



One-week GIAN course
on
ADVANCES IN 3D PRINTING/ADDITIVE MANUFACTURING:
FUNDAMENTALS TO PRACTICE WITH FUTURE RESEARCH POTENTIAL
AND RECOMMENDATIONS



Overview

3D Printing, also known as Additive Manufacturing, is one of the latest drivers in Advanced Manufacturing. The manufacturing industry considers 3D printing as a disruptive technology which could lead to the next industrial revolution, by changing the way we manufacture products. Compared to traditional manufacturing methods, 3D printing technology offers high flexibility in producing parts with complex design features for niche applications. Industries such as Aerospace, Medical, Automotive, and Tooling are the early adapters of this technology to tap the potential for maximizing the production efficiency.

Objectives

This course is aimed at giving a fundamental understanding on the state-of-the-art technology, all the way leading to practical implementation of the technology for industrial application. Focus will be on describing all the different processes under the umbrella of 3D printing technologies, which covers both polymer and metal based systems. Other topics include; Design fundamentals for 3D printing, Materials and Process selection, Quality and safety aspects, 3D printing standards development, and Recommendations for research potential in the field of 3D printing. Industrial case studies will be used to demonstrate how the technology has been implemented at various application segments. Understanding possibilities for manufacturing of these new components.

Course Contents		
Date 16 – 20 th December 2019	Day 1	<p><u>Fundamentals of 3D printing</u></p> <p>Lecture 1 Introduction and 3D printing overview</p> <p>Lecture 2 Description of the seven different 3D Printing technologies, 3D Printing file Creation, 3D printing process flow</p> <p>Lecture 3 Benefits and Limitations of 3D printing technology, Applications of the technology with case studies</p> <p>Tutorial 1 Match application to most appropriate technology using case studies</p>
	Day 2	<p><u>Design for Additive Manufacturing:</u></p> <p>Lecture 4 Design rules for Additive Manufacturing, Evaluating designs for Additive Manufacturing</p> <p>Lecture 5 Design for Manufacturability, Design for Assembly</p> <p><u>Design for Additive Manufacturing: Strategies</u></p> <p>Lecture 6 Design strategies for Additive Manufacturing, (Design for use, human factors, lead time, sustainability)</p> <p>Tutorial 2 Principle and considerations for Topology optimization using case studies</p>
	Day 3	<p><u>Materials and Process Selection for Additive Manufacturing</u></p> <p>Lecture 7 Polymer prototyping systems and materials, Polymer production systems and materials</p> <p>Lecture 8 Metal Production systems, Metallurgical considerations for metallic materials used in Additive Manufacturing</p> <p>Lecture 9 Use of Additive Manufacturing with conventional manufacturing processes, Approaches for Post processing in AM</p> <p>Tutorial 3 Optimal material and process selection for selected applications</p>

	Day 4	<p><u>Managing Quality and safety in Additive Manufacturing</u></p> <p>Lecture 10 Key Product safety issues in Additive Manufacturing, Design Validation for AM</p> <p>Lecture 11 Development and validation of Material standards, Development of processing standards</p> <p>Lecture 12 Identifying and managing material hazards, Identifying and managing machine hazards</p> <p>Tutorial 4 Quality and safety assessment of materials and process</p>
	Day 5	<p>Lecture 13: Latest advancements and industry practices in Additive Manufacturing</p> <p>Lecture 14: Recommendations for Research Potential in Additive Manufacturing with focus on Materials Development, Process Development, Modeling and Simulation, and Quality Control.</p> <p>Tutorial 5: Quality and safety assessment of materials and process (Contd.).</p> <p>Tutorial 6: Reactions and aspirations from the participants</p>
	Date of Examination: 20th December, 2019	
You should attend if you are...	<ul style="list-style-type: none"> ❖ PG/PhD students, Faculty members with research focus in Manufacturing, Production and Design Fields (Mechanical Engineering) ❖ Consulting Engineers working in Manufacturing and Design Fields ❖ Pre-Final/Final year Undergraduate students (Mechanical Engineering) 	
Registration Fees	<p>Participants from Abroad: US \$500</p> <p>Industry/ Research Organizations: Rs. 8000/-</p> <p>Faculty Members: Rs. 6000/-</p> <p>Students (Pursuing PhD / Master/ Bachelor Courses): Rs. 4000/-</p> <p>NIT Mizoram: Free (Faculty / Student / Researcher)</p> <ul style="list-style-type: none"> ❖ Registration Fee only includes attendance to Sessions, Course material and Lecture notes. ❖ UG and PG students need to produce a document as a proof of Student Identification and a letter of Nomination from their Institute/College. ❖ The Registration Fee has to be paid by DD drawn in favor of Director, NIT Mizoram, payable at SBI Bawngkawn, Aizawl 	

Registration

Register for the course online at <http://www.gian.iitkgp.ac.in/GREGN/index>. The last date of registration is **30th November, 2019**. To register or for any questions please send E-mail to basilkuriachen@gmail.com.

Number of participants for the course is limited to 50.

Course Faculty



Dr. Khalid Rafi

Head, Research and Development
UL International – Singapore.
E-mail: khalidrafi@gmail.com

Dr. Khalid Rafi leads research and development activities on Additive Manufacturing/3D printing at UL International - Singapore. His work involves developing materials and process validation program for 3D printing, master trainer for AM education, content development for AM training and education, and providing advisory services to industry for the adoption of 3D printing technology. Dr. Rafi serves as a member on the technical committees for international standards development such as ASTM F42, and ASME. He also serves as a reviewer for many international technical journals related to materials and manufacturing. Dr. Rafi holds a PhD and Master's degree in Metallurgical and Materials Engineering from Indian Institute of Technology Madras (IITM), and Post-Doctoral fellowships from University of Louisville, USA, and Nanyang Technological University, Singapore. Dr. Rafi has hands-on experience on multiple additive manufacturing technologies comprising both metal and polymers. He has more than 40 international publications on his credit, out of which 25 publications are in reputed international journals.

Course Coordinator



Dr. Basil Kuriachen

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Dr. Basil Kuriachen is an Assistant professor in the Department of Mechanical Engineering, National Institute of Technology Mizoram. His vivacity and dexterity towards abiding commitment to sublime work ethic conferred him with the Ph. D and M. Tech degree from NIT Calicut (2015) and M G University, Kottayam (2011) respectively. Prior to his joining at NIT Mizoram, he served as an Associate Professor in the School of Mechanical Science at VIT University, Vellore. His resolute research niches are in the field of micro and nano-machining processes, precision and ultra-precision machining, modeling and analysis in machining of 'difficult to machine' materials, etc. He has to his credit, 45 research publications in international referred journals and conferences alongside with two filed patents. Several M. Tech theses has been efficaciously completed through his versatile contribution and professionalism. In addition, he is an esteemed

reviewer of many international journals (SCI) and conferences (AIMTDR) of phenomenal repute.



Dr. Abhijit Sinha

Asst. Professor,

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Dr. Abhijit Sinha is an Assistant professor in the Department of Mechanical Engineering, National Institute of Technology Mizoram. He completed with excellence, the UG course from National Institute of Technology (NIT) - Agartala, Tripura, India and PG course cum Ph.D. from National Institute of Technology (NIT) - Silchar, Assam, India. His area of research interest includes Thermodynamics/ Energy and Exergy Analysis/ Thermal Design and Optimization/ Energy Conversion and Management/ Renewable and Sustainable Energy/ Fluid Mechanics and Hydraulic Machines/ Power Plant Engineering and Computational Fluid Dynamics (CFD). His academic laurels include 15 research publications in International/National referred journals and conferences, recipient of MHRD research fellowship (3 years), Outstanding Research Work on Women Tea Pluckers of Barak Valley, Assam, India (2012) and so on.

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(Under the aegis of MHRD- Global Initiative of Academic Networks)

16-20th December, 2019 at NIT Mizoram

Registration Form

GIAN Portal Application Number:

1. Name of the Candidate:
2. Category: Academic / Industry /Student
3. Category of Registration: SC/ ST/ General & OBC
4. Organization:
5. Address:

6. Mobile Number:
7. E-mail:
8. Highest Academic Qualification:
9. Payment Details:

Bank Draft/Ref./UTR Number:

Date:

Amount:

Drawn on:

Signature of the Candidate

Signature of the Head of the Dept. /Institution

Important Points:

- ❖ First, **register** in GIAN portal, <http://www.gian.iitkgp.ac.in/GREGN/index>. Get Application Number.
- ❖ Fill in this Registration Form. Take a print out of it. Get it signed by Corresponding Authority.
- ❖ Draw DD (amount specified in brochure) in favor of "**Director, NIT Mizoram**" payable at SBI Bawngkawn, Aizawl – 796012 OR The registration fee can be paid through online transfer (NEFT/RTGS) to the Account Number: **33755447886**, Name of the account holder: **National Institute of Technology Mizoram**, Bank: **SBI**, Branch: **Bawngkawn**, IFS Code: **SBIN0007059**. Candidate's first name and words "GIAN FEE" to be mentioned in the remarks. UTR/Ref. No. should be mentioned in the application form as well as a copy to be enclosed with the hard copy of application form.
- ❖ Send the hard copy of the filled in Registration Form along with DD/transaction receipt to: **Dr. Basil Kuriachen, Assistant Professor, Department of Mechanical Engineering, National Institute of Technology Mizoram, Chaltlang, Aizawl, Mizoram – 796 012**, Contact: +91-9947187133 and the scanned copy (soft copy) to E-mail: basilkuriachen@gmail.com.