Mechanical Engineering Dept. Department

Syllabus
ME 407: Advanced Manufacturing Lab (0-3-1)

Course Catalog Description:

Laboratory demonstrations and experiments and hands on experience of: Measurements (Dimensional Metrology), Variability and Distributions, Manufacturing Tolerances and Process Capability Studies, Surface Roughness Analysis, Experimental Data Analysis to Develop Empirical Models-Use of Excel, and other statistical software's, Advanced Experiments in Machining. Machining Forces and Torque Models. Non Traditional manufacturing, CAD/CAM and CNC machining, Integrated Manufacturing (CAD/CAM) Project.

Course Pre-requisites:

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

Course Co-requisites:

- ME 406: Manufacturing and Design

Course Objectives:

1. Provide students with hands-on experience for various advanced manufacturing processes and on CNC machining.
2. Enable students to handle and accomplish the CAD/CAM and Integrated Manufacturing Project on CNC machines.
3. Use of LVDT instrumentations in metrology and data acquisition in metal cutting process
4. Enable students to apply statistical analysis techniques for better understanding of the effect of various machining parameters.

Course Learning Outcomes:

CLO1. Students should acquire an understanding of the effect of machining process parameters on cutting forces, tool life and surface finish.

CLO2. Students should be able to work in a team to design a manufacturing plan (process planning), handle projects and to machine a part on a CNC machine.

CLO3. Students should demonstrate the ability to document the process design and fabrication activities in a technical report.

CLO4. Students should be able to use CAMWorks software to generate CNC program (G-Code) for CNC machining.

CLO5. Students should be able to use LVDT instruments for data acquisitions in experiments

Learning Resources:

- Handouts and lecture slides, Mechanical Engineering Department, King Fahd University of Petroleum & Minerals Dhahran Saudi Arabia

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
Final Exam	15	30.0%
Class Quiz	7	4.0%

Lab Assessment Plan:

Assessment Task	Week Due	Weight
Laboratory report 5, Powder metallurgy	12	4.0%
Laboratory report 6, Dimensional metrology	14	2.0%
Term Project	15	25.0%
Lecture and lab attendance	15	19.0%
Laboratory report 1, Forces, power and torque in turning process	2	4.0%
Laboratory report 2, Forces, power and torque in drilling process	3	4.0%
Laboratory report 3, Surface analysis and forces in grinding process	4	2.0%
Laboratory report 4, Surface analysis in milling process	5	2.0%
Home assignment on Manual CNC programming	7	4.0%

Lab Weekly Schedule:

Week#	Topics
1	Workshop orientation, safety procedures and exposure of PPE
2	Forces, power and torque in turning processes
3	Forces, power and torque in drilling processes
4	Surface analysis and forces in grinding
5	Surface analysis and forces in milling
6	Introduction to CNC machining
7	Manual CNC programing techniques
8	Manual CNC Programming Practice
9	Introduction to SOLIWORKS CAM

Week#	Topics
10	SOLIWORKS CAM: 2.5D machining
11	SOLIWORKS CAM: Multi surface machining
12	Powder metallurgy processing
13	CAD/CAM Integrated Machining Term Project Help Session
14	Metrology: Use of Electronic (LVDT) instruments in Dimensional Measurements
15	Final Exam / Machining of Term Project Part