



ADVANCES IN WELDING AND JOINING TECHNOLOGIES

PROF. SWARUP BAG

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PRE-REQUISITES : There are no pre-requisites in educational qualification.

INTENDED AUDIENCE : Bachelor/Master/PhD students having background in Mechanical/Material Science/ Metallurgical engineering/ Production Engineering/Manufacturing Technology

COURSE OUTLINE :

The progress of several welding and joining processes is ever increasing with the development of new materials and their application in modern technologies. The micro joining and nano joining is even more challenging area with the development of miniature components. This course is primarily designed from fundamental understanding to the most recent advances in welding and joining technologies. The syllabus is oriented to the advancement of the joining technologies which is different from conventional welding and joining processes. The modules cover almost all the direction of joining technologies and it is blended with fundamental development to the recent technologies. Audience will be able to develop fundamental understanding on different perspective and recent development in this field through the lectures and reinforce their knowledge by solving assignments. This course is presented in a lucid and simplified way to make it enjoyable to the beginners.

ABOUT INSTRUCTOR :

Prof. Swarup Bag, The broad area of instructor is teaching and research interest of materials and manufacturing processes through computational models using finite element method and experiments. The instructor completed his Ph.D on "Development of bi-directional heat transfer and fluid flow model for reliable design of GTA and laser welding processes" from Indian Institute of Technology Bombay. Later he has worked at the Center for Material Forming (CEMEF), MINES Paris Tech, France in Metallurgy, Structure and Rheology (MSR) group. Soon after post-doctoral research experience, he joined in the Department of Mechanical Engineering, Indian Institute of Technology Guwahati as a faculty member. His primary area of research is fundamental process modeling of welding and joining technologies, optimization of manufacturing processes and recrystallization in metal forming processes. Dr. Bag has published about 56 journal papers, 45 Conference papers, and 18 book chapters related to welding and joining processes. He is the author of the book 'Computational models for GTA and laser welding processes' and recipient of 'Royal Arc Award 2009' from Indian Institute of Welding for the best PhD thesis in welding. The instructor is involved in teaching the subjects like 'Physics of Manufacturing Processes', 'Engineering Materials', 'Advanced Welding Processes', 'Mechanical Behavior of Materials', 'Solidification Processes' and 'Manufacturing Technology' at IIT Guwahati. The subjects broadly covers the fundamentals of manufacturing processes, mechanical metallurgy, theory of plasticity, heat transfer in manufacturing processes, crystallography, dislocation mechanism, phase transformation and solidification.

COURSE PLAN :

Week 1-2 : Fundamentals of welding and joining (04 lectures)

Assignments for Week 1 – MCQ and Fill blanks

Week 2-3: Laser and electron beam welding (02 lectures)

Assignments for Week 2 – MCQ and Fill blanks

Week 3-4: Solid state welding processes (03 lectures)

Assignments for Week 3 – MCQ and Fill blanks

Week 4-5: Computational welding mechanics (02 lectures)

Assignments for Week 4 – MCQ and Fill blanks

Week 5-6: Micro-joining and nano-joining (03 lectures)

Assignments for Week 5 – MCQ and Fill blanks

Week 6-7: Welding metallurgy (02 lectures)

Assignments for Week 6 – MCQ and Fill blanks

Week 7-8: Welding and joining of non-metals (02 lectures)

Assignments for Week 7 – MCQ and Fill blanks

Week 7-8: Metal transfer in welding and metal printing (02 lectures)