

GUJARAT TECHNOLOGICAL UNIVERSITY

MECHANICAL (ADVANCE MANUFACTURING SYSTEM) (50)

ADVANCE MANUFACTURING PROCESSES

SUBJECT CODE: 2715003

SEMESTER: I

Type of course: Engineering Science

Prerequisite: None

Rationale: This course is designed to acquaint and motivate the student with the complex and interdisciplinary nature of manufacturing processes through a balanced coverage of relevant fundamentals and real world problems, to introduce primary and secondary forming processes and to develop a skill for application of these processes, to introduce several material removal processes and to initiate original thinking in judicious selection of a particular process.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	PA (V)		PA (I)			
					ESE	OEP	PA	RP		
3	2	2	5	70	30	20	10	20	0	150

Content:

Sr. No.	Contents	Total Hrs.	% Weightage
1	Advanced Machining Processes Introduction, Process principle, Material removal mechanism, Parametric analysis and applications of processes such as Water jet machining (WJM), Abrasive water jet machining (AWJM), Electron beam machining (EBM), Laser beam machining (LBM) processes	12	25
2	Advanced Casting Processes <ul style="list-style-type: none">• Metal mould casting• Continuous casting• Squeeze casting• Vacuum mould casting• Evaporative pattern casting• Ceramic shell casting	10	25
3	Advanced Welding Processes <ul style="list-style-type: none">• Details of electron beam welding (EBW)• laser beam welding (LBW)• ultrasonic welding (USW)	10	25

4	Advanced Metal Forming Processes <ul style="list-style-type: none"> • Details of high energy rate forming (HERF) process • Electro-magnetic forming, • explosive forming • Electro-hydraulic forming • Stretch forming • Contour roll forming 	10	25
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Reference Books:

1. "Materials and Processes in Manufacturing" (8th Edition), E. P. DeGarmo, J. T Black, R. A. Kohser, Prentice Hall of India, New Delhi (ISBN 0-02-978760).
2. "Manufacturing Science" A. Ghosh, and A. K. Mallik, Affiliated East-West Press Pvt. Ltd. New Delhi.
3. "Nontraditional Manufacturing Processes", G.F. Benedict, Marcel Dekker, Inc. New York (ISBN 0-8247-7352-7)

Course Outcome:

After learning the course the students should :

1. have a strong background in manufacturing processes and materials for discreet piece part manufacture, considering nomenclature recognition, limits, costs, benefits, etc. of comparative processes and materials through a hands on approach
2. have an ability to utilize modern tools and techniques to effectively communicate technical requirements and functionality in oral, written, and graphical forms

List of Experiments:

Students are required to perform experiments based on:

- Parametric study of various non-conventional manufacturing processes, advance casting processes, welding processes and forming processes.
- Tool Design assignments for selected manufacturing processes

Open ended problems:

1. Make a comprehensive table of the process capabilities of the advance machining process which described the type of tools and tool materials used, the shapes of blanks and parts produced, the typical maximum and minimum sizes, surface finish, tolerances, and production rates.
2. Select the casting component of your choice & make a solid model. Transfer it to any casting simulation software and analyze the effects of design parameters on casting defects.
3. Prepare the final pattern that will be used to make a sand mould to produce a casting specified in problem-2. Consider the necessary allowances.
4. Carry out a basic welding simulation using FEA software. Try to interpret the result.
5. Consider several shapes to be blanked from a large sheet (such as oval, L-shape, and so forth) by laser beam cutting, and sketch a nesting layout to minimize scrap generation.