Course code	Course Name	L-T-P-Credits	Year of Introduction
MP208	Metal Joining Technology	3-0-0-3	2016

Prerequisite: Nil

Course Objective

- To introduce different types of welding techniques used in industry for metal joining
- To develop a skill of selecting a welding procedure for specific applications.
- To familiarize modern welding technique and machines.

Syllabus

Introduction to welding technology and welding science. Classifications of welding. Working principles of major solid state welding processes, arc welding processes and radiant energy welding processes. Introduction to modern welding techniques.

Expected Outcome

The students will be able to

i. identify the welding processes used in different types of welded joint.
ii. select a welding process for a joint
iii. recognize the techniques behind modern welding techniques/methods.

References

1. Parmar R. S., „Welding Engineering and Technology", 1st Edition, Khanna Publishers, 2008.
2. Jackson M.D . "Welding methods and metallurgy" Charles Griffin and Co. London 1967.
3. ASHE Welding Engineers Hand Book Vol I,II,II & IV
4. Amstead B.H., Phillip E Ostwald and Myron L.Begeman, "Manufacturing Processes" John Wiley & Co., New York.
5. Schwartz M M Metal joining manual, McGraw Hill Inc.

Course Plan

Module	Contents	Hours	Sem. exam marks
I	Introduction to different joining methods, Advantages of welding over other joining techniques, limitations of welding, Various types of weld joints & weld symbols , weldability, classification of welding processes as per AWS, Selection of a welding process , common welding defects and its causes, Residual stresses and distortions, cost of welding	6	15%
II	Arc welding- electrode polarity, shielding gases, use of pulsed arc welding process, mode of metal transfers, Formation of welding arc, arc stability. Carbon arc welding, Shielded metal arc welding, Submerged arc welding (Working Principles, processes parameters applications and limitations only)	8	15%

	TIG and MIG - Working Principles, equipments, selection of welding parameters, limitations and applications		
First Internal Exam			
III	Solid state welding-forge welding, friction welding, explosive welding, ultrasonic welding. Thermit welding, Resistance welding- Spot welding, Seam welding, Projection welding, Butt welding, Flash butt welding, Percussion welding (Working Principles, process parameters, applications and limitations only)	8	15%
IV	Gas welding, - equipments, gases used for welding, flame characteristics, temperature levels and limitations. Radiant Welding processes-Electron beam welding ,Laser beam welding, Plasma welding (Working Principles, process parameters, applications and limitations only)	7	15%
Second Internal Exam			
V	Adhesive bonding (General principles, equipments and different types of adhesives), diffusion welding (General principles, processes parameters and applications), Brazing and soldering, Thermal cutting, oxygen cutting and arc cutting. Metallurgy of an arc welded joint, weld quality,metal deposition rate. Pre-heating and post welding heat-treatment.	7	20%
VI	Modern welding Techniques- Hybrid welding, Double side arc welding, Orbital welding of tubes/pipes, Under water and space welding techniques, Welding safety measures, welding inspection, welding standards ,welding of dissimilar metals.	6	20%
End Semester Exam			

Question Paper Pattern

Total marks: 100, Time: 3 hours
The question paper shall consist of three parts

Part A

4 questions uniformly covering modules I and II. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

4 questions uniformly covering modules III and IV. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

6 questions uniformly covering modules V and VI. Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed.