

Advanced Manufacturing & Material Processing with focus on Emerging Technologies for Industry Competitiveness

Overview

Within the hyped industry 4.0 concept and implementation, additive Manufacturing (AM) is a visionary approach to flexible-cell manufacturing for components for their difficult-to- make shapes, including intricate passageways. Like welding, AM relies on a layer-by-layer deposition of fused-metal feed-stock. AM and welding involve an energy source (e.g., Laser, Electron beam, Electric Arc, or Plasma), one or several feedstocks (e.g., powder, wire, sheets, and ribbon), and spatial displacement, as provided by a CNC stage or a multi-axis robot. From materials and metallurgical standpoints, welding and additive manufacturing, bring into play: (1) a multitude of complex and interacting physical phenomena such as heat and mass transfer, continuum mechanics, phase changes (including melting, solidification, allotropic transformations and diffusion phenomena such as epitaxial growth, grain growth and crystal orientation), (2) a number of process variables associated to the moving heat source (e.g., its power, power distribution, relative speed, size, all affecting energy density), its paths (e.g., linear, circular, oscillatory, etc), and added metal feed rate via powder, wire, or ribbon feed, all controlling deposit dimensions, aspect-ratio, and deposit properties, including internal defects. The effect of successive thermal cycles, as induced by the heat source moving away from an already deposited material, further adds to the overall challenge of developing industry-compliant components. The theory and practice of advanced welding and additive manufacturing will be the core of this course. Examples from industrial projects will be detailed.

The course is oriented to make researchers and engineers take a multidisciplinary approach to manufacturing with focus on processes, materials with particular emphasis on the gap between theory and practice. The roadmap to implement transfer from lab to industry will be highlighted by taking some case studies from manufacturing and service provider sectors. The end aim is to give some insights on technology survey and how pitfalls that stem from an ever increasing research papers can be avoided through rational approach based on risk analysis inherent to processes and materials. With this in view, welding and additive manufacturing will be discussed both from material science and industrial perspectives.

At the conclusion of this course, the participants are expected to:

1. Understand the material basics that govern manufacturing potentials
2. Identify the various options available to do additive manufacturing process from available welding sources.
3. Understand through some examples, the contours of industry innovation projects

Modules

A: Understanding Material basics that govern manufacturing potentials: 25th March 2019
B: Welding Science & Technology : 26th and 27th March 2019
C: From welding to Additive Manufacturing: 28th and 29th March 2019
D: Lab Demo and Examination: 30th March 2019

Number of participants for the course will be limited to fifty.

<p>You Should Attend If...</p>	<ul style="list-style-type: none"> • Student at all levels (B. E. / B. Tech / M. Sc (Engg) / M. Tech / Ph. D) and Faculty from other academic institutions and technical institutions • Executives, engineers and researchers from manufacturing, service and government organizations including R&D laboratories
<p>Fees</p>	<p>The participation fees for taking the course is as follows:</p> <p>Student Participants: Rs. 1000 Faculty Participants: Rs. 3000 Government Research Organizations: Rs. 5000 Industry Participants: Rs. 10000</p> <p>The above fee is towards participation in the course, course material, tutorials and assignments, and laboratory equipment usage charges.</p> <p>Modes of payment: <u>Online transfer:</u> Account Name: CCE IIT Madras Acc. No: 3640111110 Branch: SBI, IIT Madras Branch, Chennai IFSC Code: SBIN0001055 Swift Code: SBININBB453</p> <p>Note: The participants should be mentioned the purpose of GIAN while the transaction and have to send the transaction details to cceoffice@iitm.ac.in</p> <p style="text-align: center;">OR</p> <p>Demand draft in favour of “CCE IIT Madras” payable at Chennai. The demand draft is to be sent to the course coordinator at the address given below.</p> <p><u>Address of the Course Coordinator:</u> Dr. Sushanta Kumar Panigrahi Manufacturing Engineering Section Department of Mechanical Engineering Indian Institute of Technology Madras Chennai-600036 Email: ammpgian2019@gmail.com (preferred) Phone: 044-2257-4742(only office hours in case of urgency)</p>
<p>Accommodation</p>	<p>The participants may be provided with hostel accommodation, depending on availability, on payment basis. Further details about accommodation will be communicated with the shortlisted individual participants via email.</p>
<p>Registration Procedure</p>	<p>Please follow the following steps for the registration:</p> <ol style="list-style-type: none"> 1. Go to GIAN website (http://www.gian.iitkgp.ac.in/GREGN/index) First time users need to register and pay a one-time fee of INR 500 / 2. Enroll for the course: <i>Advanced Manufacturing & Material Processing with focus on Emerging Technologies for Industry Competitiveness</i>. Once you enroll for the course, an Enrollment/Application number will be generated, and the course coordinators will be notified.

The Faculty



Prof Surendar K Marya is an Emeritus Professor at Ecole Centrale Nantes since 2008. He was a full professor at ECN during 1999-2008, Head, Graduate school of “Applied Mechanics” during 2003-07 and Deputy Director, “International Relations” during 2003-05. Prof Marya has more than 150 research publications, 3 industrial patents, more than 30 keynote/invited presentations in reputed conferences and meetings (e.g. IIW/IIS, JWS, IWS, AWI, ASM, TMS, Am Inst. Phys., etc) and above 20 invited lectures in academic institutions across globe in his credit. He is one of the most recognised global researchers in the field of Welding and Forming. His research area includes Fusion and Solid-State Joining, Laser Arc hybrid Welding of line pipes, Friction Stir Welding (FSW) of high temperature materials, Linear Friction welding, Laser assisted FSW, Electro-magnetic Pulse Forming and Welding, Electro hydraulic forming, Superplastic forming and Additive manufacturing. He has also actively involved in several industrial consultant projects. Few of them are: Laser Arc Hybrid of line pipes, Rolled Welded Tube manufacturing, Friction Stir Welding of Steels, High penetration TIG Welding (infocus, ATIG, K Tig..). Prof Marya is French delegate to the international welding institute (IIW) and Board member of French Titanium Association..



Dr. Sushanta Kumar Panigrahi is an Associate Professor at Department of Mechanical Engineering, IIT Madras. He received his PhD from Indian Institute of Technology Roorkee in 2009. He worked as Post Doctoral Research Fellow at Missouri University of Science and Technology. He was also a Visiting Professor at Ecole Centrale Nantes, France during May-June 2016. His fields or research are: Solid state joining and processing, Sheet metal forming, Plasticity and deformation behavior of materials, Microstructural design for manufacturing, Manufacturing strategies of newer and difficult to manufacture materials. He has published 57 number of research papers in International journals and 35 in international conferences. The scopus citation index for his publications is 22. He is actively associated with sponsored projects with different funding agencies like; DST, ISRO, ARDB, DRDO, DSIR, MHRD, Renault Nissan and Magnesium Elektron North America. He is recipient of number of awards including “Emerging Professional Achievement Award-2018” from ASM International, Post-Doctoral Fellowship from Missouri University of Science & Technology, USA, Visiting Professor at Ecole Centrale Nantes, France; CSIR RA Fellowship etc.