



# WELDING APPLICATION TECHNOLOGY

## PROF. PANKAJ BISWAS

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**INTENDED AUDIENCE :** Students (UG and PG); Participant from any manufacturing industry

**PREREQUISITES :** BE/BTech In Mechanical/Production/ Manufacturing Sciences/Power Plant Engg/  
Naval And Architecture Engg

### COURSE OUTLINE :

The name of the course is Welding Application Technology. As the name implies in this course I will try to cover the fundamental overview of the traditional/ industrial welding technology especially those welding processes which are widely used in manufacturing industries. I will also try to cover the detail concepts of design and analysis of welding joints, heat treatment and weld induced residual stresses & distortions and its measurement. This will help the participants to understand and apply this knowledge of welding in practice for various industrial applications. It will also encourage academic participants to increase the research interest in the field of welding. In this present course the primary focus is on basic fundamental of welding and its importance in industries.

The brief overview of the course content can be stated like; this course will cover the industrial relevance of welding processes. It will give the fundamental knowledge of various important welding processes which includes most of the important fusion welding, solid state welding (i.e. Friction Welding, FSW etc.) and solid-liquid state welding (i.e. Shouldering and Brazing). It will also cover the importance and applications of all these welding techniques. This course will highlight the safety precautions to be followed in different welding techniques.

This course also will cover the basic concepts of weld induced residual stresses and distortions. In this course, the concepts of different residual stresses measurements techniques will be provided. This course also will provide the fundamental concepts of residual stresses and distortions mitigation techniques. This course also will provide the basic fundamental concept on design and analysis of welding joints. This course includes most of the important topics related to static analysis of welded joints which included 'Design and Analysis of Butt and Fillet Welds Joints, Strength Calculation of Parallel & Transverse Fillet Welds, Analysis of Eccentrically Loaded Welded Joint, Analysis of Welded Joint Subjected to Bending Moment'.

### ABOUT INSTRUCTOR :

I, Prof. Pankaj Biswas, am a Professor in the Dept. of Mechanical Engineering, IIT Guwahati. I did my B.E. in Mechanical Engineering from IEST, Shibpur. I did my M-Tech and PhD from IIT Kharagpur. I am working in the area of different manufacturing as well as design fields. I am working in the area of welding technology, 3-D printing and forming by line heating for the past 17 years. My areas of research are on computational weld mechanics, similar and dissimilar friction stir welding, friction stir welding of steel, hybrid welding technology, Finite Element analysis of weld induced distortion and residual stresses, Analysis of large welding structure, forming by line heating and modeling of welding processes using soft computing techniques. I guided 01 PDF, 10 PhD scholars, 40 M-Tech students and 35 B-Tech students in the area of welding, forming and 3D printing. Currently, I am guiding 02 NPDF, 08 PhD scholars in the areas of welding, 3-D printing and line heating. I already published about 105 journal articles, 95 conference proceedings, 25 book chapters and 04 patents. I worked in ten sponsored / consultancy projects. Currently, I am working in another eight sponsored / consultancy projects. I got IET Young Engineers Award 2013- 2014' in Mechanical Engineering discipline.

### COURSE PLAN :

**Week 1:** Basics of welding residual stresses & distortions and its mitigation

**Week 2:** Measurement & analysis of welding residual stresses and distortions

**Week 3:** Measurement of welding residual stresses and distortions

**Week 4:** Different type of welding methods and its details (PAW, FCAW, RSW)

**Week 5:** Different type of welding methods and its details (RW, Thermit, FSW)

**Week 6:** Different type of welding methods & its details (Brazing, Soldering)

**Week 7:** Design & analysis of butt and fillet welds joints

**Week 8:** Design & analysis of weld joints for different static loading conditions