GUJARAT TECHNOLOGICAL UNIVERSITY

MECHANICAL ENGINEERING (19)
DESIGN FOR MANUFACTURING AND ASSEMBLY
SUBJECT CODE: 2181921
B.E. 8TH SEMESTER

Type of course: Under Graduate

Prerequisite: NIL

Rationale: The Design for Manufacturing and assembly is challenging subject, the aim of present course is to introduce and aware students about the basic design process which based on different aspects of manufacturing as well assembly. Student will have idea about different criteria made on design such as machining and casting. They also have knowledge on Environment factors.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total (Hours)	% Weightage
1	Introduction: General design principles for manufacturability: strength and mechanical factors, mechanisms selection, evaluation method, Process capability: Feature tolerances, Geometric tolerances, Assembly limits, Datum features, and Tolerance stacks.	06	15
2	Factors Influencing form Design: Working principle, Material, Manufacture, Design- Possible solutions, Materials choice, Influence of materials on form design, form design of Welded members, forgings and castings.	08	15
3	Component Design-I: Machining Consideration: Design features to facilitate machining: drills, milling cutters, keyways, Doweling procedures, counter sunk screws, Reduction of machined area, simplification by separation, simplification by amalgamation, Design for machinability, Design for economy, Design for clampability, Design for accessibility, Design for assembly.	10	25
4	Component Design-II: Casting Consideration: Redesign of castings based on parting line considerations, Minimizing core requirements, machined holes, redesign of cast members to obviate cores. Identification of uneconomical design, Modifying the design, group technology, Computer Applications for DFMA	10	25
5	Design for the Environment: Introduction, Environmental objectives, Global issues,	10	20

	Regional and local issues, Basic DFE methods, Design guide lines, Example application, Lifecycle assessment, Basic method, Environmentally responsible product assessment, Weighted sum assessment method, Lifecycle assessment method, Techniques to reduce environmental impact, Design to minimize material usage, Design for disassembly, Design for recyclability, Design for remanufacture, Design for energy efficiency, Design to regulations and standards.		
	Total	44	100

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
5	**10**	**20**	**20**	**5**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Kevien Otto and Kristin Wood, Product Design. Pearson Publication, 2004.
2. Product design and development, by K.T. Ulrich and S.D. Eppinger, Tata McGraw Hill
3. Boothroyd, G, 1980 Design for Assembly Automation and Product Design. New York, Marcel Dekker.
4. Bralla, Design for Manufacture handbook, McGraw Hill, 1999.
5. Boothroyd, G, Heartz and Nike, Product Design for Manufacture, Marcel Dekker, 1994.
6. Dickson, John. R, and Corroda Poly, Engineering Design and Design for Manufacture and Structural Approach, Field Stone Publisher, USA, 1995.
7. Fixel, J. Design for the Environment McGraw Hill., 1996.
8. Graedel T. Allen By. B, Design for the Environment Angle Wood Cliff, Prentice Hall. Reason Pub.1996.

Course Outcome:

1. Students will have knowledge on design principles for manufacturability
2. Students will have knowledge Influencing factors on Design.
3. Students will have knowledge on Machining consideration while design.
4. Students will have knowledge on casting consideration while design.
5. Students will have knowledge on environment consideration while design.
6. Students will have ability to understand contemporary issues and their impact on design for manufacturing and assembly.

List of Experiments:

1. Study and report on design principles for manufacturability
2. Study and report Influencing factors on Design.
3. Case study on Machining consideration
4. Case study on casting consideration
5. Case study on Life cycle assessment of product.
6. Case study on Environmental Aspects on Design of Product

Design based Problems (DP)/Open Ended Problem:

Case problems of design of product on different issues like: Machining, casting and Environment

List of Open Source Software/learning website:

http://www.nptel.ac.in

http://www.ocw.mit.edu

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides/Canvases/Drawing sheets with different color pens for graphical representation of for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.