

ANNEXURE I

MODULE-WISE COURSE CONTENT AND OUTCOME				
SL.NO	MODULE NAME	MODULE CONTENT	MODULE LEARNING OUTCOME	DURATION (HRS)
1.	Visual Testing	Defect detection using VT method	Ability to detect defects using VT method	4
2.	Penetrant Testing	Defect detection using PT method	Ability to detect defects using PT method	5
3.	Magnetic Particle Testing	Defect detection using MPT method	Ability to detect defects using MPT method	6
4.	Ultrasonic Testing	Defect detection using UT method	Ability to detect defects using UT method	12
5.	Radiographic Testing	Defect detection using RT method	Ability to detect defects using RT method	14
6.	Radiographic Testing & Film Interpretation	Evaluation of RT films	Able to interpret RT films	4

ANNEXURE II

OVERALL LEARNING OUTCOME ASSESSMENT CRITERIA AND USECASES			
LEARNING OUTCOME	ASSESSMENT CRITERIA	PERFORMANCE CRITERIA	USECASES
<p>Ability to detect defects using VT method</p>	<ul style="list-style-type: none"> • Find out the defects using the different visual testing equipment's • Note down the findings • Interpret the results 	<ul style="list-style-type: none"> • Demonstrate the ability to find the defects using instruments like Magnifying glass, borescopes etc. • Record the findings • Interpretation 	<p>Use Case 1: Aircraft Inspection</p> <ul style="list-style-type: none"> • Visual testing is essential for the inspection of aircraft components , including fuselage, wings, turbine blades, and landing gear. • Purpose: To detect surface cracks, corrosion, paint damage, or any signs of wear and tear that could affect the aircraft's performance or safety. • Example: Inspecting the fuselage for stress cracks after long flights or

			<p>inspecting turbine blades for wear using magnification or borescopes.</p> <p>Use Case 2: Automotive Industry</p> <p>Use Case: Weld and Joint Inspections</p> <p>Visual inspection is used to check the quality of welded joints and seams in automotive parts such as chassis, exhaust systems, and body panels.</p> <p>Purpose: To identify cracks, undercuts, porosity, or incomplete fusion in welds.</p> <p>Example: Inspecting a car body's welds and joints for any flaws before the parts are painted or assembled into the final product.</p> <p>Use Case: Surface Inspections of Engine and Transmission Parts</p> <p>Inspecting components like engine blocks, cylinder heads, and transmission cases for cracks or</p>
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			<p>deformities.</p> <p>Purpose: To ensure no internal cracks or external defects could affect engine performance or vehicle safety.</p> <p>Example: Checking the surface condition of a cylinder head for cracks or overheating marks after a manufacturing process.</p>
<p>Ability to detect defects using PT method</p>	<ul style="list-style-type: none"> • Find out the defects using the different visual testing equipment's • Note down the findings • Interpret the results 	<ul style="list-style-type: none"> • Demonstrate the ability to find the defects using the penetrant kits. • Record the findings – acceptance/rejection criteria • Interpretation 	<p>Use Case 3 : Automotive Industry</p> <p>Use Case: Inspection of Engine Parts</p> <p>Purpose: To check for surface flaws in engine components such as crankshafts, camshafts, and cylinder heads.</p> <p>Example: Inspecting the crankshaft for cracks or fatigue that could lead to engine failure.</p> <p>Use Case: Inspection of Welds and Structural Components</p> <p>Purpose: To detect surface defects in welded joints and structural components used in the car body or chassis.</p> <p>Example: Inspecting the</p>

			welds on car chassis and suspension components for surface cracks or incomplete fusion.
Ability to detect defects using MPT method	<ul style="list-style-type: none"> Find out the defects using the different magnetic testing equipment's like - Yoke Note down the findings Interpret the results 	<ul style="list-style-type: none"> Demonstrate the ability to find the defects using the magnetic yoke. Record the findings - acceptance/rejection criteria Interpretation 	<p>Use case 4: Railroad Industry Use Case: Rail Track and Wheel Inspections</p> <p>MT is used to inspect the surface of rail tracks and wheels for cracks or other defects that could lead to accidents. Purpose: To prevent rail-related accidents by identifying defects in the track or wheel that could compromise train safety. Example: Inspecting the surface of rail wheels for cracks or deformities that could lead to a derailment. Use Case: Inspection of Locomotive Components</p> <p>Magnetic Particle Testing is applied to inspect high-stress components such as axles, brake drums, and couplings for surface cracks or damage. Purpose: To detect flaws in locomotive</p>

			<p>components that could affect performance or lead to failure during operation.</p> <p>Example: Inspecting brake drums on a locomotive for cracks using magnetic particle inspection.</p>
<p>Ability to detect defects using UT method</p>	<ul style="list-style-type: none"> Find out the defects using the different ultrasonic flaw detector Note down the findings Interpret the results 	<ul style="list-style-type: none"> Demonstrate the ability to find the defects using the ultrasonic flaw detector Record the findings – acceptance/rejection criteria Interpretation 	<p>Oil and Gas Industry Application: Pipeline Inspection</p> <p>Purpose: To detect internal and external defects, such as corrosion or cracks, in pipelines that transport oil, gas, and chemicals.</p> <p>Example: Inspecting the internal wall of an oil pipeline to detect corrosion or thinning of the pipe wall that might lead to leaks or failure.</p> <p>Application: Pressure Vessel and Tank Inspection</p> <p>Purpose: To assess the integrity of pressure vessels and tanks used in chemical plants, refineries, and other facilities.</p> <p>Example: Using UT to check for corrosion or wall thinning in storage tanks or pressure</p>

			vessels to ensure they remain safe under high-pressure conditions
Ability to interpret and identify RT defects in an RT film	<ul style="list-style-type: none"> Find out the defects from the RT film shared Note down the findings Interpret the results 	<ul style="list-style-type: none"> Demonstrate the ability to find the defects the RT film provided Record the findings – acceptance/rejection criteria Interpretation 	<p>Military and Defense Uses:</p> <p>Weapon Systems: RT is applied in the inspection of weapons, missiles, and ammunition, ensuring that internal components like casings, explosive charges, and wiring are intact and safe for deployment.</p> <p>Armored Vehicles: RT is used to inspect the integrity of armored vehicles, such as tanks and military trucks, by identifying potential weaknesses or flaws in their armor or structural components.</p>

LIST OF FINAL PROJECTS (20 PROJECTS THAT COMPREHENSIVELY COVER ALL THE LEARNING OUTCOME)	
SL.NO	FINAL PROJECT
1.	Find the thickness and corrosion of a given plate
2.	Find surface defects in a test plate using Visual Testing
3.	Find surface defects in a test plate using Penetrant Testing
4.	Find surface defects in a pipe using Penetrant Testing
5.	Find defects in a test plate using MPT method

6.	Find surface defects in a pipe using Magnetic Particle Testing
7.	Find defects in a test pipe using Ultrasonic Testing method
8.	Find defects in a test plate using Ultrasonic Testing method
9.	Calibrate the given UT equipment using V1 block
10.	Interpret the defects found in the Radiographic film given
11.	Make report on the advanced NDT methods
12.	Put up a study on the recent trends in NDT
13.	How robotics has influenced NDT in the recent times
14.	Scope of NDT in Aerospace Industry
15.	Scope of NDT in Automotive Industry
16.	Scope of NDT in construction Industry
17.	Scope of NDT in civil and Other engineering departments
18.	Uses of NDT in the upstream Oil and Gas Sector (Drilling)
19.	Uses of NDT in the downstream Oil and Gas sector (Refining)
20	A report on Remote NDT inspection Technology

ANNEXURE III

TABLE 3: COURSE ASSESSMENT RUBRICS (TOTAL MARKS: 70)				
ASSESSMENT CRITERIA	DESCRIBE THE CRITERIA OF THE BELOW CATEGORY PERFORMANCE			TOTAL MARKS
	FAIR	GOOD	EXCELLENT	
Theoretical Knowledge	10	12	13- 15	15
Practical Knowledge	12	16	17-20	20
Interpretation of Results	18	24	20-25	25
Project report Submission	6	8	9-10	10

Category	Assessment Criteria	Performance Levels	Weightage (Marks)
Theoretical Knowledge	Demonstrates ability of the understanding of the various NDT methods used- namely the equipment's, calibration blocks etc.	Fair, Good, Excellent	15
Practical Knowledge	Demonstrates how to use various NDT equipment's and methods, calibration of equipment's to standards	Fair, Good, Excellent	20
Interpretation of Results	Ability to clearly explain the findings and to prepare the reports as per the standards given	Fair, Good, Excellent	25
Project report Submission	Completes assigned projects or use cases demonstrating innovation, thoroughness, and skill application relevant to industry standards.	Fair, Good, Excellent	10