

1. MME 4404, Materials Processing
2. 4 credits, 3 hours of lecture and 3 hours of lab weekly
3. Guikuan Yue
4. Fundamentals of Modern Manufacturing: Materials, Processes and Systems, Fifth Edition, by Mikell P. Groover, Wiley (2013). ISBN: 978-1-118-231463.  
Other supplemental materials: Ceramic Materials: Science and Engineering, by C. Barry Carter and M. Grant Norton, Springer (2007). ISBN-10: 0-387-46270-8.
5. Specific course information
  - a. This course is an introduction to a variety of manufacturing processes. The properties, design and manufacturing of metals, ceramics, polymers and composite products will be studied. Specialized metallic manufacturing concepts, surface treatments and joining of metallic will also be covered.
  - b. MME4303, with a grade of “C” or better and junior standing.
  - c. Required course.
6. Specific goals for the course
  - a. Specific learning outcomes of instruction
    - Understand the general properties, processing and application relationships of metals, ceramics (including glassworking), polymers and composites. (Exam I, IV)
    - Understand the manufacturing flowsheet for traditional ceramics, new ceramics, and glass based on their processing-property relationship (Exam II, IV)
    - Understand the manufacturing flowsheet for polymers (thermoplastic, thermosetting and elastomers) based on their processing-property relationship (Exam II, IV)
    - Understand the manufacturing flowsheet for composites (mainly polymer matrix composites and rubber) and metals (metal forming and sheet metalworking) based on their processing-property relationship (Exam III, IV)
    - Understand powder metallurgy (metals and ceramics’ powder production and its processing for preparation such as blending and mixing, pressing and sintering), specialized property enhancement processes such as heat treatment, surface processing (cleaning, electroplating, vapor deposition, and coating), joining and assembly processes (welding, brazing, soldering and adhesive bonding) (Exam IV)
    - Investigate the operations involved in industrial processing methods of metals (forging, sheet metal shearing/bending/stamping), ceramics (powder metallurgy, glassworking), polymers (plastics blow molding, injection molding) and

composites, heat treatment of metals and alloys (annealing, martensite formation in steels, precipitation hardening, surface hardening), surface treatment (plastics finishing, electroplating/electroless plating, coating), welding, etc., through collaboration study (videos, report and presentation) (Exam V)

- b. Criterion 3 student outcomes addressed by the course: High content of Student Outcome 1 and 7, and significant coverage of Student Outcome 5 and 6.

7. A brief list of topics to be covered:

Introduction: families of materials, properties and applications

Solidification Processes: Glassworking and Polymers

Particulate Processing: Powder Metallurgy and Ceramics

Manufacturing flowsheet for composites

Property Enhancement and Surface Treatment

Metal forming and Sheet Metalworking

Joining and Assembly Processes

Special Processes: Nanofabrication etc.