

The system Approach to Precision Manufacturing - Grinding Processes

Overview

Grinding is a critical and in most cases the final manufacturing process for all precision components manufacturing. It is a surface generation process that determines the quality and performance of many critical parts, subsystems and systems.

Grinding is a process widely used in many manufacturing industries:

- From Automotive to Aircraft manufacturing
- From Cutting tools to Carbide manufacturing
- From Bearings to LEDs
- From Semiconductors to Steel manufacturing
- From Optical to bio-medical parts making, etc.

Total cost, quality, productivity and performance of precision components are all very much impacted by grinding processes.

Yet, the manufacturing processes like this are treated as “black box” amenable only for trial and error by people with years of experience. This course will demystify such notions and enable engineers with minimum of experience to develop proficiency to be successful in shop floor operations, new process and equipment development all the way up to leading projects that can change the paradigm of manufacturing in India from “toll manufacturing” to “design and manufacture”.

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| Dates for the Course | June 6 – 10, 2016 |
| Host Institute | IIT Madras |
| No. of Credits | 1 |
| Maximum No. of Participants | 50 |
| You Should Attend If... | <ul style="list-style-type: none">▪ All engineers, managers and faculty members with over 5 years of experience in precision manufacturing area.▪ Anyone with responsibility to improve the total cost, quality and productivity of precision components and industrial manufacturing.▪ Anyone responsible for precision components design and development▪ Anyone responsible to develop and implement new manufacturing process solutions.▪ Anyone in R&D, Research Institutes or academia supporting any of the above developments in the manufacturing sector. |
| Course Registration Fees | <p>The participation fees for taking the course is as follows:</p> <p>Student Participants: Rs.1000 Faculty Participants: Rs.5000 Government Research Organization Participants: Rs.10000 Industry Participants: Rs.20000</p> <p>The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges.</p> <p>Mode of payment: Demand draft in favor of “Registrar, IIT Madras” payable at Chennai</p> |
| Accommodation | <p>The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: http://hosteldine.iitm.ac.in/iitmhostel</p> |

Course Faculty



Dr. K. (Subbu) Subramanian is the President of STIMS Institute Inc., a Knowledge Integration Co., focused on developing physical science based Technology, Innovation and Management Solutions. He is now actively engaged in Research Collaboration, Industrial Innovation and Work Force Development for the manufacturing sector in India and USA. He has been actively engaged in such collaboration at IIT Madras for the past four years. Dr. Subramanian has worked for over 34 years in various positions in the industrial sector. When he served as the Director, Core Technology – Surface Preparation Technologies (SPT), at the High Performance Materials (HPM) Sector, Saint- Gobain Co, he conceived and implemented a network of Application Technology Centers in Worcester MA. - USA, Hamburg – Germany, Shanghai – China, Kure – Japan, Bangalore – India and other locations across the globe. These technology centers foster surface generation processes used in a wide variety of industries for manufacturing precision industrial components and in a wide variety of industrial and consumer applications. Dr. Subramanian has extensive personal and hands on knowledge in R&D, New Product Development, New Business Development as well HR development for the 21st Century Economy.



Dr. N. Ramesh Babu is Professor of Manufacturing Engineering at the Department of Mechanical Engineering, Indian Institute of Technology Madras. His areas of expertise cover abrasive machining processes, advanced machining processes, high precision machine tools and automation in manufacturing. He has about two years industrial experience and more than three decades of teaching and research experience at the Institute. He is consultant to many multi-national companies engaged in sheet metal working and abrasive products manufacture and many Indian machine tool and automobile sectors. He is very active in translational research and development activities and has demonstrated the technical feasibility of many advanced machining processes and algorithms for industrial applications.

Course Coordinator

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URL: <http://>

Objectives:

- Ability to look at the grinding process (and other manufacturing processes) with a broader perspective.
- Grinding process is not a “black box” or random/ statistical event. Instead it is a judicious combination of Science, Engineering and Management aspects as required and relevant to the situation to generate surface at the required functionality and cost.
- A template and frame work for The ‘System Approach’, which the students can apply immediately for their precision components manufacturing projects or assignments.
- Ability to “Zoom in” to look at the scientific / technical details and also “Zoom out” to look at the big picture (in terms of engineering and economic issues) as required.
- Ability to build bridges by connecting the knowledge already available from the shop floor, from the engineering departments, from the suppliers, from the machine tool builders and yes, even from the customers!

PROGRAMME SCHEDULE

Day 1

- Topic 1: Introduction to the GIAN Courses and Overview of Surface generation Processes
- Topic 2: Why should we grind? The System Approach for industrial processes;
Framing the grinding process as an Input/Transformation/output system
- Topic 3: Transformation - Microscopic interactions (the Science of grinding processes)
- Topic 4: Inputs – Work materials and their response to Grinding Processes
- Topic 5: Inputs - Operational parameters and their role in the Grinding system

Day 2

- Topic 1: Measurement and Analysis of Grinding Processes – Part 1 (Translating Science into Engineering)
- Topic 2: Inputs – Abrasive Tools and their role in Grinding System
- Topic 3: Measurement and Analysis – Part 2

Day 3

- Topic 1: Analysis of time in-dependent grinding processes
- Topic 2: Technical outputs
- Topic 3: Grinding Process Signal, Data Analysis and application for process problem solving
- Topic 4: Fundamentals of Tribology as applied to Grinding Processes

Day 4

- Topic 1: Coolant System Design and optimization for grinding processes
- Topic 2: Analysis of Belt grinding processes
- Topic 3: Analysis of grinding processes for brittle materials
- Topic 4: System outputs for grinding processes; Application of the system approach for Grinding Process

Day 5

- Topic 1: Real world challenges in the practice of System Approach-Discussion
- Topic 2: **Industry presentation:** The need for System Approach in the industrial practice
The need for System Approach in research programs
- Topic 3: Govt./Industry/Research collaboration – Examples in India
Classroom problems & solutions on analysis of grinding processes
Laboratory Demonstration; Measurement of vital signals during the grinding processes; Data Analysis and interpretation of signals – Exercises;
Practical 1: Inputs – Machine Tools (Platform for Grinding Processes)