GUJARAT TECHNOLOGICAL UNIVERSITY

PLASTIC TECHNOLOGY (24)

PLASTICS MOULD MANUFACTURING TECHNOLOGY

SUBJECT CODE: 2722402

SEMESTER: II

Type of course: Core

Prerequisite: basics knowledge of materials and process for mold manufacturing

Rationale: correlate appropriate mold material and surface treatment for mold materials.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs	% Weightag
1	**Material for Moulds:** Selection of steels – Properties of steels – common steels used for moulds – strength of materials, calculation of wall thickness for cavity – Insert size – Life of mould Non-ferrous metals for mould construction: Application – Zinc base alloys – Aluminium alloys – Beryllium copper Non-metallic materials for mould construction: Advantages and its applications – epoxies - polyester – silicon	**10**	25
2	**Surface Treatment of Mould Materials:** Introduction – Heat treatment process – case hardening – through hardening – nitriding – tips on successful heat treatment – vacuum hardening – cryogenic heat treatment – Hard chrome plating – Nickel plating – chemical etching – Mould Polishing techniques	**08**	20
3	**Mould Making Techniques:** Pantograph engraving – Hydro copying – Jig boring – CNC machines – CNC Lathe –CNC Milling – CNC EDM – Advantages and its Applications – Assembly of moulds – Rapid prototyping.	**10**	25
4	**Inspection and Quality Control of Moulds:** Introduction to Tool Room measuring instruments – Vernier – Micrometer – Height Gauge – Slip Gauge – Dial Gauge – Measuring tapers and angles – CMM.	**08**	20

5	**Mould Estimation, Repair and Protection :** Procedure for estimating mould cost – General outline – Cost calculation – Basic moulds – Cavity – Basic functional components – Special functions etc. Introduction – Mould Repair and maintenance – scheduling mould maintenance – advantages – storage – corrosion protection – wear and lubrication – special consideration.	**06**	10

Reference Books:

1. Cyril Donaldson George H. Lecain V C Goold, Tool Design, TATA McGraw-Hill, 1998.
2. Richard R. Kibbe John E. Neele, Roland O Meyer, Warran T. White, Machine Tool Practices, Prentice Hall of India Pvt. Ltd., 1999.
3. Irwin Rubin, Injection Moulded Theory and Practice, Wisely Interscience Publication, 1972.
4. Society of Plastics Industry, Plastics Engineering Hand Book, Van Nostrand Reinhold Company, 1960.
5. Dominick V. Rosato, Donald V. Rosato, Injection Moulding Hand Book, CBC Publishers & Distributors, 1987.

Course Outcome:

After learning the course the students should be able to:

1. Design mold manufacturing steps along with material selection, surface treatment
2. Understand inspection, quality control and protection of molds.
3. Understand basics of CNC machine.

List of Experiments/tutorials:

1 Various types of steels, selection and properties of steels used for moulds.
2 Non-ferrous metals for mould construction- Zinc base aluminium and Beryllium copper
3 Heat treatment process for mold materials.
4 Hard chrome plating and Nickel plating for surface treatment of mold materials.
5 CNC Lathe process, advantages and its applications
6 CNC Milling process, advantages and its applications
7 Rapid prototyping
8 Mould Repair and maintenance

Major Equipments: Pantograph engraving, CNC Lathe –CNC Milling – CNC EDM

Open ended problems/ design oriented problems

1. Calculation of wall thickness for cavity
2. Determine mold dimension using Vernier Caliper
3. Determine mold dimension using Micrometer
4. Calculating mould cost.

List of Open Source Software/learning website:

http://www.nptel.ac.in/

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.