

INDIAN INSTITUTE OF TECHNOLOGY
KANPUR

A Short term School on
MICROMANUFACTURING

Sept.30 - Oct.04, 2011

(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.: Fax 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, Give details.....)

Payment details

Demand draft no. _____ dated _____

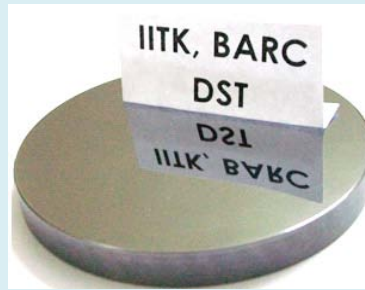
Amount in Rs. _____ drawn at _____

Recommendation

Signature of applicant

Signature of Head of the Department
/ Head of the organization.

Note: Correspondence will be done through e-mail, but application's hard copy is required.



Nanofinishing of silicon (8 nm) by CMMRF process and stainless steel tube (16 nm) by R-MRAFF process

***IMPORTANT DATES**

For College Teachers

- Receipt of applications: Aug. 30, 2011
- Information to the selected candidates: Sept. 05, 2011
- Receipt of the draft: Aug. 16, 2011
- Short term school duration: Sept.30 to Oct. 04, 2011

For Participants from Industries and R&D Labs

- Receipt of applications: Sept. 10, 2011
- Information to the selected candidates: Sept. 16, 2011
- Receipt of the draft: Sept. 24, 2011
- Short term school duration: Sept. 30 to Oct. 04, 2011

ADDRESS FOR CORRESPONDENCE

Dr. V. K. Jain
Mechanical Engineering Department
Indian Institute of Technology Kanpur
Kanpur- 208016
E-mail:-edtvkj@iitk.ac.in
Phone:- 0512-259 7916(O), 259 8646(R)
Fax:- 0512-259 7408
*Home page:- <http://home.iitk.ac.in/~vkjain/>

A short term school

On

Micromanufacturing

For Engineering College Teachers,
Practicing Engineers and Scientists.

Sept. 30 – Oct. 04, 2011

Sponsored by

Quality Improvement Programme
All India Council of Technical Education,
New Delhi.
And
Bhabha Atomic Research Center, Mumbai.

**Coordinators: Drs. V. K. Jain, V. K. Suri,
R. Balasubramaniam**



Mechanical Engg. Department,
Indian Institute of Technology,
Kanpur.



Bhabha Atomic
Research Center,
Mumbai.



Quality Improvement Prog.
All India Council for Technical
Education, New Delhi.

INTRODUCTION

An intensive course on MICROMANUFACTURING will be offered from Sept. 30 – Oct. 04, 2011, under the Continuing Education Programme of I.I.T. Kanpur. It is sponsored by All India Council of Technical Education and Bhabha Atomic Research Center, Mumbai. 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 micro machining, micro- to nano-finishing, micromolding, microwelding, microcasting, nanometrology, etc.

OBJECTIVE

Nowadays, meso (1-10 mm) and micro (1-1000 μm) 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. The meso- and micro-manufacturing processes can be applied to metallic as well as non-metallic materials.

With the advent of numerical control (NC), computer numerical control (CNC) and direct numerical control (DNC), 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 ($1\text{mm}=10^6\text{m}$) 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 μ -manufacturing.

The demand of industries for μ -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 μ -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 μ -machining of various types of materials. Conditions for chip production for conventional material removal processes are affected by molecular scale phenomena. The depth of cut is in the range of nanometers ($=10^9\text{m}$).

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. μ -machining can be placed in the group of precision machining and ultraprecision machining. μ -machining can be divided into two categories like bulk μ - machining where comparatively large amount of material is removed when compared with surface μ - machining where the objective is just 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 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 μ -manufacturing process, and research trends in the area of μ - manufacturing process. Thus, this short term school will deal with various areas of micromanufacturing including measurement technique.

COURSE CONTENTS

Introduction to MICROMANUFACTURING

- **Traditional Micromachining**
 - a) Micromilling.
 - b) Microturning.
 - c) Microgrinding.
- **Advance Micro / Nano– Machining**
 - a) Abrasive Micromachining.
 - b) Diamond Microgrinding / Microturning.
 - c) Ultrasonic Micromachining.
 - d) Electro discharge Micromachining.
 - e) Laser beam Micromachining.
 - f) Electrochemical and Chemical Micromachining.
 - g) Ion Beam Machining.
 - h) Photochemical Etching.
- **Micro / Nano-finishing**
 - a) Abrasive Flow Finishing.
 - b) Magnetic Abrasive Finishing.
 - c) Magnetorheological Abrasive Flow Finishing.
 - d) Magnetic Float Polishing.
 - e) Magnetorheological finishing
- **Microforming**
 - a) Micro/Nano-Embossing(Hot and UV embossing).
 - b) Micro-Injection Moulding.
 - c) Micro-Bulk Forming.
 - d) Micro-Sheet Forming.
 - e) Micro-Hydroforming.
 - f) Micro-Laser Forming.
- **Microjoining Technology**
 - a) Laser Beam Microwelding / Microjoining.
 - b) Electron Beam Microwelding / Microjoining.
 - c) Microsoldering.
- **Microcasting.**
- **Microsensors / Microactuators.**
- **Measuring techniques in μ -Manufacturing & finishing.**

FACULTY

Faculty 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 ONLY

There is no course fee for 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 guest house / hostel of IIT Kanpur .The applications of the teachers from the accredited colleges should reach the course coordinator latest by Aug 30, 2011 giving the information as shown in the Proforma. The engineering College teachers are required to send applications 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 the manufacturing specialization are most welcome.

*For selected candidates: The selected candidates will be requested to send a refundable caution deposit of Rs.500/- to ensure their commitment for participation in this course. This amount will be refundable to those teachers who attend the course (**Please do not send the money until you get selection letter / e-mail / fax**).

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.7000/- per participant. The participants will have to make their own arrangements to meet their travel and other expenses. Boarding and lodging can be arranged in IITK guest house or IITK hostels based upon prior request and **on the payment basis**. Applications on a separate sheet giving the information shown in the Proforma should reach the Course Coordinator latest by Sept. 10, 2011.

Mode of Payment

The registration fee or refundable caution money deposit should be sent by bank draft payable at the “State 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/>