

King Fahd University of Petroleum & Minerals
MECHANICAL ENGINEERING DEPARTMENT
ME 322 Manufacturing Processes I

Catalogue Description: (3-0-3)

Manufacturing methods of metals and plastics including: metal casting, bulk forming, sheet metal forming, machining, welding, and plastic processing. Both quantitative and qualitative study of manufacturing processes with emphasis on process selection for optimum design.

Status in Curriculum (Required or Elective): Required (offered Fall & Spring)

Pre-requisites: ME210 OR CE101, ME216, ME217

Co-requisites: ME323

Prerequisites by Topics:

- Reading engineering drawings (ME210 OR CE101)
- Properties and testing of engineering materials (ME216, ME217)
- Phase diagrams, heat treatment, Metallography (ME216, ME217)
- College physics and college chemistry (ME216, ME217, PYP101, CHE101)

Textbook:Principles of Modern Manufacturing: Materials, K. P. Groover , 5th Edition John Wiley, New York, 2013.

References:

- 1) **Introduction to Manufacturing Processes**J. A. Schey, 2nd Edition, McGraw-Hill, 1987.
- 2) **Manufacturing Processes for Engineering Materials**, Kalpakjian, S, 5th edition, Addison-Wesley, 2008.
- 3) **Metalworking Science and Engineering**, E. M. MielenickMcGraw-Hill, New York, 1991

Coordinator:Dr. Numan AbuDheir, AssistantProfessor of Mechanical Engineering

Goals:(general objectives)

The purpose of this course is to discuss basic manufacturing processes and stress their capabilities and limitations. Teach students to analyze metal manufacturing processes, and to relate the dependence of manufacturing process on material properties, and of the integrity of the manufactured part on processing method/parameters.

Course Outline (Lecture Topics):

1. Introduction to Manufacturing(2 hours)
2. Metal Casting Fundamentals & Processes:solidification of metals; cast structures; fluid flow and heat transfer; melting practice and furnaces; casting alloys; ingot and continuous casting; casting processes; design considerations and economics of casting (10 hours)
3. Welding Principals and Processes: arc, resistance and special welding processes, weldability of different materials, effect of welding on microstructure and mechanical properties, weld distortion and residual stresses, weldment design(5 hours)
4. Material Removal Processes:mechanics of chip formation; tool wear and failure; surface finish and integrity; machinability; cutting tool materials and cutting fluids; cutting processes and machine tools for producing round and other shapes. (10 hours)
5. Fundamentals of Metal Forming (Mechanical Behavior of Materials): tension, compression, hardness, work of deformation(4 hours)
6. Bulk Deformation Processes: analysis of processes such as forging, rolling, extrusion, wire drawing, etc. by ideal work and slab methods; die manufacturing and die failures.(10 hours)
7. Sheet Metalworking: sheet-metal characteristics; analysis of shearing, bending and stretch forming(3 hours)

Design Activities/Projects:

Design assignments including design of mold casting feeding system, pattern design, and design considerations in welding.

Computer Usage:

Students are encouraged to solve some assigned homework problems using the available engineering software, such as solid works and Excel.

Laboratory:None

Assessment Tools:

- i- Mid-term Examinations
- ii- Homework Assignments
- iii- Quizzes
- iv- Final Exam

Course Learning Outcomes:

- I- Describe and distinguish the processes involved in component manufacture.
- II- Identify the issues pertaining to casting processes.
- III- Explain mechanical behavior of materials involving plastic deformation.
- IV- Identify the issues pertaining to bulk forming processes.
- V- Identify the issues pertaining to sheet metal forming processes.
- VI- Identify the issues pertaining to metal cutting processes.
- VII- Explain the joining processes which utilize welding.
- VIII- Relate manufacturing processes parameters to product design.
- IX- Understand the impact of manufacturing processes on the society, environment and global economy.

Course Learning Outcomes mapped to Student Outcomes:

Student Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course-to-Student outcome mapping	I to VIII		II, IV, V, VIII, IX		I to VIII			I to VIII			
Emphasis*	S		S		S			S			

* L:: Little/None M: Moderate S: Strong

Status of Continuous Improvement review of this Course:

Date reviewed: March 1st 2015
Prepared by: Dr. Numan AbuDheir

Reviewed by: Dr. T. Laoui, Dr. S Akhtar
Date prepared: March 2nd 2015