

A short term Course  
on  
**MICROMANUFACTURING**

June 29 – July 03, 2015

(Registration form should contain the following information. It should be printed (not hand written) on A4 size paper)

Name:  
Position:  
Department:  
Institution/Organization:  
Address:  
E-mail Address:                      Mobile No.:  
Telephone No.:

Educational Background (starting from B.E./B.Tech):

Degree	Field of Specialization	Institution	% marks/ CGPA/CPI	Year	Rank in the class
B.E./B.Tech.					
M.E./M.Tech.					
Ph.D.					

**Areas of Research Interest:** \_\_\_\_\_

Have you attended any course on "Micromanufacturing" at IITK or elsewhere: Yes / No  
(If yes, please give details.....)

**Note:** Candidates from the teaching Institutions should send the DD only when they get the selection letter through e-mail.

**Payment details**

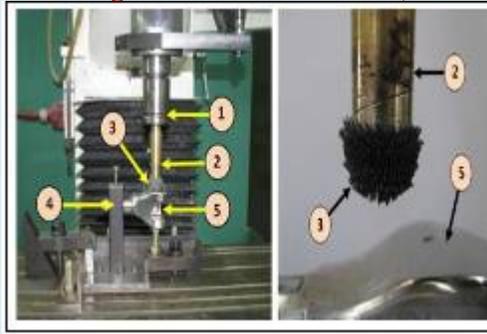
Demand draft no. \_\_\_\_\_ dated \_\_\_\_\_  
Amount in Rs. \_\_\_\_\_ drawn at \_\_\_\_\_

**Recommendation                      Signature of applicant**

Signature of Head of the Department  
/ Head of the organization (with seal).

**Note:** Correspondence will be done through e-mail.  
Application's hard copy should definitely be sent by post.

**Nano-finishing of Free form Surfaces (Knee - Joint)**



(1- CNC milling M/c head, 2- MR finishing tool, 3- MR polishing fluid, 4- fixture for knee joint implant (Ti6Al4V), 5- knee joint implant)

**\*IMPORTANT DATES**

**For College Teachers**

- Receipt of applications: May 23, 2015
- Intimation to the selected candidates: May 31, 2015
- Receipt of the draft: June 08, 2015
- Short term course duration: June 29 to July 03, 2015

**For Participants from Industries and R&D Labs**

- Receipt of applications: May 30, 2015
- Intimation to the selected candidates: June 06, 2015
- Receipt of the draft: June 13, 2015
- Short term course duration: June 29 to July 03, 2015

**ADDRESS FOR CORRESPONDENCE**

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A short term course  
On  
**Micromanufacturing**

For Engineering College Teachers,  
Practicing Engineers and Scientists

June 29 – July 03, 2015

Sponsored by  
**All India Council of Technical Education,  
New Delhi**

Coordinators: **Dr. V. K. Jain, Dr. J. Ramkumar,  
Dr. Niraj Sinha**



Mechanical Engineering Department    All India Council of Technical Education,  
Indian Institute of Technology                      New Delhi  
Kanpur

## INTRODUCTION

An intensive course on **Micromanufacturing** will be offered from June 29 to July 03, 2015, under the Continuing Education Programme of I.I.T. Kanpur. It is sponsored by Quality Improvement Programme, All India Council of Technical Education, New Delhi. The course is designed to cater the needs of teachers, scientists from R & D houses and Labs., and practicing engineers from industries. This programme will be specifically useful for persons who are concerned with training / teaching, research, and industrial applications of micromachining, micro- to nano-finishing, micromolding, microwelding, microcasting, nanometrology, etc.

## OBJECTIVE

Nowadays, meso (1-10 mm) and micro (1-1000  $\mu\text{m}$ ) manufacturing are emerging as an important technology specially in the areas where miniaturization yields economic and technical benefits, namely, aerospace, automotive, optical, biomedical and similar other areas.

With the advent of numerical control (NC) in machine tools, accuracy, uniformity and repeatability of the machined parts have improved and manufacturing has gained the flexibility. With time, the miniaturization of the machines and devices is leading to the demand of parts with dimensions of the order of a few micrometers to a few hundred micrometers. Scientists and researchers are engaged in developing even the nano featured products such as NEMS (Nano Electro Mechanical System). It is quite safe to say that there is a need to have the manufacturing processes, which are capable of dealing with atomic and molecular dimensions. Hence, such processes come under the category of  $\mu$ -manufacturing.

The demand of industries for  $\mu$ -manufacturing of various types of materials (metallic, ceramics and plastics) is increasing day by day. Miniature parts have applications in various industries like electronics, medicine, communication, avionics and others. Some of the examples of the products that require  $\mu$ -manufacturing are micro holes in fiber optics, micro nozzles for high temperature jets, micro molds etc. Conventional methods (turning, drilling, etc.) with modified versions have been employed for  $\mu$ -machining of various types of materials.

In case of advanced machining processes, material is removed at micro level either by mechanical means (USM, AJM, MAF), thermal erosion (EBM, LBM), anodic dissolution (ECM), chemical reaction or combination of two or more than two processes, called *hybrid machining*.  $\mu$ -machining can be placed in the group of precision machining and ultraprecision machining.  $\mu$ -machining can be divided into two categories like bulk  $\mu$ -machining where comparatively large amount of material is removed when

compared with surface  $\mu$ - machining where the objective is mainly to improve surface finish in the sub-micron range.

The surface roughness values obtained by these processes have been reported as low as the size of an atom or even a fraction of the size of an atom. Now, the natural question arises, how to measure such surface roughness or which equipment should be used to measure such low values of surface roughness? Atomic force microscope is one of the latest equipment used to measure such a low value of surface roughness.

The basic objective of the present course is to acquaint the participants with the principles, basic machine tools, developments in the  $\mu$ -manufacturing processes, micro and nano metrology and research trends in the area of  $\mu$ -manufacturing processes. Thus, this short term course will deal with various areas of micromanufacturing including measurement techniques.

## COURSE CONTENTS

- **Introduction to Micromanufacturing**
- **Traditional Micromachining**
- **Advanced of Micro- / Nano- Machining**  
*Mechanical Micromachining, Thermal Micromachining, Electrochemical and Chemical Micromachining, Ion Beam Machining, Photochemical Etching, X-ray Lithography.*
- **Nano-finishing**  
*Abrasive Flow Finishing, Magnetic Abrasive Finishing, Magnetorheological finishing, etc.*
- **Microforming**  
*Micro-Sheet Forming, Micro-Laser Forming, etc.*
- **Microjoining Technology**  
*Laser Beam Microwelding/Microjoining, Electron Beam Microwelding/Microjoining, etc.*
- **Microcasting.**
- **Microsensors / Microactuators.**
- **Micro- / Nano-Metrology**

## FACULTY

Eminent researchers and speakers shall be drawn from various disciplines of different IITs and other institutions of higher learning, and related industries and R&D organizations of different parts of the country.

## COURSE FEE

### FOR COLLEGE TEACHERS

There is no course fee for the sponsored teachers from engineering colleges (**only those approved by AICTE, New Delhi**). They will be paid to and from III AC class train fare via shortest route (**strictly on production of ticket**), and free boarding and lodging in the hostel of IIT Kanpur. The applications of the teachers from the accredited colleges should reach the course coordinator latest by 23<sup>rd</sup> May, 2015 giving the information as shown in the Proforma. The engineering College teachers are required to send hard copy of application duly *recommended by the Head of the Institution/Department*. The candidate should have minimum qualification as B.E. / B.Tech. in Mechanical / Production / Production and Industrial Engineering. However, the candidate with M.E. / M.Tech. in Production / Production and Industrial Engineering will be given preference. The candidates with Ph.D. degree in any of the above mentioned areas are most welcome, and will be given higher preference.

**For the selected candidates:** The selected candidates will be re-requested to send a refundable caution deposit of Rs.1000/- to ensure their commitment for participation in this course. This amount will be refundable only to those teachers who attend the course (**Please do not send the money until you get selection letter / e-mail**). Please write your name on the back of the demand draft.

### FOR PARTICIPANTS FROM INDUSTRIES AND R & D LABS

Private and public sector industries, R & D Labs, teaching Institutions and other organizations are welcome to depute their executives, managers, teachers and engineers to participate in the course. The sponsoring organizations are required to pay a registration fee of Rs.7500/- per participant. The participants will have to make their own arrangement to meet their travel and other expenses. Limited boarding and lodging can be arranged in IITK guest house or IITK hostels based upon **prior request and on the payment basis, provided it is available**. Application on a separate sheet giving information shown in the proforma should reach the course coordinator latest by 30<sup>th</sup> May, 2015.

\*\* For Ph.D. and M.Tech. / M.E. Scholars, the registration fee is Rs. 2500/-. Please note that these scholars have to bear their boarding & loading and travel expenses themselves.

## MODE OF PAYMENT

The registration fee or refundable caution money deposit should be sent by bank draft payable at the "Union Bank of India, IIT Kanpur" Branch and drawn in favour of "**Micromanufacturing**".

The list of the selected candidates will also be displayed on the home page of the coordinator, as given below.

Home page: <http://home.iitk.ac.in/~vkjain/>