

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: VII

METALLURGY ENGINEERING

Subject Name: **Metal Joining Processes**

Subject Code: **172103**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam (E)		Mid Sem Exam (Theory) (M)	Practical (Internal)
				Theory	Practical		
3	1	2	6	70	30	30	20

Sr. No	Course Content	Total Hrs.
1.	History, Importance of Metal Joining Processes, Types of Metal joining processes.	2
2.	Classification Of Welding Processes, Fusion Welding: Joint design and edge preparation, methods and selection, nature of heat sources, physics of arc, electrical characteristic of arc, machine characteristics.	6
3.	Metal transfer, forces acting on the arc, different modes of metal transfer, heat flow in metals, prediction of heating and cooling rates.	5
4.	Gas-metal and slag-metal reactions, evolution of gases, formation of porosity, inclusions in weld metal, weld pool solidification, residual stresses, weld cracking,	6
5.	SMAW – Function of coatings, classification of coating types, formulation of continuous welding by coated electrodes, SAW, electrosag welding.	6
6.	GTAW, GMAW, FCAW, Plasma Welding, type of guns.	5
7.	Electron Beam Welding: Laser beam welding, gas welding, cutting methods. Solid phase welding, cold pressure welding, hot pressure welding, friction welding, explosive welding, ultrasonic and diffusion welding.	6
8.	Resistance Welding: Contact resistance, spot, seam projection, resistance butt, flash butt etc. Soldering and brazing, theory, types of alloy systems, methods of heating type of joints, adhesive joining.	6

9.	Weldability of carbon and low alloy steels. Hydrogen embrittlement, Brittle fracture, weldability of stainless steels, weldability tests, weldability of non-ferrous systems. Weldability of non-ferrous alloys especially aluminium, nickel and titanium alloys. Joining metallurgy of the dissimilar metals, clad metals etc. Welding metallurgy of various types of cast irons. Metallurgy of repair welding. Welding metallurgy of spray coating. Metallurgy of cutting.	6
10.	Quality control in welding, procedure for control of material, establishment of correct welding procedure, qualification of operators, testing and inspection during and after welding. Welding defects.	6

Text Books:

1. The Metallurgy of Welding, Brazing and Soldering – J.F. Lancaster, George Alien and Unwin Ltd., London.
2. Introduction to Welding and Brazing – D.R. Milner & R.L. Apps. Pergamon Press, London.

Reference Books:

1. Manufacturing Technology (Foundry, Forming and Welding)-P.N.Rao, Tata Mc-Graw Hill.
2. The Physics of Welding- L.F.Lancaster, Pergamon Press.
3. Principles of Welding- R.S. Parmar.
4. Welding Technology- O.P. Khanna, Khanna Pub.