



Mechanical Engineering Dept. Department

Syllabus

ME 406: Manufacturing and Design (3-0-3)

Course Catalog Description:

Basic statistical concepts in characterizing the variability of measurements, and introduction to statistical manufacturing process control. Process capability analysis. Design considerations in manufacturing. Abrasive machining and non-traditional metal removal processes, CAD/CAM - Numerical Control machining. Powder metal processing. Manufacturing with Polymers, Rapid Prototyping. Design for Manufacturability and Economics of Manufacturing. Design and Manufacturing Case Studies.

Course Pre-requisites:

- ME 322: Manufacturing Processes
- ME 323: Manufacturing Lab

Course Co-requisites:

- ME 407: Advanced Manufacturing Lab

Course Objectives:

1. To establish a specialized understanding of conventional and non- conventional material removal processes, rapid prototyping, and processing plastics, and metal powders.
2. To understand the influence of process variables on the quality of the products and economy of the processes.
3. Students are expected to be able to use the knowledge from this course to design detailed process plans for the manufacturing processes or to develop detailed product designs by applying design for manufacturing (DFM) concepts
4. To provide a basic understanding of engineering statistics and process control through use of statistical software and linear regression to develop manufacturing process models.

Course Learning Outcomes:

- CLO1. Understand basic statistics and application of statistical tools in quality control and assurance requirements of a manufactured product.
- CLO2. Understand metal powders processing technologies, and know their applications
- CLO3. Understand various plastics and their composites processing technologies, and know their applications.

CLO4. Understand the basics of the different types of nontraditional machining processes. AND Develop an understanding of the effect of process parameters on machining (turning, Grinding) variables such as tool life and surface finish.

CLO5. Understand various design aspects for manufacturability and design issues relevant to various manufacturing processes.

CLO6. Utilize knowledge acquired in effective and integrated manner to solve a manufacturing related problem

CLO7. Be able to provide a plan to manufacture a product providing details of processes used, tools design and with economic analysis.

Learning Resources:

- Mikell P. Groover, Principles of Modern Manufacturing, Fifth Edition, John Wiley and Sons, 2013
- Class PowerPoint slides
- 1. Tool and Manufacturing Engineers Handbook, by Daniel B. Dallas, Editor-in-Chief, Society of Manufacturing Engineers. 2. Kalpakjian, S., Manufacturing Processes for Engineering Materials, 5TH edition, Addison-Wesley, 2009 3. Erik Oberg, et al., Machinery's Handbook, Industrial Press Inc., 2000. 4. M. P. Groover, Fundamentals of Modern Manufacturing Materials, Processes, and Systems, 3rd Edition, John Wiley and Sons, Inc., 2007.
- YouTube manufacturing videos

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
Test2	12	20.0%
Term Project Report	15	10.0%
Test1	6	20.0%
Test 3	Final	30.0%
Quizzes	Regular	10.0%
HomeWork	Regular	10.0%

Lecture Weekly Schedule:

Week#	Topics
1	Introduction
	Events and Probability
2	Discrete RV and Probability Distributions
3	Continuous RV and Probability Distributions
4	Continuous RV and Probability Distributions (Continue)
	Random Sampling
	Decision Making
5	Decision Making (Continue)
6	Quality Control

Week#	Topics
7	Powder Metallurgy
8	Powder Metallurgy (Continue)
9	Shaping and Processing of Plastics
10	Shaping and Processing of Plastics (Continue)
	Polymer Matrix Composites
11	Polymer Matrix Composites (Continue)
12	Grinding and Abrasive Machining
13	Grinding and Abrasive Machining (Continue)
	Non-Traditional Machining
14	Non-Traditional Machining (Continue)
15	Design Economics of machining