 Analyse
CO4	Interpret experimental observations related to spring stiffness and fatigue behaviour, and present the results using proper calculations, graphs, and technical reporting.	K4 Analyse

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	1	1	-	-	-	-	-	-	3	-
CO2	3	2	-	1	1	-	-	-	-	-	-	3	-
CO3	2	3	-	2	1	-	-	-	-	-	-	3	1
CO4	2	3	-	2	1	-	-	-	-	-	-	3	1
Avrg	2.6	2	-	1.5	1	-	-	-	-	-	-	3	1

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*	*	*	*	_
CO2	*	*	*	*	*	*	*	*	_
CO3	*	*	*	*	*	*	*	*	_
CO4	*	*	*	*	*	*	*	*	_

WKs Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*	*	*	-

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	**50**	**50**	**2.5 hrs**

Continuous Internal Evaluation Pattern:

Attendance : 5 marks
Continuous Assessment Test : 25 marks
Internal Examination : 20 marks

SYLLABUS

Experiments

1. Evaluate the tensile properties of a ductile material such as mild steel or high-strength steel using a Universal Testing Machine (UTM) with an extensometer.
2. Conduct a compression test on a ductile material such as mild steel, tor steel, or high-strength steel using a Universal Testing Machine (UTM) with an extensometer.
3. Determine the tensile properties of cast iron, a brittle material, using a Universal Testing Machine (UTM) with an extensometer.
4. Determine the shear strength of a mild steel rod by conducting a shear test.
5. Determine the Brinell hardness number of the given material using a Brinell hardness testing machine.
6. Evaluate the Vickers hardness value of the given specimen using a Vickers hardness tester.
7. Measure the Rockwell hardness of the given material using a Rockwell hardness testing machine and identify the appropriate hardness scale.
8. Determine the torsional rigidity of mild steel, copper, or brass rods by conducting a torsion test.
9. Evaluate the flexural stiffness or flexural rigidity of mild steel, copper, or brass specimens using a three-point bend test on a Universal Testing Machine (UTM).
10. Determine the impact strength of the given material at room temperature using the Izod impact test.
11. Evaluate the notch toughness of the given material at room temperature using the Charpy impact test.
12. Investigate the effect of coil type, close-coiled and open-coiled, on spring stiffness.
13. Study the effect of spring arrangement, series and parallel, on the overall stiffness of a spring system.
14. Evaluate the fracture toughness of a given material using a Universal Testing Machine (UTM).
15. Study the procedure for plotting the S–N curve using a fatigue testing machine.

Minimum 10 experiments should be completed

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 Examination	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

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

Text Books:

1. Callister, W. D., & Rethwisch, D. G., *Callister's materials science and engineering* (10th ed.). Wiley, 2018.
2. Kuhn, H., & Medlin, D., *Mechanical testing and evaluation* (Vol. 8). ASM International, 2000.

Reference Books:

1. Gere, J. M., & Goodno, B. J., *Mechanics of materials* (9th ed.). Cengage Learning, 2022.
2. Shackelford, J. F., *Introduction to materials science for engineers* (8th ed.). Pearson, 2022.