Introduction to Manufacturing



Outline

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



Contact Details

- Prof. Ramesh Singh
- Room: Machine Tools Lab (Prof. Ramesh Singh)
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 - Tel: 7507
 - Off. Hrs.: Fridays 4-5 p.m.
 - Also by appointment
 - Class website:
 http://www.me.iitb.ac.in/~ramesh/courses/ME206/me206.html



Focus and Objectives of Course

- Learn the fundamentals of casting, joining, deformation processes, polymer processing (Mass conservation and Mass addition processes)
- Develop first order mathematical descriptions for select processes to analyze and calculate important quantities for the unit processes e.g., temperature, forces, power, time, final shape, etc.
- Develop an understanding of the capabilities and limitations of the unit processes in terms of quality and productivity
- Emphasis on understanding the physical principles underlying these processes
- Apply this knowledge to manufacturing process selection, part design for manufacture and quality control.
- Encourage teamwork and group activity group project.



Introductory Remarks

- See second page of syllabus
 - Homework
 - Exams
 - Honor code
 - No cellphones on the desk !!!!
 - In silent mode in your bag/pocket



Grading Policy

Individual Assignments 10%

Quizzes 10%

• Midterm 25%

• Term Project 20% (7.5% Midsem & 12.5% for endsem)

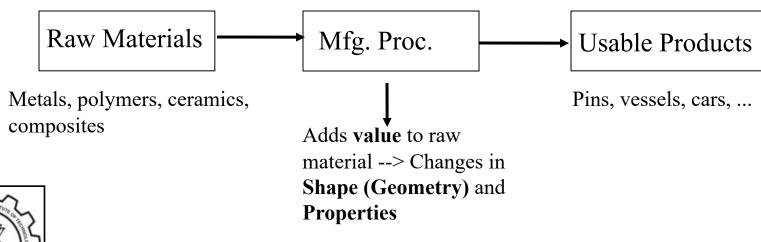
• End semester exam 35%

• Total 100%



Definition

- 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.





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What is Materials Processing?

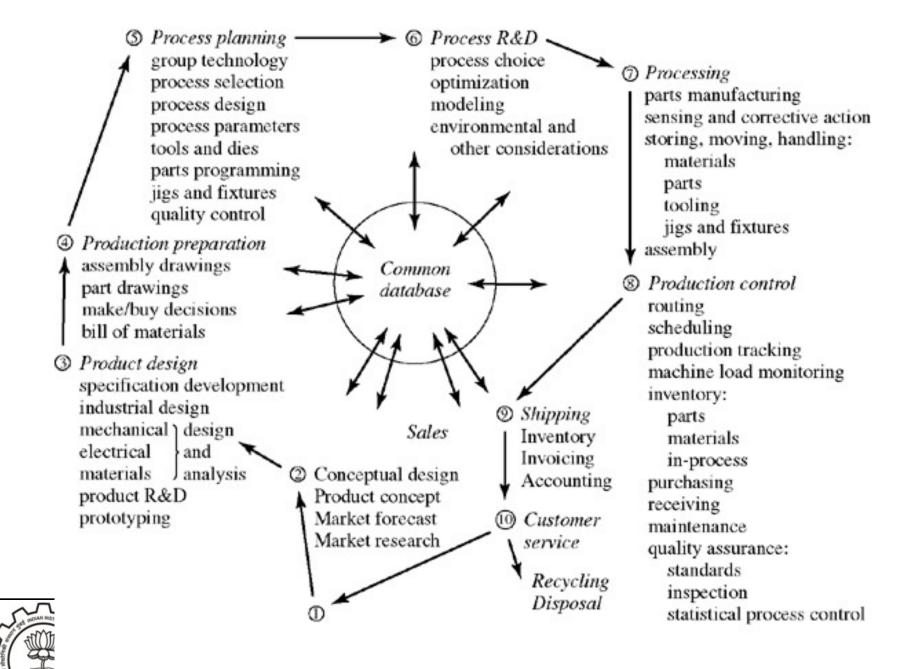
- Imparting changes in material:
 - Geometry
 - Material properties:
 - Strength
 - Hardness
 - Toughness
 - Etc.



Systems-Oriented Definition

- Manufacturing as a system or enterprise
 - "A series of interrelated activities and operations involving design, materials selection, planning, production, quality assurance, management, and marketing of discrete consumer and durable goods" (CAM-I)
 - a highly complex, interdependent activity that is dynamic in nature.





Design - Materials - Process Relationship

- Product design, materials selection, and materials processing are highly interrelated.
- For example:
 - weight reduction --> thin cross-sections --> mfg.
 problems
 - tight tolerance specs. --> specialized/high
 precision processes required --> increased cost
 - aluminum vs. steel beverage cans --> different metal forming needs.



Coke Cans over the Years

0.66 oz. (18.8 g) in 60's, 0.48 oz (13.5 g) in 90's



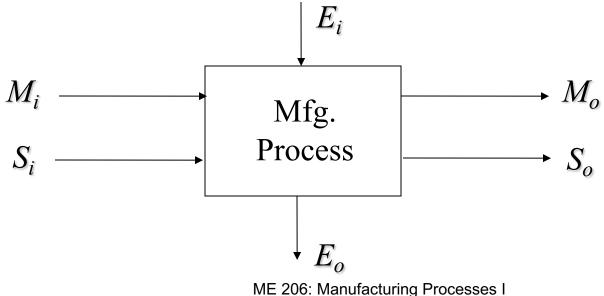


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Classification of Unit Manufacturing Processes

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,...



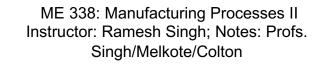


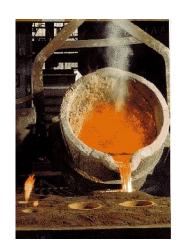
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Classification of Unit Manufacturing Processes

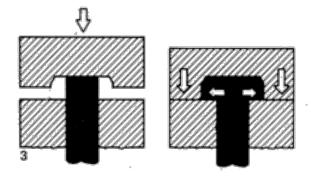
- Shaping process classification
 - Mass conserving, dM ~ 0
 - examples: casting, bulk forming, powder processing
 - Mass reducing, dM < 0
 - examples: conventional and unconventional machining
 - Mass adding, dM > 0
 - examples: joining processes

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





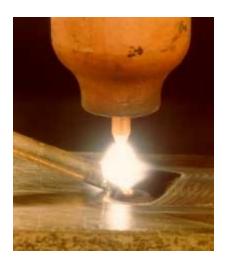
Casting $(dM \sim 0)$



Fiorging $(dM \sim 0)$



Cutting (dM < 0)



Welding (dM > 0)

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Summary

- Focus on:
 - Physical principles and analysis of process
 - Process Capabilities

- Teamwork will be encouraged
 - Homework
 - Term Paper



Robotic Restoration System



Indian Institute of Technology Bombay



Laser Vent Cleaning



Indian Institute of Technology Bombay India

