

**One Week Short Term Course
on**

Micro Manufacturing: Challenges and Opportunities

04 – 08 January, 2021

at

Punjab Engineering College



Jointly Organized

by

**Punjab Engineering College
(Deemed to be University)
Sector-12, Chandigarh-160012**

&

**National Institute of Technology Patna
Ashok Rajpath, Patna-800005**

Coordinator:

Dr. Sarbjit Singh (PEC)

Joint-Coordinator:

Dr. Sanjeev Kumar (PEC)

Dr. Amit Kumar (NITP)

Convenor:

Dr. Abhishek Singh (NITP)

INSTITUTE DETAILS (PEC)

Punjab Engineering College (Deemed to be University) (PEC) having its roots in Lahore as Mugalpura Engineering College since 1921, moved to its present campus in 1953 as PEC affiliated to Panjab University. The institute became Deemed to be University in 2003 through a MHRD notification. It is a Grant-in-Aid institution under administration of Union Territory of Chandigarh, Government of India. The institute has a 146 acres sprawling and pious campus. The academic and administrative processes are similar to IITs in the country. The institute offers 8 Undergraduate (B.Tech.) Programmes and 13 Post graduate (M.Tech.) Programmes in various disciplines of Engineering and Technology. After becoming University, the institute has also started PhD programme in various disciplines of engineering, sciences, management, humanities and social sciences. The admission to UG and PG programmes are made through national level examinations namely JEE (Mains) and GATE respectively. There are nine academic departments and four centres of excellence in the institute.

INSTITUTE DETAILS (NIT Patna)

National Institute of Technology Patna is the 18th National Institute of Technology created by the Ministry of Human Resource Development, Government of India after rechristening the erstwhile Bihar College of Engineering, Patna. The Institute has highly qualified faculty of high calibre in various disciplines. Institute offers B.Tech, M.Tech & Ph.D programmes in respective field of Engineering, Sciences and Technology with well-equipped laboratories. The institute is situated on the south bank of holy river Ganges behind Gandhi Ghat, one of the most important and reverential place of Patna. The Gandhi Ghat is associated with the immersion of ashes of Father of the Nation Mahatma Gandhi in the river Ganges. The campus has a picturesque river view with historic heritage building presenting a spectacle of architectural delight and natural beauty.

CONTENT OF THE FACULTY DEVELOPMENT PROGRAMME

**Topic: Micro Manufacturing: Challenges and
Opportunities**

In recent years, the applications of miniaturized products have dominantly increased in the field of optics, biomedical, automobile, Lab-on-chip devices, micro electromechanical systems (MEMS) etc. The fabrication of miniaturized products with dimensions in the range of 1-999 μm is known as micro-manufacturing. Basically, the micro-manufacturing techniques are categorized into two parts named as; lithographic based techniques and non-lithographic based micro-manufacturing techniques. The lithographic based techniques include the chemical etching, photolithography, LIGA method etc. The non-lithographic techniques are based on the fundamentals of mechanical micro-machining, electro physical and chemical machining i.e. electrical discharge machining (EDM), electrochemical machining (ECM), laser beam machining (LBM) and electrochemical discharge machining (ECDM) etc. The applications of lithographic based techniques are limited to silicon and glass materials. On the contrary, the non-lithographic techniques are universally applicable to wide range of materials. The major challenges in micro-manufacturing are poor surface characteristics due to heat affected surface layer and micro-cracks on machined surface. However, the thermal effect is minimized in case of micro-machining by ECM. Still, the atomic scale accuracy is a major challenge to researchers in chemical based machining processes. Importantly, the acceptability of miniaturized products in different applications depends upon precision, atomic scale accuracy, surface integrity, micro-component life and cost etc. Usually, these criteria are not fulfilled by single micro-manufacturing process. To address aforementioned requirements of miniaturized products, a single micro process may be converted to sequential machining and hybrid machining. The term sequential machining represents the incorporation of two micro-machining process in sequence on single machine tool.

Based on the different challenges in micro-machining, the following opportunities are available:

- Modelling and simulation of micro processes on atomic scale.
- Incorporation of two or more micro-machining processes for development of micro-products i.e. sequential machining and hybrid machining.
- Exploration of mechanics and mechanism of hybrid machining process for fundamental physics behind micro-machining, micro-chipping etc.
- Assistance of different non-contact sensors of high resolution on machining setup for in-situ dynamic measurement of micro-components, tool accuracy and metrology aspects for atomic scale machining.
- Sustainability assessment of micro-machining process in terms of energy consumption, machining cost, environmental regulations and hazardous waste etc.

TOPICS TO BE COVERED:

Micro-Manufacturing Processes:

Thermal processes

- Micro-Electric Discharge Machining
- Micro-Laser Beam Machining
- Micro-Electron Beam Machining
- Micro-Plasma Arc Machining

Mechanical Processes:

- Micro-Ultrasonic Machining
- Micro-Abrasive Jet Machining
- Micro-Abrasive Water Jet Machining
- Micro-Abrasive Flow Machining
- Magnetic-Abrasive Flow Machining

Chemical Processes:

- Electrochemical Micro Machining
- Electrochemical Discharge Machining

Traditional Machining Processes:

- Micro-Turning
- Micro-Milling
- Micro-Drilling

- Micro-Grinding

Hybrid Micro Machining Processes.
Mathematical Modelling of Micro Processes.
Concept of Sustainability and Sustainable Micro Machining Processes.

DATES TO REMEMBER:

Receipt of application: **Dec 04, 2020**

Information to selected candidates: **Dec 07, 2020** (By email)

Final registration cum submission of fee: **Dec 21, 2020**
Short Term Course duration: **Jan 04, 2021 to Jan 08, 2021**

ADDRESS FOR CORRESPONDENCE:

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TARGET PARTICIPANTS:

The course is exclusively designed for young faculty and budding research scholars keen to pursue research in the innovative field of micro manufacturing. The participants will be able to understand challenges and opportunities posed by the micro-manufacturing processes. The course will provide them a deep understanding of micro-manufacturing, mathematical modelling, effect of process parameters, basic fundamentals or physics behind the materials removal, challenges in measurements, surface characteristics features of the machined parts, its applications etc.

REGISTRATION FEE:

Faculty/Industry Persons (Offline)	6000/- (Includes boarding and lodging on sharing basis at Institute hostel/cum guest house)
	3500/- (without boarding and lodging)
Research Scholar/Others (Offline)	4000/- (Includes boarding and lodging on sharing basis at institute hostel/cum guest house)
	2500/- (without boarding and lodging)
Online	1000/- (for all)

“Payment details will be shared with selected candidates only”



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on

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(Jan 04-Jan 08, 2021)

DEPARTMENT OF MECHANICAL ENGINEERING

PUNJAB ENGINEERING COLLEGE

(Deemed to be University)

Chandigarh-160012, U.T., India

LINK FOR REGISTRATION:

<https://forms.gle/7s45DHJrD4WcCRLD6>



Scan for online registration form