Exam Content: (will be based on material covered in the following courses)

ME 330, Engineering Materials
ME 450, Modeling in Materials Processing

Exam Topics:

1. Materials Science Fundamentals
   - Material structure (crystals, polymer chains, etc.)
   - Phase diagrams
   - Strengthening mechanisms
   - Hardenability; TTT diagrams
   - Cold work and annealing

2. Engineering Science Fundamentals
   - Balance equations for mass, momentum, and energy
   - Simple Newtonian and power-law fluid flow problems (parallel plates, tubes, etc.)
   - Heat transfer (transient conduction in slab and semi-infinite body; convection; dissipation)
   - Mass transfer (diffusion, convection, partition coefficient)
   - Solidification (heat of fusion, segregation, interface stability; heat transfer results, including mold, metal and interface control)

3. Application to Processes
   - Heat treatment
   - Metal casting
   - Polymer extrusion and molding
   - Welding and joining
   - Metal forming (forging, rolling, drawing)

Reference Textbooks:
1) “Materials Science and Engineering” by Callister, 0-471-78062-6, Publisher - Wiley
3) “Fundamentals of Modern Manufacturing" by M. P. Groover, 0-471-74485-9, publisher, Wiley
QUALIFYING EXAMINATION
FOR
Materials Processing

Department of Mechanical and Industrial Engineering
University of Illinois at Urbana-Champaign

Wednesday, August __, ____
9:00 AM – 12:00 PM

IMPORTANT EXAMINATION INFORMATION

1. Identify your examination and work with your University Identification Number (UIN, I-Card number in blue beginning with 65) on each page. **DO NOT ENTER YOUR NAME ANYWHERE IN THE EXAMINATION.**

2. Choose 3 out of the 4 problems.

3. Each problem counts 10 points.

4. Start each problem in a new examination booklet and write on only the right-hand side (front side) of each sheet.

5. Hand in this problem package with your exam booklets.