
2. 3 credits, 3 contact hours

3. Instructors: Prof. R. J. Christensen, Prof. D. Flannigan, Prof. L. Francis, Prof. W. Gerberich, Prof. C. Macosko, Prof. S. Mantell


5. Specific course information:
   b. Prerequisites: CHEM 1061, CHEM 1065, MATH 1272 or MATH 1372, PHYS 1301W, CSE student
   c. Required course.

6. Course outcomes (related ABET student outcomes indicated in square brackets):
   a. Learn the scientific principles underlying the structure of engineering materials, including bonding, crystal structure, defects and microstructure. [1]
   b. Understand the importance of phase behavior and phase transformations in determining structure. [1]
   c. Learn fundamental relationships between structure and mechanical properties and performance (failure). [1,2,4]
   d. Learn about processing and manufacturing of engineering materials, and the connections between processing and structure. [1,2]
   e. Develop an understanding of the different types of engineering materials (metals, ceramics, polymers, composites) in terms of their structure, properties and applications. [1]

7. Course topics:
   a. Atomic Bonding.
   b. Crystal Structure.
   d. Diffusion in Solids.
   e. Mechanical Properties of Materials.
   f. Failure: Fracture, Fatigue, Creep.
   g. Dislocations, Slip, Failure.
   h. Strengthening Mechanisms.
   i. Phase Diagrams of Metals.
   j. Phase Transformations of Metals.
   k. Steel Microstructures.
o. Polymer Materials: Structures & Processing.