



# WELDING PROCESSES

**PROF. MURUGAIYAN AMIRTHALINGAM**

Department of Metallurgy and Material Science  
IIT Madras

**TYPE OF COURSE** : Rerun | Elective | UG/PG

**COURSE DURATION** : 12 weeks (24 Jan' 22 - 15 Apr' 22)

**EXAM DATE** : 23 Apr 2022

**PRE-REQUISITES** : Graduates of Metallurgical/Mechanical/Automobile/Production Engineering

**INTENDED AUDIENCE** : Masters students in Metallurgical, Mechanical, Automobile and Production Engineering. Practicing welding engineers, welders, R&D personnel in academia and national laboratories, quality management personnel from welding and manufacturing industries and research scholars who are working in welding and joining.

**INDUSTRIES APPLICABLE TO** : Construction, Fabrication, Automobile and Power generation industries and research labs

## **COURSE OUTLINE :**

The modern material assemblies require the combined use of alloys for a given commercial application. Welding technologies are of critical importance for the construction of virtually all components of the assemblies. This course aims to elaborate the physical principles of arc, plasma, laser, resistance spot, electron beam and solid state welding processes. This includes, physics of electric arc-plasma, engineering the arc-plasma for welding, metal transfer and mass flow in the weld pool, laser/electron beam - material interactions, pressure and force balance in keyhole mode power beam welding, fundamentals of heat generation by Joule heating and process principles and overview on types of resistance and solid state welding processes.

## **ABOUT INSTRUCTOR :**

Prof. Murugaiyan Amirthalingam is currently working as an Assistant Professor in IIT-Madras. His research and teaching interests include welding metallurgy, welding processes development, steel product development and additive manufacturing.

## **COURSE PLAN :**

**Week 1:** Introduction to the course

**Week 2:** Physics of welding arc – Part I

**Week 3:** Physics of welding arc – Part II

**Week 4:** Introduction to arc welding processes – Part I

**Week 5:** Electrical power sources for welding

**Week 6:** Introduction to arc welding processes – Part II

**Week 7:** Fundamentals of resistance welding – Part I

**Week 8:** Fundamentals of resistance welding – Part II

**Week 9:** Introduction to power beam welding processes Plasma, laser and electron beam welding processes

**Week 10:** Principles of power beam welding processes

**Week 11:** Introduction to pressure welding processes

**Week 12:** Principles and operational considerations of pressure welding processes