Advanced Machining Processes



Outline

- Contact details
- Course objectives
- Introductory remarks
- Grading policy
- Introduction to manufacturing



Contact Details

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Contact Details

- Teaching Assistants :
 - Shahrukh (shahrukh1995@iitg.ac.in)
 - Sauranga Das (dsauranga@iitg.ac.in)
 - Nobel Karmakar (n.karmakar@iitg.ac.in)
 - Akshat Agnihotry (aagnihotry@iitg.ac.in)
 - Santosh Kumar (ksantosh@iitg.ac.in)
 - Bishwajit Sutradhar (bsutradhar@iitg.ac.in)

Class Timings:

Tuesdays 3:00 pm – 3:55 pm Wednesdays 2:00 pm – 2:55 pm Thursdays 3:00 pm – 3:550 pm



Objective of Course

- Basics of non-conventional machining as well as hybrid machining processes
- Learn the principles of material removal mechanisms of nonconventional machining as well as hybrid machining processes
- Develop first order mathematical descriptions for selected processes
- Understand the advantages and limitations of various processes in terms of quality and productivity



Objective of Course

- Emphasis on understanding the physical principles underlying these processes
- Apply this knowledge to manufacturing process selection, design and part quality
- Encourage teamwork and group activity via group assignments and Project.



Grading Policy

Group Assignments & Quizzes	15%
(May be divided in 5% in attendance	e)
Project	15%
Midterm	25%
End semester examination	40 %
Total	100 %



Important Instructions

- Lecture notes and homeworks will be posted on the course website or through shared folder
- Home assignments will be submitted in a self-selected group of four and are due in class on **the submission date**. <u>No late submission will be accepted</u>.
- Any form of uncanny similarity or copying on the homework <u>will be severely</u> <u>penalized</u>.
- Students could opt for an **analysis project** either using Deform/commercial finite element code or analytical techniques. Alternatively, a **research paper** on recent work in advanced machining processes could also be considered.
- Surprise quizzes may be there in classes.
- It would be good if we all learn together the more two-way interactions, the better for all of us. I will make mistakes, which you will be expected to correct, and vice versa!



Textbooks and Reference Books

- V. K. Jain, Advanced Machining Processes, Allied Publishers, 2009
- Hassan El-Hofy, Advanced Machining Processes, McGraw-Hill Prof Med/Tech, 2005
- Helmi Youssef, Non-Traditional and Advanced Machining Technologies, CRC Press, 2020
- Gary F. Benedict, Nontraditional Manufacturing Processes, Taylor & Francis, 1987
- Bijoy Bhattacharyya and Biswanath Doloi, Modern Machining Technology, Academic Press, 2019
- V. K. Jain, Introduction to Micromachining, Alpha Science International Limited, 2010
- J. A. McGeough, Micromachining of Engineering Materials, Taylor & Francis, 2001.
- P K Mishra, Non-Conventional Machining, Narosa India Publication, 1997.
- P. C. Pandey and H. S. Shan, Modern Machining Processes, Tata McGraw-Hill Education, 1980.
- James A. Brown, Modern Manufacturing Processes, Industrial Press, 1991.



What is Manufacturing?

- Derived from the Latin word manufactus
- manus = hand, factus = made
- Practical definition: process of converting or processing raw materials into usable products.



Classification of Manufacturing Processes

- Based on:
 - process type e.g., shaping vs. non-shaping
 - state of workpiece material e.g., solid or liquid
 - processing energy e.g., mechanical, electrical,...





Classification of Manufacturing Processes

- Shaping process classification
 - Mass conserving, $dM \sim 0$

examples: casting, bulk forming, powder processing

– Mass reducing, dM < 0</p>

examples: conventional and unconventional machining

- Mass adding, dM > 0

examples: joining processes

Further sub-classification is possible based on processing energy and workpiece state considerations









Forging $(dM \sim 0)$





Cutting (dM < 0)

Welding (dM > 0)

Manufacturing Processes



Summary

- Focus on:
 - Physical principles and analysis of process
 - Process Capabilities
- Teamwork will be encouraged
 - Homework
 - Project

