Introduction
Today’s Lecture

- Course Policy
- Introduction
- Aspects of Manufacturing
Instructor

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Pre and Corequisites

- **Prerequisites:** DR 133 (2D AutoCAD for Engineers)
- **Corequisites:** ESM 250 (Mechanics of Materials); MTE 271 (Engineering Materials)
- **Required for ME, MFGE, IE …**
Notes, Textbook, and References

- **Lecture Notes:** http://www.me.ua.edu/me383
- **References:** three books
Enrollment

- **Lec**: MW 9:00 - 9:50am, HR 286
- **Lab**: M 2:30-6:30 pm
  - Rm. 1213 (machine shop)
  - Shelton State Community College
  - 9500 Old Greensboro Rd.
- **Mandatory Enrollment**: Lecture (ME 383)
  - Laboratory (ME 283)
Class Structure and Policies

- Mandatory Attendance
- Assignments
  Regular HW and in-class quizzes
  HW due as specified
  50% off for late HW
- Lab (ME 283): Mr. Ronnie Guy at SS, 391-2444
  BAMA Vise
- Project: 1 for each group
  (CNC rapid prototyping or computer simulation)
- Exams: 2 midterms, 1 final exam
Class Structure and Policies

• Grading

*ME 383*:
Homework & Quiz  20%
Midterm (x 2)  20% each
Final  20%
Project  20% (team: 15%; individual: 5%)

*ME 283*:
Team  80% (given by the instructor)
Individual  20% (given by your team members)
Class Structure and Policies

• Grading
  A: 90-100
  B: 80-89.9
  C: 70-79.9
  D: 60-69.9
  F: < 60
  “+” and “-”: upper and lower 25% in each range
Introduction

• **Manufacturing:**
  Made by hand: *manus* (hand),
  *factus* (make)

• **Definition:** the process of converting raw materials into products

Product Design  ➔  Materials Selection  ➔  Manufacturing Processes  ➔  Quality

(Value added)
Manufactured Products

- **Discrete Products**: individual parts, *such as nails, gears, bearing balls, cans, engine blocks, ...*
- **Continuous Products**: items produced by continuous processes, *such as sheet metal coil (almost), oil refinery, ...*
Concurrent Manufacturing

Market

Specification

Concept Design

Detail Design

(CAD)

Manufacturing

(CAM)
Materials Selection

1. Engineering Materials
   - Metals
     - Ferrous
       - Amorphous
         - Steels
           - Stainless steels
           - Tool and die steels
           - Cast irons
             (Chapter 5)
         - Aluminum
         - Copper
         - Titanium
         - Tungsten
         - Others
           (Chapter 6)
     - Nonferrous
   - Plastics
     - Thermoplastics
       - Acrylics
       - ABS
       - Nylons
       - Polyethylenes
       - PVC
       - Others
       (Chapter 7)
     - Thermosets
       - Epoxies
       - Phenolics
       - Polyimides
       - Others
       (Chapter 7)
   - Elastomers
     - Rubbers
     - Silicones
     - Polyurethanes
       (Chapter 7)
   - Ceramics and others
     - Oxides
     - Nitrides
     - Carbides
     - Glasses
     - Glass ceramics
     - Graphite
     - Diamond
     (Chapter 8)
   - Composites
     - Reinforced plastics
     - Metal-matrix
     - Ceramic-matrix
     - Laminates
       (Chapter 9)
Manufacturing Processes

Casting:
- Expendable mold
- Permanent mold

Forming & Shaping:
- Rolling
- Forging
- Extrusion
- Drawing
- Sheet forming
- PM

Machining:
- Turning
- Milling
- Drilling
- Boring
- Grinding
- Shaping
- Broaching

Joining:
- Welding
- Brazing
- Soldering
- Bonding
- Assembly

Finishing:
- Lapping
- Polishing
- Deburring
- Surface treating
- Coating
Manufacturing Processes Examples- Casting

1. Pouring ladle
2. Molten metal
3. Downspue
4. Parting line
5. Mold (sand)
6. Sprue and runner (to be trimmed)
7. Solid casting

(1) (2)
Manufacturing Processes Examples- Forming

Rolling
Manufacturing Processes Examples - Forming
Manufacturing Processes Examples- Machining

(a) Turning
- Rotation (work)
- Chip
- Starting diameter
- Diameter after turning
- Workpiece
- Feed tool
- Single point cutting tool

(b) Drilling
- Rotation
- Feed
- Drill bit
- Work part
- Hole

(c) Milling
- Rotation
- Milling cutter
- Material removed
- Work
- Feed
Manufacturing Processes Examples - Machining
Manufacturing Processes Examples - Joining

Single square-groove weld

Single flare bevel-groove weld

Assembled parts

Bolt

Nut

(a)

Screw

(b)
Manufacturing Processes Examples - Selection

- Geometry
- Material Properties
- Quantity
- Quality
- Cost
Quality Assurance

- Next Lecture