

Advances in ultra-precision machining processes

Overview

Today the demand for micro devices and components is growing at a rapid pace in various areas such as aerospace, energy, optical, electronics and bio-medical industries. Miniaturization has pushed manufacturing improvements related to attainable accuracies and tolerances to the sub-micron range. This can be achieved by employing ultra-precision manufacturing processes such as single point diamond turning. Various ultra-precision material removal processes can be classified into mechanical, physical, or chemical processes. While physical and chemical machining processes are restricted to specific materials and applications, machining by mechanical means is considered to be almost universal in its applicability to almost all the materials. However, one of the formidable challenges to analyze and improve the mechanical based ultra-precision machining processes is that the mode of material removal at fine precision level changes from continuous to discrete. An accurate understanding of this phenomena is important.

In view of this, a 2-credits two weeks (20 lecturing hours) course on “Advances in ultra-precision machining processes” is organized at state-of-the-art E-classroom developed at the Center for Education Technology (CET), IIT Guwahati during July 4th to July 16th 2016. The course will be conducted by Dr. Saurav Goel (Queens University, UK) and Dr. Shrikrishna N. Joshi (IIT Guwahati).

The course has two modules. First module focuses on fundamentals of ultra-precision machining processes such as classification of ultra-precision machining processes, size effects, differences between macro, micro and nano machining, scaling issues, differences between mechanical, physical and chemical machining processes. In the second module, the course participants will learn the topics viz. molecular dynamics and its application to ultra-precision machining processes, latest developments in diamond machining and hybrid micromachining processes, newer approaches of micro-laser assisted machining, surface defect machining and vibration assisted machining. Course participants will learn these topics through lectures and assignments. Also case studies will be shared to stimulate research motivation of participants.

Modules	A: Ultra-precision machining : July 4 – July 8 (minimum 2 hours daily) B: Molecular dynamics and its application to study ultra-precision machining : July 11 – July 15 (minimum 2 hours daily) Evaluation / examination : July 16, 2016 Number of participants for the course will be limited to fifty.
You Should Attend If...	<ul style="list-style-type: none"> ▪ you are a BTech/MSc/MTech/PhD student or faculty from academic institution interested in learning how to do research in diamond machining, hybrid micromachining processes, micro-laser assisted machining, and vibration assisted machining ▪ you are an executive or engineer or researcher from manufacturing, service and government organization including R&D laboratories and interested in developing technologies for ultra-precision micro and nano level manufacturing especially in machining and finishing
Fees	<p>The participation fees for taking the course is as follows: Students : Rs. 1000 (will be refunded after the course) Participants from Abroad : US \$500 Industry/ Research Organizations: Rs. 30000 Academic Institutions: Rs. 10000</p> <p>The above fee include instructional material, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. Reading material in the form of printed notes/book will be supplied during the course. The participants will be provided with accommodation and fooding on payment basis.</p> <p>For more info about registration and course please visit: http://www.gian.iitkgp.ac.in/GREGN/index http://www.iitg.ac.in/aupl/</p>

The Faculty



Dr. Saurav Goel is an Assistant Professor in the School of Mechanical and Aerospace Engineering at Queen's University of Belfast, UK. He has worked progressively over the years by developing the skill sets and knowledge on ultra-precision machining and application of atomic simulations to study these processes. His research interests spans from Molecular Dynamics simulation, Multiscale Simulations, Brittle-ductile transition, Thermal Spraying, Layer by Layer (LbL) assembly, Nanoindentation, Nanoscratching, Single point diamond machining, Hard turning of steels, Bonnet polishing, Dynamic mechanical Testing (DMS), Precision Drilling, Composite Materials Characterisation and Material characterization of thin films like DLC.



Dr. Shrikrishna N. Joshi is an Assistant Professor in the Department of Mechanical Engineering, IIT Guwahati. His research interests are Single point diamond turning; Laser based manufacturing; computer aided design and manufacturing (CAD/CAM); Manufacturing process modeling and optimization; and Mechatronics. He has developed a web course on "Mechatronics and Manufacturing Automation" for National Programme on Technology Enhanced Learning (NPTEL) funded by Ministry of Human Resource Development, Government of India.

Course Coordinator

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