

# MOHAMMED SATHAK A J COLLEGE OF ENGINEERING

Siruseri IT park, OMR, Chennai - 603103

## LESSON PLAN

Department of MECHANICAL Engineering

Name of the Subject	NON DESTRUCTIVE TESTING AND EVALUATION	Name of the handling Faculty	RAJESH J
Subject Code	ME8097	Year / Sem	IV / VII
Acad Year	2020-2021	Batch	2019-2023

### Course Objective

To study and understand the various Non Destructive Evaluation and Testing methods, theory and their industrial applications

### Course Outcome

CO1: Explain the fundamental concepts of NDT .

CO2: Discuss the different methods of NDE .

CO3: Explain the concept of Thermography

CO4: Explain the concept of Eddy current testing. And Ultrasonic Testing

CO5: Explain the concept of Acoustic Emission and Radiography.

### Lesson Plan

Sl. No.	Topic(s)					T / R*	Periods Required	Mode of Teaching (BB / PPT / NPTEL / MOOC / etc )	Blooms Level (L1-L6)	CO	PO
						Book					
UNIT I											
1	NDT Versus Mechanical testing					T1	2	BB	L2	CO1	PO1
2	Overview of the Non Destructive Testing					T1	2	BB	L1	CO1	PO1
3	Methods for the detection of manufacturing defects					T1	1	BB	L2	CO2	PO1
4	Material characterisation Relative merits and limitations,					T1	1	BB	L1	C02	PO1
5	Various physical characteristics of materials and their applications in NDT					T1	1	BB	L1	CO2	PO1
6	Visual inspection unaided and aided					T1	2	PPT/NPTEL	L3	CO2	PO1
Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any * Assignment given to the students											
UNIT II											
7	Liquid Penetrant Testing					T1/R1	1	PPT	L3	C02	PO1
8	Principles, types and properties of liquid penetrants and limitations of various method					T1	2	BB	L2	CO2	PO1

9	Testing Procedure, Interpretation of results	T1	1	BB	L2	CO2	PO1
10	Magnetic Particle Testing	T1/R3	2	BB	L3	CO2	PO1 & PO5
11	Theory of magnetism, inspection materials Magnetisation methods	T1	1	BB	L1	CO2	PO1 & PO5
12	Interpretation and evaluation of test indications	T1	1	BB	L3	CO2	PO1 & PO5
13	Principles and methods of demagnetization, residual magnetism	T1	1	BB	L1	CO2	PO1 & PO5
<b>Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any</b> <b>* Assignment given to the students</b>							
<b>UNIT III</b>							
14	Thermography- Principles, Contact and non contact inspection methods	T1	1	BB	L1	CO3	PO1 & PO5
15	Techniques for applying liquid crystals, Advantages and limitation	T1	1	BB	L2	CO3	PO1 & PO5
16	infrared radiation and infrared detectors,	T1	1	BB	L2	CO3	PO1 & PO5
17	Instrumentations and methods, applications.	T1	1	BB	L2	CO3	PO1 & PO5
18	Eddy Current Testing-Generation of eddy currents	T1	2	BB	L3	CO4	PO1 & PO5

<b>19</b>	Properties of eddy currents, Eddy current sensing elements	<b>T1</b>	<b>1</b>	<b>PPT</b>	<b>L1</b>	CO4	PO1 & PO5
<b>20</b>	Probes, instrumentation, Types of arrangement, Applications, advantages, Limitations, Interpretation/Evaluation.	<b>T1</b>	<b>2</b>	<b>BB</b>	<b>L3</b>	CO4	PO1 & PO5
<b>Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any</b> <b>* Assignment given to the students</b>							
<b>UNIT IV</b>							
<b>21</b>	Ultrasonic Testing	<b>T1/R1</b>	<b>1</b>	<b>PPT</b>	<b>L3</b>	CO4	PO1 & PO5
<b>22</b>	Transducers, transmission and pulse-echo method	<b>T1</b>	<b>2</b>	<b>BB</b>	<b>L2</b>	CO4	PO1 & PO5
<b>23</b>	straight beam and angle beam instrumentation	<b>T1</b>	<b>1</b>	<b>BB</b>	<b>L2</b>	CO4	PO1 & PO5
<b>24</b>	data representation methods A-Scan, B-scan, C-scan.	<b>T1</b>	<b>2</b>	<b>BB</b>	<b>L1</b>	CO4	PO1 & PO5
<b>25</b>	Phased Array Ultrasound, Time of Flight Diffraction	<b>T1</b>	<b>1</b>	<b>BB</b>	<b>L2</b>	CO4	PO1 & PO5
<b>26</b>	Acoustic Emission Technique – Principle, AE parameters, Applications	<b>T1</b>	<b>2</b>	<b>PPT</b>	<b>L3</b>	CO5	PO1 & PO5

**Suggested Activity: Quiz are conducted**

## UNIT V

<b>27</b>	Principle, interaction of X-Ray with matter,	<b>T1</b>	<b>1</b>	<b>PPT</b>	<b>L1</b>	CO1	PO1 & PO5
<b>28</b>	imaging, film and film less types and use of filters and screens	<b>T1</b>	<b>2</b>	<b>PPT</b>	<b>L1</b>	CO1	PO1 & PO5
<b>29</b>	geometric factors, Inverse square, law, characteristics of films	<b>T1</b>	<b>1</b>	<b>PPT</b>	<b>L2</b>	CO5	PO1 & PO5
<b>30</b>	graininess, density, speed, contrast, characteristic curves,	<b>T1</b>	<b>1</b>	<b>PPT</b>	<b>L2</b>	CO5	PO1 & PO5
<b>31</b>	Penetrameters, Exposure charts,Radiographic equivalence.	<b>T1</b>	<b>1</b>	<b>PPT</b>	<b>L1</b>	CO5	PO1 & PO5
<b>32</b>	Fluoroscopy- Xero-Radiography	<b>T1</b>	<b>2</b>	<b>PPT</b>	<b>L3</b>	CO5	PO1 & PO5
<b>33</b>	Computed Radiography,Computed tomography	<b>T1</b>	<b>1</b>	<b>PPT</b>	<b>L3</b>	CO5	PO1 & PO5

**Suggested Activity:** Case Studies are givent to the student

### Content Beyond the Syllabus Planned

1	Application of NDT in industrial field
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2	Automatic and Semiautomatic penetrant Testing methods												
Text Books													
1	Baldev Raj, T.Jayakumar, M.Thavasimuthu “Practical Non-Destructive Testing”, Narosa Publishing House, 2014												
2	Ravi Prakash, “Non-Destructive Testing Techniques”, 1st revised edition, New Age International Publishers, 2010												
3													
Reference Books													
1	ASM Metals Handbook, ”Non-Destructive Evaluation and Quality Control”, American Society of Metals, Metals Park, Ohio, USA, Volume-17.												
2	ASNT, American Society for Non Destructive Testing, Columbus, Ohio, NDT Hand book, Vol.												
3	Charles, J. Hellier,“ Handbook of Nondestructive evaluation”, McGraw Hill, New York 2001.												
4	Paul E Mix, “Introduction to Non-destructive testing: a training guide”, Wiley, 2 <sup>nd</sup> Edition New Jersey, 2005												
Website / URL References													
1	<a href="http://nptel.ac.in/courses/112105127/pdf/LM-35.pdf">http://nptel.ac.in/courses/112105127/pdf/LM-35.pdf</a>												
Blooms Level													
Level 1 (L1) : Remembering				Lower Order Thinking	Fixed Hour Exams	Level 4 (L4) : Analysing					Higher Order Thinking	Projects / Mini Projects	
Level 2 (L2) : Understanding						Level 5 (L5) : Evaluating							
Level 3 (L3) : Applying						Level 6 (L6) : Creating							
Mapping syllabus with Bloom’s Taxonomy LOT and HOT													
Unit No	Unit Name				L1	L2	L3	L4	L5	L6	LOT	HOT	Total



<b>CO1</b>	PO1:Applying of engineering concept is more predominant				
<b>CO2</b>	PO1:Applying of engineering concept is more predominant PO5: Modern Tools are used for testing purpose				
<b>CO3</b>	PO1:Applying of engineering concept is more predominant PO5: Modern Tools are used for testing purpose				
<b>CO4</b>	PO1:Applying of engineering concept is more predominant PO5: Modern Tools are used for testing purpose				
<b>CO5</b>	PO1:Applying of engineering concept is more predominant PO5: Modern Tools are used for testing purpose				
<b>3</b>		<b>High level</b>	<b>2</b>	<b>Moderate level</b>	<b>1</b>
					Low level
Name & Sign of Faculty Incharge : RAJESH J					
Name & Sign of Subject Expert :					
Head of the Department :					

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