

Introduction to Manufacturing



ME 338: Manufacturing Processes II
Instructor: Ramesh Singh; Notes: Profs.
Singh/Melkote/Colton

Outline

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



Contact Details

- Prof. Ramesh Singh/Prof. S. S. Pande/Prof. S. S. Joshi
 - Room: Machine Tools Lab (Prof. Ramesh Singh)
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 - Off. Hrs.: Fridays 4-5 p.m.
 - Also by appointment
 - Class website:
<http://www.me.iitb.ac.in/~ramesh/ME338/>



Focus and Objectives of Course

- Learn the fundamentals of machining, optimization, non conventional machining, fixturing and metrology
- Develop first order mathematical descriptions for select processes to analyze and calculate important quantities for the unit processes e.g., 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 via group assignments and Project.



Introductory Remarks

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



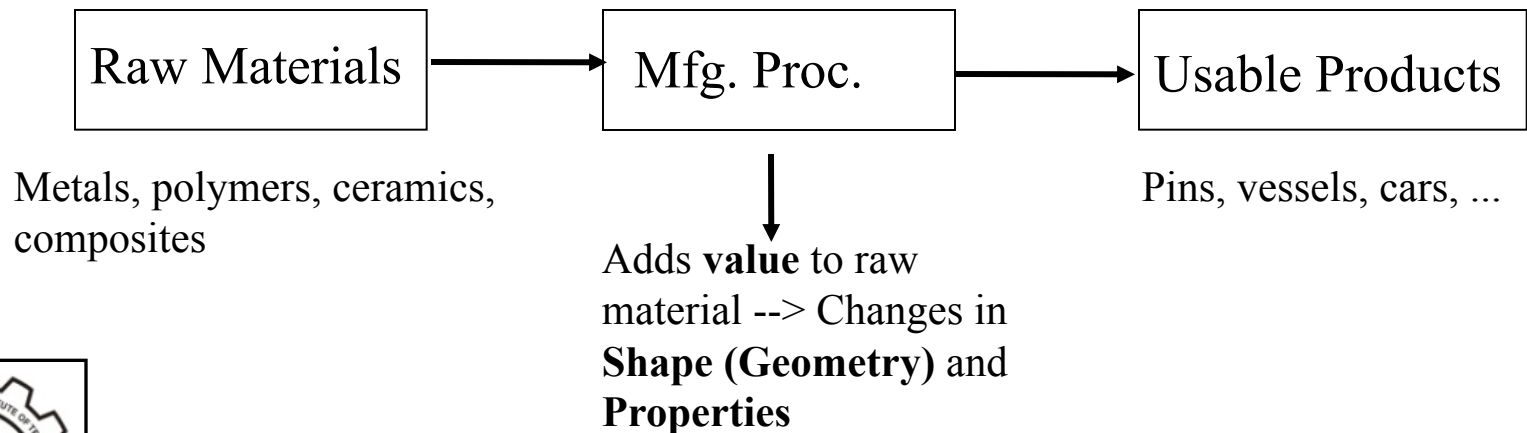
Grading Policy

- Group Assignments in self-selected groups of 4 or less 10%
- Quizzes 10%
- Midterm 25%
- Term Project 15%
- End semester exam 40%
- 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.*



What is Materials Processing?

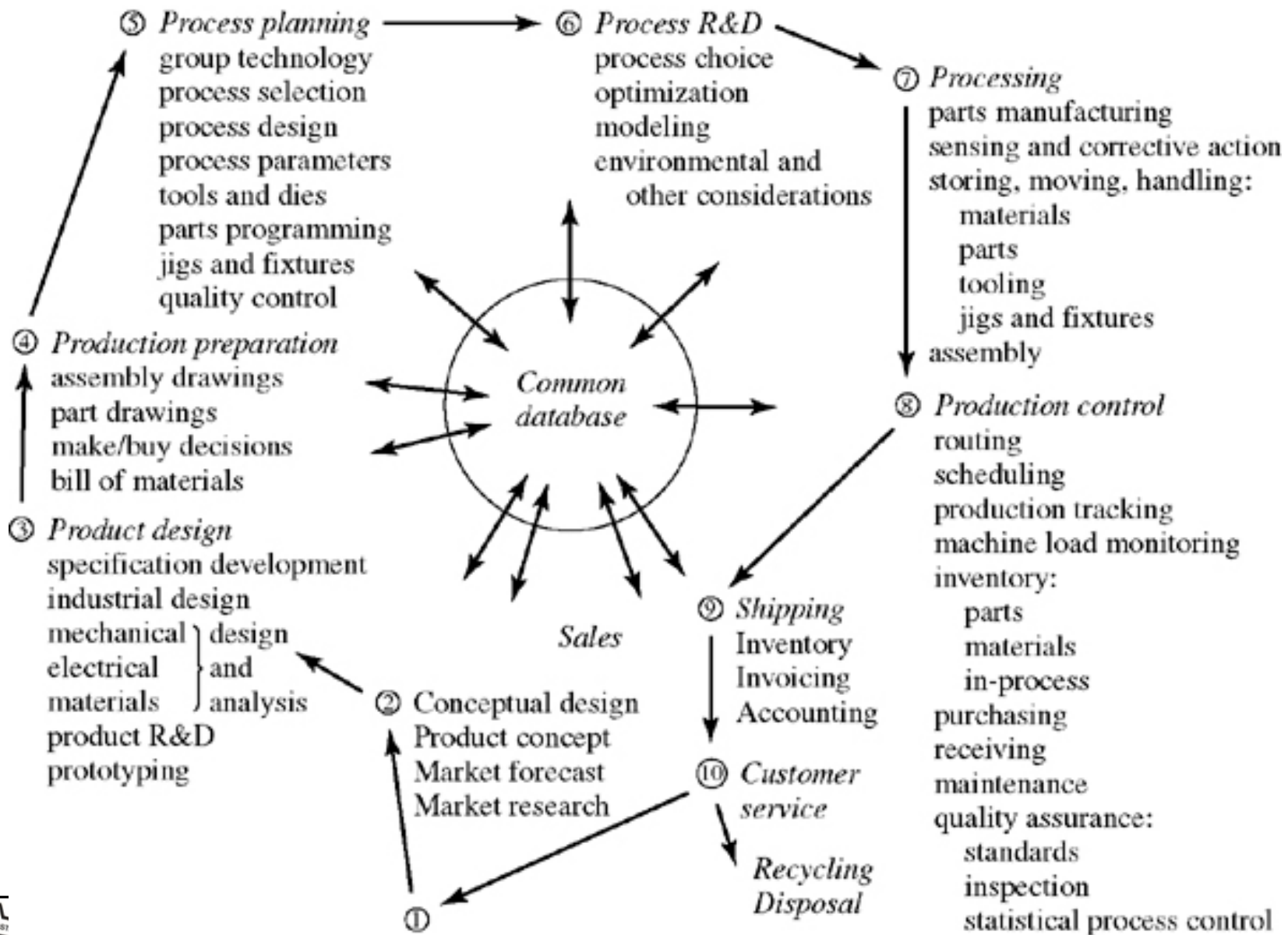
- Imparting changes in material :
 - Geometry
 - Material properties:
 - Strength
 - Hardness
 - Toughness
 - Etc.



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.



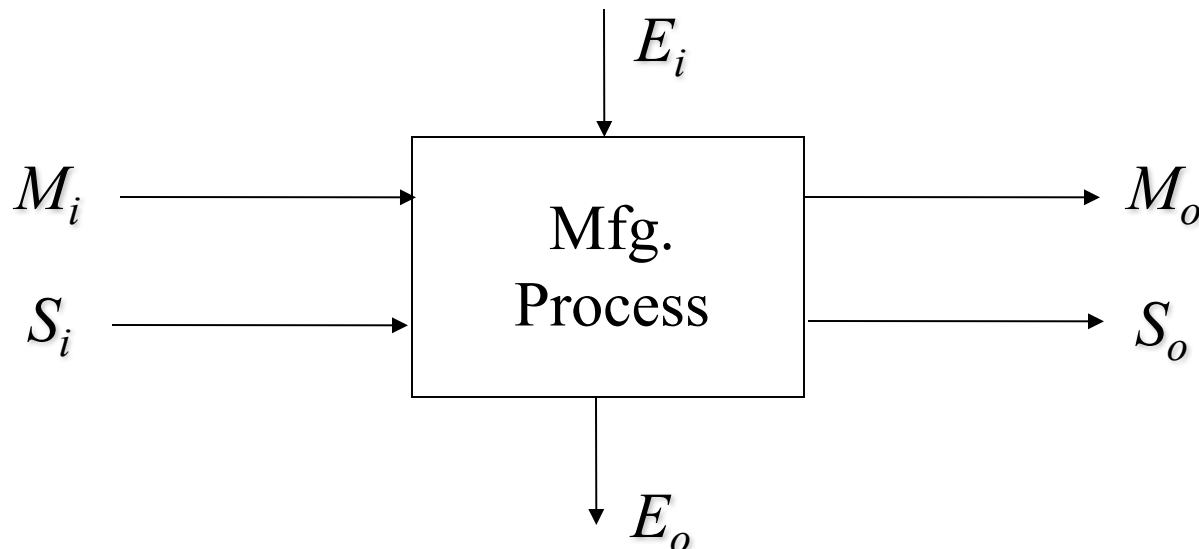
Coke Cans over the Years

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



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,...



Classification of Unit Manufacturing Processes

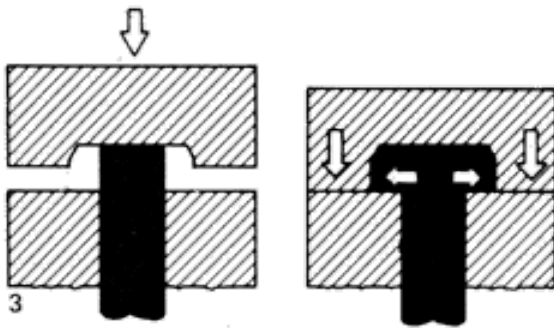
- Shaping process classification
 - Mass conserving, $dM \sim 0$
 - examples: casting, bulk forming, powder processing
 - Mass reducing, $dM < 0$
 - examples: conventional and unconventional machining
 - Mass adding, $dM > 0$
 - examples: joining processes

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





Casting ($dM \sim 0$)



Forging ($dM \sim 0$)



Cutting ($dM < 0$)



Welding ($dM > 0$)



Summary

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

