

IME 541 Advanced Materials Processing

Designation: Professional elective

Catalog Data: IME 541 Advanced Materials Processing (3) Engineering analysis in the processing of materials. Rapid manufacturing fundamentals. Nontraditional manufacturing techniques. Dynamic coupling, tool-workpiece interaction, energy and thermal analysis; mechanics of material removal and displacement. Prerequisites: IME 240 or 340 or permission of instructor.

Textbook:

S. Kalpakjian and S. Schmid, Manufacturing Processing of Engineering Materials, 4th Edition, Prentice Hall

Additional course handouts for some topics

Prerequisites by Topic:

1. Introductory courses in manufacturing.
2. Knowledge of the manufacturing properties of materials

Course Objectives:

Students completing this course will have:

Objective	Link to Curriculum Objective
1. An understanding of the basic capabilities, applications, and economics of non-conventional material removal processes	7, 8
2. An understanding of the mechanics and capabilities of abrasive machining processes	7, 8
3. An understanding of the capabilities of advanced machining processes	7, 8
4. An understanding of the mechanics of machine tool instability and some of the methods of elimination	7, 8
5. Experience of undertaking a project related to advanced manufacturing practice and of presenting the results orally and in writing	9, 10, 14
6. Experience of carrying out laboratory experiments, interpreting the results and preparing written reports	9, 10, 14

Topics Covered:

1. Non-Conventional Material Removal Processes, including ultrasonic machining, EDM, ECM, laser cutting, plasma cutting, water jet cutting, abrasive jet cutting and others
2. Abrasive machining processes – grinding, coated abrasive machining

3. Advanced machining processes – high speed machining, hard machining, advanced cutting tool materials

4. Machine tool dynamics and stability – regenerative and mode coupling instability, chatter control.

Laboratory experiments on various topics are integrated into the main topics covered. A final project that must be reported orally to the class and in writing is assigned to each student.

Contribution to Professional Component:

Engineering Science: 1 ½ credits or 50%

Engineering Design: 1 ½ credits or 50%

Course Outcomes:

Departmental Outcome	Indicator
A. An ability to solve engineering problems by applying knowledge of mathematics and basic science	Homework, Tests, Overall Grade
B. An ability to use modern computing tools and techniques to effectively solve industrial engineering problems	Final project report and oral presentation
J. An understanding of common manufacturing processes and their applications	Homework, Tests, Overall Grade
L. An in-depth study knowledge of at least one area of interest related to industrial engineering	Overall grade
M. An ability to take an assigned engineering problem, analyze it and formulate and implement a solution	Homework assignments, Tests
N. An ability to effectively contribute to a team solution of a complex engineering problem	Final project report
O. An ability to effectively carry out engineering experiments and interpret data	Laboratory reports
T. An ability to present and discuss information clearly and succinctly in written form	Final project report
U. An ability to make clear oral presentations	Project oral presentation

Prepared by: Winston Knight

Date: May 2006

