ENG MN 465 Materials Processing

Catalog Data:
ENG MN 465 Materials Processing Prereq: ENG EK 156, EK 305, EK 306, and either EK 304 or EK 424. The influence of manufacturing processes on structure and properties of materials. Manufacturing by liquid and solid state processing techniques, material removal processes, and bonding and joining processing. Surface modification techniques for enhancing performance and product service life. Includes lab. 4 cr, 2nd sem.

Course Schedule: 4 lecture hours/week

Status in the Curriculum: Required for Manufacturing majors.

Textbooks: Manufacturing Processes for Engineering Materials, Serope Kalpakjian Prentice Hall, Fifth Edition, 2008.

Reference: Manufacturing Processes and Systems, P.F. Ostwald and J. Munoz
The Production of Inorganic Materials, J.W. Evans and L.C. De Jonghe

Coordinator: Srikanth Gopalan, Associate Professor of Mechanical Engineering

Prerequisites by topic:
1. An understanding of the laws of thermodynamics as taught in EK 304 or EK424.
2. An understanding of materials and process design as taught in EK 306 Materials Science and EK 156 Design and Manufacture.
3. An understanding of mechanical properties of materials as taught in EK 305.

Goals:
This course utilizes the fundamentals to study the practical manufacturing aspects of synthesis of bulk materials, solid-and-liquid-state processing, welding and joining, material-removal processes, surface modification and finishing operations. It is intended to draw together the various earlier courses in the curriculum to understand the science and engineering of manufacturing processes. The course has a laboratory component and requires working, reporting and presenting a team project. The idea is to obtain hands-on experience and learn to work in teams, and be able to communicate effectively through presentations and reports.

Course Learning Outcomes:
As an outcome of completing this course, students will:
i. Gain a thorough understanding of various manufacturing processes.
ii. Gain an in-depth understanding of one of the industrial sectors through project work.
iii. Gain experience and confidence in working in a team environment.
iv. Learn to produce well-organized and clearly written engineering reports.
v. Learn to make a clear and well-organized presentation.
vi. Be able to relate theory and practice through laboratory exercise.

Course Learning Outcomes mapped to Program Outcomes:

Program:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Course:	i, vi	iv, vi, ii	ii, iii	iii, ii	i, vi	iii, vi	iii, iv, v	ii, i	i	i, ii	i, ii, vi	i, ii, vi	i, ii, vi	i, ii	i, ii	i, ii, vi
Emphasis:	4	4	4	4	4	3	4	4	4	4	5	5	4	3	3	4

Topics:

1. Synthesis of Bulk Materials (2 weeks)
2. Shaped Products from Solid-State Processing (4 weeks)
3. Shaped Products from Liquid-State Processing (2 weeks)
4. Welding and Joining Processes (1 weeks)
5. Material Removal Processes (2 weeks)
6. Finish Processes (1 weeks with experimental lab)
7. Student Presentations of Project (4 Lecture Periods)

Project Assignments (Lab):

Teams are formed with 5-6 students per team by second week. Each team picks one industrial sector such as the automobile, iron and steel, aerospace, plastic, chemicals, paper, cement/concrete, glass, electronics, etc. Sometimes a particular company is identified within the industrial sector. Students identify all the manufacturing steps/processes involved in the production of a final product. These steps are divided equally among the team members for independent research. Each student writes a report to describe the manufacturing processes he/she has researched. It addresses the science and engineering details associated with the manufacturing processes. The report typically does not exceed 5 typed pages although figures and tables can be extra. It constitutes 40% of the project grade. Each team has one hour for presentation including discussion. Each student is expected to make a presentation of around 10 minutes that describes the topic researched for the written report. Clarity and quality of the presentations is evaluated. The presentation constitutes the other 1/2 of the project grade.

Contribution of Course to Meeting the Professional Component:

Engineering topics: 100%

Grading:

40% Lab Project
30% Midterm
30% Final