

# Friction Stir Welding and Processing

## Overview

Many of the high-strength aluminium alloys such as 2XXX and 7XXX series alloys are difficult to weld by fusion welding methods due to the poor microstructure in the fusion zone that leads to inferior properties. Some of these alloys can be resistance welded but that requires surface preparation which leads to higher cost. Therefore, an alternative solid-state joining method was needed to overcome these difficulties and that is when Friction stir welding (FSW) was invented at The Welding Institute (TWI) of UK as a solid-state joining technique. The method is fairly simple. It utilizes the frictional heat from a non-consumable rotating tool to soften, plasticize and join the material. Owing to its high energy efficiency and versatility, friction stir welding (FSW) is considered to be the most significant development in metal joining in the last decade. It was observed that the process also refined the microstructure in the weld zone. Based on this Rajiv Mishra et al. developed Friction stir processing (FSP) as a generic tool for microstructure refinement. Since then FSW and FSP have emerged as very effective joining and processing techniques. In this course, the participants can learn about these techniques in great details. Friction stir processing (FSP) is to be mentioned specially as the inventor of the process, Prof. Rajiv Mishra, himself is going to talk about it.

The course will cover all major aspects of FSW/FSP. The topics in the course module include Introduction to FSW and FSP, process fundamentals, tool geometry and material flow, Grain refinement by FSP, Effect of FSP on mechanical properties, Fabrication of composites by FSP and Surface engineering aspects of FSP. Some hands-on experience will also be provided to the participants through demonstration of the facilities available at IIT Madras.

<b>Dates for the Course</b>	<b>5<sup>th</sup> September, 2016 to 10<sup>th</sup> September, 2016</b>
<b>Host Institute</b>	<b>IIT Madras</b>
<b>No. of Credits</b>	<b>1</b>
<b>Maximum No. of Participants</b>	<b>50 - 60</b>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"><li>▪ You are a Materials/Metallurgical/Mechanical/Manufacturing/Production engineer or research scientist interested in welding, manufacturing and surface engineering.</li><li>▪ You are a student or faculty from academic institutions in the above mentioned and allied areas interested in learning about FSW/FSP or wanting to learn how to do research in this area.</li></ul>
<b>Course Registration Fees</b>	<p>The participation fees for taking the course is as follows: <b>Student Participants:</b> Rs.1000 <b>Faculty Participants:</b> Rs.5000 <b>Industry/ Research Organization Participants:</b> Rs.10000</p> <p>The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges.</p> <p><b>Mode of payment: Demand draft in favour of “Registrar, IIT Madras” payable at Chennai</b> The demand draft is to be sent to the Course Coordinator at the address given below.</p>
<b>Accommodation</b>	<p>The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: <a href="http://hosteldine.iitm.ac.in/iitmhostel">http://hosteldine.iitm.ac.in/iitmhostel</a></p>

## Course Faculty



**Prof. Rajiv Mishra** is a distinguished Research Professor at Materials Science and Engineering, University of North Texas. He is also Director, Advanced Materials and Manufacturing Processes Institute and UNTSite Director NSF Industry/University Cooperative Research Center for Friction Stir Processing. His research interests

are Friction stir welding and processing, ultrafine grained materials, superplasticity, composite materials, bulk metallic glasses, materials for alternative energy systems.



**Dr. Ranjit Bauri** is an Associate Professor in the Dept. of Metallurgical & Materials Engineering, Indian Institute of Technology Madras. His research interest includes Friction stir processing, composite materials, structure-property correlation, electron microscopy, solid oxide fuel cells and hydrogen energy.

## Course Coordinator

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