

# Fundamentals of Micromachining

## Overview:

Emerging miniaturization technologies are perceived by many as potentially key technologies of the future that will bring about completely different ways people and machines interact with the physical world. The miniaturization of devices associated with a number of fields including optics, electronics, medicine, avionics to name a few is demanding the production of components with manufactured features in the range of a few to a few hundred microns. Specific applications include micro-scale fuel cells, fluidic micro-chemical reactors requiring micro-scale pumps, valves and mixing devices, micro-fluidic systems, micro-holes for fiber optics, micro-nozzles for high-temperature jets, micro-molds and deep X-ray lithography masks, etc. Functional requirements of many devices demand very tight tolerances and the use of a wide variety of engineering materials including stainless steel, titanium, brass, aluminum, platinum, iridium, plastics, ceramics, and composites. To meet these rapidly evolving needs, this course focuses on the key issues associated with product miniaturization and manufacturing of the miniaturized products. Emphasis will be placed on both conventional and new advanced micro-machining processes in addition to the accompanying trend toward the miniaturization of manufacturing equipment and metrology systems. The fundamental scientific and pragmatic technological topics associated with miniaturization will be discussed.

**Course Duration:** August 8-19  
Number of participants for the course will be limited to 50.

<b>Modules:</b>	08 Aug 2016: Mon	Introduction to Micro-manufacturing and Scaling Laws
	09&10 Aug 2016: Tu-W	Mechanical micromachining and associated Computer/laboratory work
	11&12 Aug 2016: Th-F	Advanced micromachining processes including, Electro-discharge machining, Electro-chemical, Ultrasonic and Vibration-assisted machining and Laser machining processes and associated laboratory work
	16-17 Aug, 2016: Tu-W	Micro-machine Tool systems and machining essentials including part registration, calibration and cutting fluid application
	18-19 Aug 2016: Th-F	Metrology and micro-manufacturing case studies, Concluding remarks, General Q & A session

- You should attend if:**
1. You are an engineer/researcher/scientist from Industry and Government Organization including R&D laboratories
  2. You are a student at all levels (BTech/MTech/PhD)
  3. You are a faculty from academic institutions.

Fees :

The participation fees for taking the course is as follows:

**Participants from abroad:** US \$500 for both modules

**Industry/ Research Organizations:** Rs.10,000

**Academic Institutions:** Rs.5,000 for both modules

The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

### **The Faculty:**



**Shiv G. Kapoor** is a Professor and Grayce Wicall Gauthier Chair, Department of Mechanical Science and Engineering University of Illinois at Urbana-Champaign. For nearly 30 years, Professor Kapoor has sustained a relevant and well-supported research program in the areas of manufacturing process modeling and process automation both at the macro- and micro-scale with the goal of developing a science-based understanding of the processes for the purpose of increasing productivity and improving quality. He has directed an NSF-sponsored Industry-University Cooperative Research Center on Machining and Machine Tools for fifteen years. He has published more than 350 technical articles in Journals and conferences of high repute. A Fellow of the American Society of Mechanical Engineers (ASME) and the Society of Manufacturing Engineers (SME), Prof. Kapoor has received numerous ASME and SME society awards including most recent SME Gold Medal in 2015, SME's most coveted Education Award in 2005 and ASME William T. Ennor Manufacturing Technology Award in 2003. He also received ASME's Blackall Machine Tool and Gage Awards for outstanding research paper, in 1992, 1997, and 2008. He currently serves as an editor-in-chief for the Journal of Manufacturing Processes and Chair the ASME Technical Committee on Publications and Communications that provide long-range plans and manages affairs of all 30 ASME Transaction and Review Journals for the dissemination of technical knowledge.

**J. Ramkumar**



**Course Coordinator**

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