

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 Iron extraction Steel making	Ch. 1
	II. Casting Sand Casting Permanent Mold Casting Solidification Heat Transfer Casting Defects	Ch. 2
	III. Metal-Working Classification of metal-working processes Continuum plasticity Work method Slab Analysis Forging Rolling Sheet forming Microstructural evolution	Ch. 4, Ch. 5
	IV. Heat Treatment Phase equilibria	Notes

Transformation of austenite TTT diagrams Hardenability Annealing, normalizing, martempering	
V. Powder Metallurgy Power production Powder characteristics Cold compaction Hot compaction	Ch. 6
VI. Surface Processing Thermal surface hardening Thermochemical treatment Coatings	Ch. 9
VII. Machining Metal cutting Tool materials Machinability	Ch. 7
VIII. Joining Welding Soldering	Ch. 8

References:

1. Manufacturing with Materials, Ed. Lyndon Edwards and Mark Endean, The Open University, 1990, Alden Press, London, England.
2. The Production of Inorganic Materials, James W. Evans and Lutgard C. DeJonghe, Macmillan Publishing Company, 1991, New York.
3. Processes and Design for Manufacturing, Sherif D. El Wakil, 1998, PWS Publishing Company, Boston, MA.
4. Manufacturing Processes and Materials for Engineers, Lawrence E. Doyle, Carl A. Keyer, James L. Leach, George F. Schrader, Morse B. Singer, 1985, Prentice-Hall, Englewood Cliffs, NJ.
5. Manufacturing Processes and Systems, Phillip F. Ostwald and Jairo Munoz, John Wiley & Sons, 1997.

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.