GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Subject Code: ME02000841

Course / Subject Name: Advance Welding Technology

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	PCC

Prerequisite:	Nil
Rationale:	This course provides the knowledge and practice regarding different Welding Process Physics and Characteristics. Students can find easy in different aspects of welding machine and Weldability in Practices. Industries now a days modernized by adopting automated welding systems.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	Understand physics of Welding	
2	Demonstrate welding machines and Characteristics.	
3	Analyse welding temperature, residual stress, distortion and different welding test.	
4	Extend automated welding processes	
5	Compare Modern welding practices.	

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Physics of welding arc - characteristics of arc and mode of metal transfer, welding fluxes and coatings - type and classification; electrode codes and their critical evaluation.	08	18

2.	Welding machine characteristics - conventional and pulsed power sources, inverter type, power sources for resistance welding, weldability - weldability of cast iron, plain carbon and low alloy steels, stainless steels	08	18
3.	Determination of preheat temperature, use of Schaeffler's diagram, weldability tests, heat flow in welding - significance, theory of heat flow, cooling rate determination, selection of welding parameters based on heat flow analysis.	08	18
4.	Residual stress and distortion - theory of residual stresses and distortion calculation, welding codes, joint design, analysis of fracture and fatigue of welded joints - fracture, energy consideration, fracture toughness testing and its application to welded joints.	08	18
5.	Automated welding systems; microprocessor control of arc welding and resistance welding, quality assurance in welding, welding fumes and their effect on the environment.	07	14
6.	Modern welding processes like: EBW, LBW, Under water Welding, Ultrasonic welding etc. welding of ceramics, plastics and composites.	09	14
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**20**	**20**	**20**	**20**	**10**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Dr. R. S. Parmar "Welding processes and technology" Khanna Publishers
2. Welding technology, R. Little, TMH
3. American society for metals, metal hand book vol.6
4. Welding process technology-houldcraft PT-cambridge univ.press
5. Modern Arc Welding by S V Nadkarni, Advani – Orlikon

(b) Open-source software and website:

1. http://www.gowelding.com/
2. http://www.weldingsoftwarepro.com/
3. http://nptel.ac.in/courses/112107077/33
4. http://nptel.ac.in/courses/112107078/
5. http://www.albertatechfutures.ca/RDSupport/Petroleum/BitumenandHeavyOil/EngineeredMaterials/AdvancedWeldingTechnologies.aspx

Suggested Course Practical List:

1. Study of the welding process.
2. Effect of various welding parameters on bead characteristics in arc welding.
3. Determination of preheat temperature using Schaeffer's Diagram.
4. Selection of Welding Parameters based on Heat Flow Analysis.
5. Study of welding joint design.
6. Estimation and Costing of welding length.
7. To prepare a WPS, WPQ and PQR as per AWS section IX.

List of Laboratory/Learning Resources Required:

1. Gas Welding set up
2. Arc welding setup (MMAW, TIG, MIG, SAW)
3. Ultra sonic Welding Machine
4. Laser Beam Welding Machine
5. Automated Welding Systems
6. Infrared Temperature Gun
7. Profile cutting setup

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