



## One-week GIAN course

on

## LASER SURFACE ENGINEERING: FUNDAMENTALS AND APPLICATIONS



### Overview

The overarching goal of this course is to disseminate cutting-edge technology and research in the field of laser engineering. In today's world, lasers offer new and innovative solutions in many areas of manufacturing. Laser surface engineering techniques include surface heat treatment, alloying, cladding, coating, drilling, marking, machining and joining. With an introduction to physics of lasers and various types of lasers, fundamentals of laser-material interactions and their implications in various laser materials processing techniques along with innovative applications of laser surface engineering with emphasis in manufacturing will be discussed in this course. In-line with the current Government of India initiatives on MAKE IN INDIA AND SKILL INDIA, manufacturing industry personnel and researchers working in this area will immensely benefit from the expertise shared by the speaker on Laser Surface Engineering. gain in the shop and at the planning level. Thus, process planning is often seen as an art rather than science. However, with the rapid developments that are taking place in technologies, the experience itself will not be sufficient for process planning. It is necessary to incorporate sufficient scientific principles so that optimum process plans could be developed all the time by incorporating past data.

## Objectives

The primary objectives of the course are as follows:

- ❖ Introduce the participants to fundamental properties of laser beams as advanced materials processing and manufacturing tool.
- ❖ Provide the participants an overview of principles involved in laser-material interactions.
- ❖ Build broad understanding of laser based physical processes and their implications in surface engineering.
- ❖ Provide exposure to practical problems and their solutions through laser based surface engineering for manufacturing processes in various industries.
- ❖ Enable the participants to identify, select, and optimize laser materials processes through case studies of practical problems and probable solutions for innovative and potential next generation manufacturing processes.

Course Contents		
<p><u>Date</u> October 29<sup>th</sup> - November 02<sup>nd</sup>2018</p> <p><u>Date of Examination</u> November 02<sup>nd</sup>2018</p>	Day 1	<p><b>Lecture</b> Basics of Lasers – Laser Operation Mechanism, Properties of Laser Radiation, Basics of Lasers – Types of Industrial Lasers</p> <p><b>Tutorial</b> Problem/Questions solving/answering session with examples: Laser Radiation and Laser Operation</p>
	Day 2	<p><b>Lecture</b> Laser Materials Interactions: Absorption of Laser Radiation, Thermal Effects, Lasers in Surface Engineering: Laser Forming/Shaping, Laser Heat Treatment</p> <p><b>Tutorial</b> Problem/Questions solving/answering session with examples: Thermal Effects associated with Physical Processes during Laser Material Interaction</p>
	Day 3	<p><b>Lecture</b> Laser Surface Coating, Cladding and Alloying, Marking and Drilling, Laser Cutting, Laser Drilling, Machining</p> <p><b>Tutorial</b> Problem/Questions solving/answering session with examples: Thermal Effects specific to Industrial Processes</p>
	Day 4	<p><b>Lecture</b> Laser Surface Marking, Drilling and Texturing, Laser Surface Additive Manufacturing - Classification and Processing Philosophy</p> <p><b>Tutorial</b> Problem/Questions solving/answering session with examples: Compositional and Microstructural Effects during Surface Modification</p>
	Day 5	<p><b>Lecture</b> Innovative Applications of Laser Surface Engineering in Manufacturing</p> <p><b>Tutorial</b> Problem/Questions solving/answering session with examples: Design and optimize laser manufacturing process for potential application</p>

<p><b>You should attend if you are...</b></p>	<ul style="list-style-type: none"> <li>❖ PG/PhD students, Faculty members with research focus in Manufacturing, Production and Design Fields (Mechanical Engineering)</li> <li>❖ Consulting Engineers working in Manufacturing and Design Fields</li> <li>❖ Pre-Final/Final year Undergraduate students (Mechanical Engineering)</li> </ul>
<p><b>Registration Fees</b></p>	<p><b>Participants from Abroad:</b> US \$500  <b>Industry/ Research Organizations:</b> Rs. 5000/-  <b>Faculty Members:</b> Rs. 3000/-  <b>Students (Pursuing PhD / Master/ Bachelor Courses):</b> Rs. 2000/-  <b>NIT Mizoram:</b> Free (Faculty / Student / Researcher)</p> <ul style="list-style-type: none"> <li>❖ Registration Fee only includes attendance to Sessions, Course material and Lecture notes.</li> <li>❖ UG and PG students need to produce a document as a proof of Student Identification and a letter of Nomination from their Institute/College.</li> <li>❖ The Registration Fee has to be paid by DD drawn in favor of Director, NIT Mizoram, payable at SBI Bawngkawn, Aizawl</li> </ul>

## Registration

Register for the course online at <http://www.gian.iitkgp.ac.in/GREGN/index>. The last date of registration is **25<sup>th</sup> October, 2018**. To register or for any questions please send E-mail to [basilkuriachen@gmail.com](mailto:basilkuriachen@gmail.com)

**Number of participants for the course is limited to 50.**

## Course Faculty



**Prof. (Dr.) Narendra B. Dahotre**  
University Distinguished Research Professor  
Department of Materials Science and Engineering  
University of North Texas, 1155 Union Circle #305310,  
Denton, Texas 76203, USA. Tel:1-940-369-7678  
Web: [https://www.researchgate.net/profile/Narendra\\_Dahotre](https://www.researchgate.net/profile/Narendra_Dahotre)

**Dr. Narendra B. Dahotre** is a University Distinguished Research Professor and former Chairman (2010- 2013) of the Department of Materials Science and Engineering, University of North Texas (UNT), USA. He is founding Director of Center for Advanced Orthopaedics at University of North Texas with international academic/industrial members collaborating on R&D and implementation of science/technology. Prior to joining UNT, he held a joint

faculty appointment with Oak Ridge National Laboratory and Department of Materials Science and Engineering of the University of Tennessee-Knoxville (2002-2010). Moreover, he was Director, Deputy Director, and a senior faculty member of the Center of Research Excellence for Laser Applications at the University of Tennessee (1995-2010).

Dr. Narendra B. Dahotre has been recognized for the pioneering contributions to fundamental understanding and engineering of laser materials interactions along with implementation of high power lasers in materials processing and advanced manufacturing with primary emphasis on surface engineering, additive manufacturing, and machining. In this regard, he is internationally known for his work on fundamentals and applications of laser surface engineering of metals, ceramics, composites, and biomaterials and laser machining of ceramics. His work in the area of biomedical engineering is focused on custom designed low-cost hard tissue implants via laser assisted additive manufacturing and surface engineering. So far his work in the area of laser processing/manufacturing of biomaterials has resulted in over 35 publications, authorship of one book (Machining of Bones and Hard Tissues Springer International Publishing, AG Switzerland, 2016) and one issued US patent (Laser Assisted Machining (LAM) of Hard Tissues and Bones, US Patent #9,387,041, 2016) and two pending US patents. His research has been extensively funded by the government and industrial organizations including but not limited to Department of Defense, Department of Energy, National Science Foundation, GM, Ford, Honda, ALCOA, and Babcock & Wilcox.

Moreover, his work over 25 years on laser materials-interactions has been compiled in 4 books as author and 13 books as editor in areas of laser materials processing/manufacturing and surface engineering, 16 issued and 2 pending U.S. Patents, and 267 publications. He has guided/advised/mentored 17 MS students, 14 PhD students, and 11 post-doctoral fellows. Additionally, he is fellow of prestigious organizations, namely American Institute of Medical and Biological Engineering (2016), World Innovation Foundation (2014), National Academy of Inventors (2013), Materials Research Society-India (2011), Society of Manufacturing Engineers (2010), American Association of Advancement of Science (2009), Indian Institute of Metals (2009), American Society for Mechanical Engineers (2008), and American Society for Metals International (2004). He is a founding Editor-in-Chief of International Journal of Additive and Subtractive Materials Manufacturing, Editor of Optics and Laser Technology, and currently serving on 8 editorial boards of refereed journals in the area of materials science and engineering. He is Professor Brahm Prakash visiting Chair at Indian Institute of Science, Bangalore, India (2013), Honorary Guest Professor, Shandong University, Jinan, China, Honorary Professor, Northwestern Polytechnical University, Xian, China and Honorary Advisor of Research, Narayana Medical College and Hospital and Narayana Institutions, Nellore, India (2012-Present). He is recipient of University of North Texas Foundation Faculty Leadership Award (2016), 2013 TMS-Materials Processing and Manufacturing Division Distinguished Engineer/Scientist Award, 2006 R&D 100 Award, 2006 University of Tennessee

Chancellor's Research and Creativity Achievement Award, and 2006 University of Tennessee College of Engineering Research Fellow Award.

## Course Coordinators



**Dr. Basil Kuriachen**

Assistant Professor, Department of Mechanical Engineering  
National Institute of Technology Mizoram

Mobile: +91 - 9947187133

E-mail: basilkuriachen@gmail.com

Web page: [http://nitmz.ac.in/emp\\_profile.aspx?nDeptID=30140](http://nitmz.ac.in/emp_profile.aspx?nDeptID=30140)

**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/National 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. Surender Ontela**

Assistant Professor, Department of Mathematics  
National Institute of Technology Mizoram

Mobile: +91 - 9436792174

E-mail: surender.math@nitmz.ac.in

Web page: [http://nitmz.ac.in/emp\\_profile.aspx?nDeptID=30131](http://nitmz.ac.in/emp_profile.aspx?nDeptID=30131)

**Dr. Surender Ontela** is an Assistant professor in the Department of Mathematics, National Institute of Technology Mizoram. He completed with excellence, the UG courses from NIT Warangal (Mathematics-I, II, III and Mathematics-IV), NIT Mizoram (Mathematics-I, II, Numerical Methods & Probability Theory, Mathematical Methods) and PG course from NIT Warangal (Numerical & Optimization Techniques). His academic laurels include 19 research publications in International/National referred journals and conferences, qualified for Assistant Professor/Lectureship - SET/SLET (APSET-2012), CSIR International Travel Grant for Research Scholars and so on.

**A**  
**One Week GIAN Course**  
**on**  
**A LASER SURFACE ENGINEERING: FUNDAMENTALS AND APPLICATIONS**  
(Under the aegis of MHRD- Global Initiative of Academic Networks)  
**29<sup>th</sup> October - 02<sup>nd</sup> November 2018 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. Demand Draft Details:

Bank Draft 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 favour of “**Director, NIT Mizoram**” payable at SBI Bawngkawn, Aizawl – 796012 and send the hard copy of the filled in Registration Form along with DD to: **Dr. Basil Kuriachen, Assistant Professor, Department of Mechanical Engineering, National Institute of Technology Mizoram, Chaltlang, Aizawl, Mizoram - 796012**, Contact: +91-9947187133, E-mail: [basilkuriachen@gmail.com](mailto:basilkuriachen@gmail.com).