



**National Institute of Technology Meghalaya**  
An Institute of National Importance

**CURRICULUM**

Programme	<b>Bachelor of Technology in Mechanical Engineering</b>	Year of Regulation	<b>2018</b>
Department	<b>Mechanical Engineering</b>	Semester	<b>IV</b>

Course Code	Course Name	Credit Structure				Marks Distribution	
		L	T	P	C	Continuous Evaluation	Total

<b>ME 254</b>	<b>Material Science Lab</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>100</b>	<b>100</b>
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Course Objectives	To understand basics of microstructure of materials, its hardness under different conditions.	Course Outcomes	<b>CO1</b>	Demonstrate the annealing process and its effect on a given work specimen (Understanding).
	To understand basics of heat affected zone of materials and detection of flaws of materials.		<b>CO2</b>	Demonstrate the effect of quenching and tempering on hardness of the steel (Understanding).
			<b>CO3</b>	Ability to examine the microstructure of material under various heat treatment processes (Applying).
			<b>CO4</b>	Experiment with hardness tester to characterize the heat affected zone in a welded specimen (Applying).
			<b>CO5</b>	Demonstrate the effect of tempering temperature on hardness of a given samples. (Applying)

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	3	0	0	0	2	0	0	2	0	0	0	2	3	2	0
2	CO2	3	0	0	0	2	0	0	2	0	0	0	2	2	2	0
3	CO3	3	0	0	0	2	0	0	2	0	0	0	2	2	2	0
4	CO4	3	0	0	0	2	0	0	2	0	0	0	2	2	2	0
5	CO5	3	0	0	0	2	0	0	2	0	0	0	2	3	2	0

**SYLLABUS**

No.	Content	Hours	COs
I	Study of the microstructure of an annealed mild steel sample and determination of grain size by line intercept method and Image analysis method.	02	CO1
II	Study of the microstructure and determine the volume fraction of carbon fibres in the Al-matrix by point count method and Image analysis method.	02	CO1
III	Study of the effect of quenching and tempering on hardness of a given specimen and determine the effect of water, oil, sand and air quenching on hardness of the samples.	02	CO2
IV	Study of the material hardness of a given set of specimens after heat treatment.	02	CO3
V	Study of the heat affected zone (HAZ) in a welded sample of low carbon steel.	02	CO4
VI	Study of the effect of tempering temperature on hardness of a given samples. Study to detect the flaws in a given specimen by NDT.	04	CO5
Total Hours		<b>14</b>	

**Essential Readings**

- G.E. Dieter, "Mechanical Metallurgy", Mc Graw Hill Education; 3<sup>rd</sup> Edition, 2017.
- W. D. Callister, "Material Science and Engineering: An Introduction", Wiley, 6<sup>th</sup> Edition, 2006.
- W.F. Smith, "Principles of Materials Science", McGraw Hill, 3<sup>rd</sup> Revised Edition, 1990.
- T.V. Rajan, C.P. Sharma and A. Sharma, "Heat Treatments: Principles and Techniques", Prentice Hall, 2<sup>nd</sup> Edition, 2010.