



शिक्षा मंत्रालय  
MINISTRY OF  
EDUCATION



# Global Initiative on Academic Networks (GIAN) Program

under the aegis of Ministry of Education, Government of India

## One-week GIAN Course on Metal Additive Manufacturing (MAM) (Online mode) Dec 12-17, 2022

Organized by:

Department of Industrial and Production Engineering  
Dr B R Ambedkar National Institute of Technology Jalandhar-144011,  
Punjab, INDIA

 International Faculty

**Dr Ma Qian (Distinguished Professor)**

Deputy Director, Centre for Additive Manufacturing, RMIT University, Australia

 Chief Patron

**Shri. S C Ralhan (Chairman BOG)**

 Patron

**Prof. Binod Kumar Kanaujia (Director)**

 Co-Patron

**Prof. R K Garg (HAG)**

**Prof. Arvind Bhardwaj (HAG)**

**Dr. Lakhwinder Pal Singh (HOD)**

 Program Coordinator

**Prof. Vishal Santosh Sharma**

**Dr. Gurraj Singh**

 Local GIAN Coordinators

**Dr. Rajneesh Rani**

**Dr Shish Ram**

## Overview

Additive Manufacturing (AM) processes are playing an increasingly important role in the manufacturing industry, particularly in those areas where conventional manufacturing reaches its limitations in terms of both design freedom and manufacturing capabilities. Many metal AM processes are available today, including the powder-bed, powder-fed, and wire-fed processes based on laser, electron beam or plasma melting, and non-fusion metal AM processes based on sintering or solid-state joining. At the same time, the variety of metal feedstock materials suitable for metal AM continues to expand. On the other hand, our scientific understanding of both the metal AM processes and the performance of the AM-fabricated metal parts have advanced significantly. This has resulted in good niche applications in many industrial sectors. In the realm of manufacturing, this technological evolution has been regarded as an integral part of the fourth stage of industrialization, or Industry 4.0. It is conceivable that metal AM will play an indispensable role in the future metal manufacturing industry.



## Course Objectives

This course aims to provide a comprehensive introduction to the state-of-the-art research and practice of metal AM by focusing on the following:

- Essential fundamentals of the various metal AM processes will be introduced. Some of the relevant advanced metal manufacturing processes such as sintering, advanced solidification processing and metal injection moulding will be covered as well.
- Current commercially important metal AM processes such as laser powder bed fusion (L-PBF), electron beam PBF (EB-PBF), directed energy deposition (DED) including metal powder or wire deposition by laser, electron beam or plasma arc.
- Existing applications and case studies of metal AM technologies will be introduced to demonstrate the advantages and potential of metal AM. Future trends will be discussed as well.

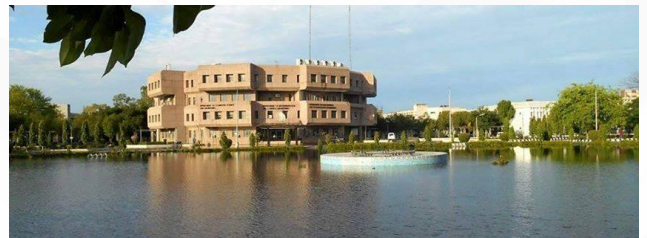
## Course Organization

Metal AM holds the great promise of increased flexibility in manufacturing, better quality and improved productivity, which enables companies to take on the challenges of producing more custom-made products with a short lead-time to market and a reformed supply chain. The resultant higher quality products and services ultimately enhance manufacturers' competitiveness.

## Who Can Attend this Course

- Executives, engineers and researchers from manufacturing, service and government organizations including R&D laboratories.
- Student students at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions.

## About the Institute



Dr B R Ambedkar National Institute of Technology was established in the year 1987 as Regional Engineering College and was given the status of National Institute of Technology (Deemed University) by the Government of India on October 17, 2002 under the aegis of Ministry of Human Resource Development, New Delhi. The Ministry of Human Resource Development, Government of India has declared the Institute as 'Institute of National Importance' under the act of Parliament-2007. The Institute offers B Tech, M Tech, M Sc, MBA and Ph D programs in several disciplines of Engineering, Science & Technology, and Management.

## About the Department

Department of Industrial and Production Engineering, at National Institute of Technology Jalandhar is emerging as a specialized branch of Mechanical Engineering with an objective of enabling engineers to improve efficiency and effectiveness of both manufacturing and service sector Industries A strong emphasis is laid on designing of such systems of Man Machine symbiosis, which facilitate optimum utilization of scarce resources It is concerned with the design of Man Machine System that attempts to optimize the resources, which are becoming increasingly scarce Its Alumni are occupying eminent positions in industries, research and academic institutions in India and abroad.



## Teaching Faculty



Dr Ma Qian



Distinguished Professor

Deputy Director, RMIT Centre for Additive Manufacturing, Royal Melbourne Institute of Technology (RMIT University) City Campus, Melbourne, VIC 3000, Australia.



ma.qian@rmit.edu.au

Professor Ma Qian is a Distinguished Professor of School of Engineering, Royal Melbourne Institute of Technology (RMIT University), and Deputy Director of the RMIT Centre for Additive Manufacturing (RCAM). The RCAM houses seven metal printers (powder bed fusion and directed energy deposition) and a variety of other printers for non-metallic materials. His current research focuses on metal AM, solidification processing, powder metallurgy, metallic biomaterials and dealloying. With his team members and collaborators, he has published 290 peer-reviewed journal articles, one co-authored monograph (Light Alloys: Metallurgy of the Light Metals, 2017, Elsevier), three edited Elsevier books on titanium alloys and their applications and 72 Conference Proceedings papers. Together, they have resulted in more than 15,000 (Scopus) or 20,000 (Google Scholar) citations by September 2022. He was a highly ranked metallurgist in 2020 based on the impact of publications in Scopus according to a study published by a team from Stanford University. He is a fellow of American Society for Metals International. He initiated the biennial international conference on Titanium Powder Metallurgy in 2011 and served as the Organizing Committee Chair and Conference Co-Chair for the 1st (2017) and 2nd (2019) Asia-Pacific International Conference on Additive Manufacturing in Melbourne (RMIT city campus), organized by Materials Australia.



Dr. Vishal Santosh Sharma



Professor

Department of Industrial and Production Engineering, Dr. B. R. Ambedkar National Institute of Technology, G. T. Road Bye pass, Jalandhar, Punjab 144 011, India



sharmavs@nitj.ac.in

Dr. Vishal S Sharma is working as an Professor in the Department of Industrial & Production Engineering at Dr. B.R. Ambedkar National Institute of Technology, Jalandhar, Punjab, India. He received his Doctorate in the field of Mechanical Engineering from Kurukshetra University. Subsequently he completed post-doctoral fellowship from École Nationale Supérieure d'Arts et Métiers, one of the Grand School from France. He also worked on two project at NTNU Norway namely Minimum Quantity Lubrication and Condition monitoring of Wind Turbines. He has 3 years of Industrial and 25 years of teaching /research experience. Also he has worked as Associate professor at WITS University-Johannesburg, South Africa for a period of two years. His teaching and research interests are Industrial Automation, Condition Monitoring, Additive Manufacturing and Machining. He has contributed more than 100 International journal publications in the domain of Machining, Additive Manufacturing and Composites. He has supervised 11 PhD scholar and 30 Masters Students. He currently serves as Associate Editor for Journal of Intelligent Manufacturing (Springer) & Alexandria Engineering Journal (Elsevier).



Dr. Gurraj Singh



Assistant Professor

Department of Industrial and Production Engineering, Dr. B. R. Ambedkar National Institute of Technology, G. T. Road Bye pass, Jalandhar, Punjab 144 011, India.



singhg@nitj.ac.in



+91-9888853154

Dr Gurraj Singh is working as Assistant Professor in the Department of Industrial and Production Engineering at Dr B. R. Ambedkar National Institute of Technology, Jalandhar, Punjab, India. He has completed his Ph.D., Masters and Bachelors all from the Industrial and Production Engineering Department of Dr. B.R. Ambedkar National Institute of Technology, Jalandhar. He has over 6 years of teaching experience. He has published over 30 research papers in reputed international journals with a citation count of over 1000. He is also associated with numerous journals as a reviewer. He holds an international patent as an inventor. He also has 3 books published under his name and has also acted as the sole Indian adaptor for a book by Wiley Publishers. His major areas of research are Machining, Sustainable manufacturing, Life cycle assessment and agricultural machinery. He has played the role of organizing several STCs and conferences and has also acted as a conference chair on a couple of occasions. He is frequently invited to deliver guest lectures in reputable institutes.



- Tentative Duration:  
12 Dec 2022– 17 Dec 2022 (6 days): 16.5 hours lectures and 2 hours Lab Sessions
- Preferred maximum number of students: 60

Course Schedule	Time	Topic	
DAY - 1	Lecture 1	1.5 hrs	<ul style="list-style-type: none"> <li>• Introduction to Additive Manufacturing (AM)</li> <li>• History of AM</li> <li>• Existing metal AM processes</li> <li>• Competitive manufacturing technologies</li> </ul>
	Lecture 2	1.5 hrs	<ul style="list-style-type: none"> <li>• Additive metallurgy</li> <li>• Essential concepts (melting, solidification, welding and sintering)</li> </ul>
	Lecture 3	1.0 hrs	<ul style="list-style-type: none"> <li>• Laser technologies for metal AM</li> </ul>
DAY 2	Lecture 4	1.5 hrs	<ul style="list-style-type: none"> <li>• Metal AM by L-PBF</li> </ul>
	Lecture 5	1.5 hrs	<ul style="list-style-type: none"> <li>• Metal AM by EB-PBF and binder jetting processes</li> </ul>
DAY 2	Lecture 5	1.5 hrs	<ul style="list-style-type: none"> <li>• Metal AM by metal powder deposition</li> </ul>
	Lecture 6	1.5 hrs	<ul style="list-style-type: none"> <li>• Metal AM by wire deposition and emerging metal AM processes</li> </ul>
DAY 4	Laboratory	2.0 hrs	<ul style="list-style-type: none"> <li>• Demonstration on Polyjet 3D printer/FDM/WAAM</li> </ul>
	Lecture 7	1.5 hrs	<ul style="list-style-type: none"> <li>• Defect formation in AM-fabricated metal parts</li> </ul>
DAY 4	Lecture 8	1.5 hrs	<ul style="list-style-type: none"> <li>• Mechanical performance of AM metal parts</li> </ul>
	Lecture 9	1.5 hrs	<ul style="list-style-type: none"> <li>• Metal AM lattice structures and applications</li> </ul>
DAY 5	Lecture 10	2.0 hrs	<ul style="list-style-type: none"> <li>• Wrap-up - Revision (1 hour)</li> <li>• Discussion (1 hour)</li> </ul>
	Examination		<ul style="list-style-type: none"> <li>• 2 hrs</li> </ul>
DAY 6	Presentations		<ul style="list-style-type: none"> <li>• 3 hrs</li> </ul>

## Registration Process



### Step-1:

One time Web (Portal) Registration: Visit GIAN Website at the link: <https://gian.iitkgp.ac.in/GREGN/index> and create login User ID and Password.

Fill up the blank registration form and do web registration by paying ₹500 online through Net Banking/Debit/Credit card. This provides him/her with life time registration to enroll in any number of the GIAN courses offered.

### Step-2:

Course Registration (Through GIAN Portal): Log in to the GIAN portal with the user ID and Password created. Click on "Course Registration" option given at the top of the registration form. Select the Course titled 'Metal Additive Manufacturing (MAM)' from the list and click on 'Save' option. Confirm your registration by Clicking on 'Confirm Course'.

### Step-3:

After successfully GIAN Registration the Course fee is to be deposited online in the institute account:

Students/Research Scholars	:	₹ 100
Faculty/Staff of Academic Institutions	:	₹ 200
Industry/Research Organizations	:	₹ 1000
Participants from abroad	:	USD 50
18% GST amount extra in each category of fee for external candidates		
<b>Last Date of Registration: 30 Nov 2022</b>		

### Payment of Programme Fee

Participants should pay registration fee through online mode (NEFT/IMPS), in the account details given below;

### Account Detail for NEFT:

Bank Name	Canara Bank
Account Name	Global Initiative on Academic Networks (GIAN)
Account Number	2945101004688
IFSC Code	CNRB0002945
SWIFT	CNRBINBBBMC

### Step-4:

After online payment of registration fee, fill up transaction ID/details in the google form with the link given below  
Registration Link

<https://forms.gle/MzdYfS7EdMLgwkg06>

Or scan this QR code

