UNIVERSITY OF ILLINOIS  
College of Engineering  
Department of Materials Science and Engineering

Spring 2019  
METALS PROCESSING  
MSE 441

Instructor: JK Shang, 208 Ceramics, 333-9268, jkshang@illinois.edu  
Lecture: MWF 11:00 – 11:50 AM, Room 4101 MSEB  
Office Hour: M 1-2 PM 208 Ceramics; Tue., 4-5 PM, 322 MSEB  
Text: Principles of Metal Manufacturing Processes  
Beddoes & Bibby, Arnold Publishing, 1999  
Supplement: Lecture Notes  
Lecture Notes MSE441 on http://compass2g.illinois.edu  
Teaching Assistant: Quentin Rizzardi, qpr2@illinois.edu

Course Objectives:  
• Learn major metallurgical processes for producing metals and metallic structures;  
• Understand metallurgical and engineering principles controlling individual metallurgical processes;  
• Understand the microstructures produced by major metallurgical processes;  
• Understand common defects produced by major metallurgical processes

Course Outline:  
I. Extraction of Metals  
Ch. 1  
Iron extraction  
Steel making

II. Casting  
Ch. 2  
Sand Casting  
Permanent Mold Casting  
Solidification  
Heat Transfer  
Casting Defects

III. Metal-Working  
Ch. 4, Ch. 5  
Classification of metal-working processes  
Continuum plasticity  
Work method  
Slab Analysis  
Forging  
Rolling  
Sheet forming  
Microstructural evolution

IV. Heat Treatment  
Notes  
Phase equilibria
Transformation of austenite
TTT diagrams
Hardenability
Annealing, normalizing, martempering

V. Powder Metallurgy  
Ch. 6
Power production
Powder characteristics
Cold compaction
Hot compaction

VI. Surface Processing  
Ch. 9
Thermal surface hardening
Thermochemical treatment
Coatings

VII. Machining  
Ch. 7
Metal cutting
Tool materials
Machinability

VIII. Joining  
Ch. 8
Welding
Soldering

References:

Grading:
5% Iclicker Quiz
20% Weekly Homework
25% Midterm-I (Wed., Feb. 13)
25% Midterm-II (Wed., March 27)
25% Exam-III (Wed., May 1)

Homework Policy: No late homework but extensions possible if requested in advance.