

GUJARAT TECHNOLOGICAL UNIVERSITY

MECHANICAL (CAD/CAM) (08) COMPUTER AIDED PROCESS PLANNING SUBJECT CODE: 2720813 SEMESTER: II

Type of course: Engineering Science

Prerequisite: Zeal to learn the subject

Rationale: Developing design and manufacturing ability of equipment or assembly with manufacturing constraints, its planning and required strategy for its computer implementation.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
					ESE	OEP	PA	RP		
4	0	2#	5	70	30	20	10	10	10	150

Content:

Sr. No	Topic	Lectures	Weightage
1	Introduction: Introduction to process planning and production planning : Role of process planning in the Manufacturing cycle, Concept of route sheet, Process Planning and Concurrent Engineering	8	10%
2	Group Technology: Part Families, Parts Classification and Coding, Features of Parts Classification and Coding Systems, Opitz, MICLASS and KK3 schemes of part classification and coding with examples, Production Flow Analysis (PFA), Composite part and key machine concept, Machine cell design, Applications of Group Technology, Quantitative analysis of Cellular Manufacturing, Grouping of parts and machines by Rank Order Clustering (ROC), Hollier method 1 and 2, Arranging Machines in a GT Cell.	13	25%
3	Cellular Manufacturing: Pull production – Kanban system, Push production, work cell concepts, work cell applications, work cell design, linked work cell and sub cell, work cell time, staffing work cell, equipment issues, and issues in implementing cellular manufacturing.	7	10%
3	Process Engineering and Process Planning: Experienced, based planning, Decision table and decision trees, Process capability analysis, Process boundaries, Process parameters, Process optimization. Process Planning, Variant process planning, Generative approach, Forward and Backward planning, Input format, expert systems, AI, criteria for selecting CAPP system, implementation issues.	9	20%
4	Computer Aided Process Planning Systems: Logical Design of a Process Planning, Implementation considerations,	6	15%

	manufacturing system components, production Volume, No. of production families, CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO, CPPP, PROLOG.		
5	An Intergraded Process Planning Systems: Totally integrated process planning systems, An Overview – TIPPS Design philosophy, CAD Interface, Modulus structure, Interactive surface identification, Process knowledge, Description language, Data Structure; operation - Input and Display of CAD model, surface identification, select process, select process parameters, Report Generation- Testing results, Expert process planning.	8	15%
6	Just in Time: The goals of JIT, prerequisite to JIT, JIT production, strategic implementation of JIT system, advantages and limitations of JIT.	3	5%

References:

1. Industrial Robotics Technology: Programming and Applications M. P. Groover, Mitchell Weis, Roger, N. Nagel, G. Nicholas and Odrey, Mc Graw-Hill, 2012.
2. Principles of Process Planning, A logical approach, I. Alevi and R.D. Weill, Chapman & Hall, 2008.
3. An Introduction to automate process planning systems, Tien-Chien Chang, Richard A.Wysk, , Prentice Hall, 2005.
4. Systems Approach to Computer Integrated Design and Manufacturing, Nanua Singh, John Wiley, 2008.
5. Computer Aided Manufacturing, P. N. Rao, McGraw Hill Publishing, 2010

Course Outcome:

After learning the course the students should be able to:

1. Identify the process capabilities such as process parameters, process boundaries and process cost for machining, material and assembly
2. Implement either manual or computer aided process planning based on process planning criteria and its economic evaluation.

List of Experiments:

1. Development of route sheets of a given product at least with five components
2. Identification of part codes using OPITZ/MICLASS/KK3 schemes of part classification and coding
3. Development of part machine incident matrix of a product
4. Use of cell formation techniques using PFA concept
5. Introduction of any of CAPP, MIPLAN, APPAS, AUTOPLAN, PROLOG software
6. Programming using any of above software
7. Demonstration of CAPP program using such software

Design based Problems (DP)/Open Ended Problem:

1. Students may visit nearby industry. Understand the procedure of coding of components or assembly and apply any coding technique they have studied for any one component individually. Suggest valuable outcomes to the industry.

Major Equipment:

1. Computer and Software.

List of Open Source Software/learning website:

1. PROLOG

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website