ME 4210 Manufacturing Processes and Engineering (Required)

Catalog Description: ME 4210 Manufacturing Processes and Engineering (3-0-3)
Prerequisites: (MATH 3770 or ISyE 3770 Statistics and Applications), COE 3001 Mechanics of Deformable Bodies, and ME 3345 Heat Transfer
Major manufacturing processes, their capabilities, analysis, and economics. Manufacturing process selection.

Textbook: Serope Kalpakjian, Steven R. Schmid, *Manufacturing Processes for Engineering Materials, 5*th Edition, Prentice Hall, 2007.

Topics Covered:

1. Basics:
    - 1.1 Review of materials and mechanical properties
    - 1.2 Metrology and surface finish
    - 1.3 Taxonomy of manufacturing processes
2. Manufacturing Processes:
    - 2.1 Casting
    - 2.2 Bulk deformation (forging, rolling, drawing, extrusion)
    - 2.3 Sheet metal forming
    - 2.4 Mechanical material removal (cutting, grinding)
    - 2.5 Non-Mechanical material removal (ECM, EDM, laser, electron beam, water jet)
    - 2.6 Polymer and polymer composites processing
    - 2.7 Joining (welding, adhesives, rivets)
    - 2.8 Micro manufacturing methods (MEMS, Micromachining)
3. Manufacturing Engineering:
    - 3.1 Economic modeling and cost analysis
    - 3.2 Process selection

Course Outcomes:

Outcome 1: To teach students to perform mathematical analyses of conventional and non-traditional manufacturing processes

1.1 Students will demonstrate the ability to break down manufacturing processes for analysis.
1.2 Students will demonstrate the ability to identify known and unknown parameters including initial and boundary conditions for major manufacturing processes.
1.3 Students will demonstrate the ability to draw clear and appropriate free body diagrams and control volumes of select manufacturing processes.
1.4 Students will demonstrate the ability to apply the fundamental principles from prerequisite courses in mechanics, materials and thermo-fluids to analyze manufacturing processes.

Outcome 2: To teach students to integrate core mechanical engineering principles to design manufacturing processes and systems

2.1 Students will demonstrate the ability to integrate the relevant core principles in mechanical engineering (mechanics, materials and thermo-fluids) to solve problems in manufacturing.
2.2 Students will demonstrate the ability to carry out manufacturing process design based on first principles.

Outcome 3: To train students to interpret product requirements, manufacturing process capability data and apply them to select and/or synthesize suitable manufacturing process(es)

3.1 Students will demonstrate knowledge of process capabilities of major manufacturing processes.
3.2 Students will demonstrate the ability to make use of process capability information to select and/or synthesize manufacturing processes and systems.

Outcome 4: To teach students basic process optimization techniques

4.1 Students will demonstrate an understanding of the role of economic considerations in manufacturing process selection and optimization.
4.2 Students will demonstrate the ability to perform simple cost and time based process optimization for select manufacturing processes.

Correlation between Course Outcomes and Program Educational Outcomes:

ME 4210												
	Mechanical Engineering Program Educational Outcomes											
Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l
Course Outcome 1.1							X		X		X	X
Course Outcome 1.2	X				X		X		X		X	X
Course Outcome 1.3	X				X		X				X	X
Course Outcome 1.4	X				X		X				X	X
Course Outcome 2.1	X				X		X				X	X
Course Outcome 2.2	X		X		X		X		X		X	X
Course Outcome 3.1			X				X			X	X	
Course Outcome 3.2			X				X	X	X	X	X	X
Course Outcome 4.1			X			X	X	X	X		X	
Course Outcome 4.2			X			X	X	X			X	

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