

Branch Name:	Mechanical Engineering (Production Technology)
Semester/Year:	Semester II / First Year
Subject Title:	Advance Welding Technology
Subject Code:	1ET2090201
Pre-requisite:	Workshop and Welding Technology

Course Objectives:

1. To perform on different welding techniques and gain knowledge of the concepts, operating procedures, applications, advantages and limitations of various welding processes.
2. Define the problem that occurs on the arc welding and recognize the type of metal, electrode, and tools that are used in arc welding
3. To know safety measure when use the welding machine along the welding process and understand the various codes and standards on welding applications

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
02	00	02	04	60	40	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weightage (%)
1	Physical aspects of Welding: Classification and Factors affecting for selection of manufacturing processes, Emission and ionization of arc, arc characteristics, Welding power sources, arc blow, Duty cycle, Metal Transfer and thermal aspects of welding.	04	20
2	Advanced Fusion welding Processes: Activated arc welding processes, Pulse gas tungsten arc welding and pulse gas metal arc welding, Cold metal transfer narrow groove welding, hot-wire arc welding, selection of electrodes, Electron Beam Welding, Laser beam welding, Hybrid welding processes. Mechanical properties of joints: hardness, tensile, corrosion, fatigue, welding economics, welding design, welding defects	06	25
3	Solid State welding Processes: Comparison of Fusion and Solid-state Welding, Microstructure Evolution in solid-state welding, Friction welding, Friction stir welding, Ultrasonic welding, Explosion welding, Diffusion bonding. Similar and dissimilar material welding by solid-state welding. Recent trends in solid-state welding.	06	25
4	Welding Metallurgy: Heat flow in welding, Metallurgical transformation in and around weldment, Implication of cooling rates, Heat affected zone (HAZ), Weldability of plain carbon steels, Stainless steels, Cast iron, Aluminium and its alloys. Design of weldments, Joint design, Residual stresses and distortion, Testing of welded joints, Destructive Tests and Non-destructive tests (NDT).	04	15

5	Welding Defects and Testing: Type of defects in weldments, causes and remedies of defects. Repair of defective welds, Destructive testing like tensile, bend, impact and non-destructive testing like leak test, X-ray and gamma ray radiography, magnetic particle test, liquid dye penetration test, ultrasonic etc.	04	15
		24	100

Review Presentation: The student is expected to spend minimum 2 hours per week (as mentioned in the teaching and evaluation scheme) to refer at least two peer reviewed journal papers related to this domain/subject. The student is expected to identify issues/challenges and emerging trends in the domain/subject. Student is supposed to explore various video lectures (E.g. NPTEL) available in the domain/subject. Student is required to make a review-presentation on the work carried out for the same. Recommended sites for journal papers are (1) asmedigitalcollection.asme.org (2) springer.com (3) sciencedirect.com (5) ieeexplore.ieee.org (6) scholar.google.co.in or others of similar repute.

Course Outcomes:

The student will be able to

1. To compare fusion and solid-state welding processes.
2. To evaluate joint performance of different combinations of materials.
3. To identify the importance of metal forming in manufacturing.
4. Learn and Evaluate metallurgical aspect of welding processes
5. To learn the issues and challenges in welding processes.

List of Reference Books:

1. Dr.R.S.Parmar “Welding processes and technology” Khanna Publishers
2. P.N. Rao, Manufacturing Technology Vol 1, Mc Graw Hill India.
3. S. Kalpakjian and S.Schmid, Manufacturing Processes for Engineering Materials, 6th Edition, Pearson.
4. M.P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, 7th edition, Willey.
5. A. Ghosh and A. K. Mallik, Manufacturing Science, East west press, New Delhi, 2006.

List of Practicals:

1. Demonstration of gas welding process.
2. To study the safety aspects of welding operations.
3. To study the fusion welding processes.
4. To study the solid state welding processes.
5. Hands on experience on Gas welding.
6. Hands on experience on Gas metal arc welding.
7. Hands on experience on Resistance welding spot.
8. Development of macro and microstructure of welded joints.
9. To study Injection moulding of plastics.
10. To study the welding defects and it's testing.