GUJARAT TECHNOLOGICAL UNIVERSITY

CHEMICAL TECHNOLOGY (36)
COMPOUNDING & PROCESSING OF PLASTICS & RUBBERS
SUBJECT CODE: 2163602
B.E. 6th SEMESTER

Type of course: Chemical Technology

Prerequisite: subject PR-05(Compounding & Processing of Plastics & Rubbers- I) basic knowledge of the polymers and rubbers how they get process

Rationale: The main objective of this subject is to study the mixing of two polymers and rubbers and what is the machinery used to process them in chemical industries. This subject provides fundamental knowledge of various types of rubber & polymers and how to carry out the compounding as well as processing of rubber & polymers in chemical industries.

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		
4	0	3	7	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs.	% Weightage
1	**Compounding**- Basic Concept of Polymer/Rubber Compounding & Processing	4	12
2	**Extrusion and Moulding**- Extrusion process- cold feed, Hot feed, Crosshead, Single Screw Extruder, Twin Screw Extruder, making of profiles, tyre tubes etc. Compression Moulding, Transfer Moulding, Single daylight, Multiday light	15	22
3	**Injection moulding-** Rubber injection, Reaction injection, Cold and hot runners, flashless mould, Plastic injection, Reaction Injection moulding, Gas/Water assisted Injection moulding	11	22
4	**Calendaring**- Its types-3 Roll, 4 Roll, Z type etc	4	16
5	**Additive**-Classification & type of Additive for Rubbers & Plastic: Fillers, Carbon Black, Accelerators, Antioxidants, Activators, Process aids, Colors, Flame Retardants. Rubber Process oils.	10	16
6	**Pultrusion**- Pull winding. Caps & enclosure preparation	2	12

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
60	**10**	**10**	**10**	**10**	**00**

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

Reference Books:

1. Understanding Injection Molding Technology, Herbert Rees, Hanser Publishers, 1994.
2. Understanding Extrusion, Chris Rauwendaal, Hanser Publishers, 1998
3. Rotational Molding, Glenn L. Beau, Hanser Publishers, 1998
4. Understanding Compounding, R. H. Wildi & Maier,Hanser Publisher mc, 1998
5. Fundamentals of Polymer Processing, S. Middleman,Houghton Mifflin Company, 1997
6. Fillers & Filled Polymers, J. F. Gerard, Wiley-VCH verlag GmbH, 2001
7. Handbook of Fillers, C. Wypych, Chem. Tech Publishing 2000
8. Handbook of Fillers & Reinforcements for Plastics, H. S. Katz & J. V. Milewski,Van
9. Rubber Compounding, Barlow, CRC Press, 2nd Ed, 1993
10. Rubber Compounding: Chemistry and Applications , Brendan Rodgers, CRC, 1st Ed, 2004
11. Introduction to Rubber Technology, Andrew Ciesielski, RAPRA Publications, 2000
12. Rubber Technology, Maurice Morton, Springer, 1st Ed, 1987
13. Introduction to rubber technology - Maurice Morton
14. Rubber technology and manufacture, 2nd ed., C. M. Blow

Course Outcome:

1. To get an introductory knowledge of Polymers & Rubbers Technology.
2. To know the Rapid Polymers & Rubbers concept, as well as its application
3. To be able to apply this knowledge in Polymers & Rubbers industries

List of Experiments:

1. Compounding of Polymer in two roll mill
2. Compounding of Rubber in two roll mill
3. Compression Moulding: Polymer
4. Compression Moulding: Rubber
5. Mould analysis for Injection Moulding
6. Mould analysis for Compression Moulding
7. The effect of Additive in Polymers
8. The effect of Additive in Rubbers
9. Compression Moulding: Rubber

Design based Problems (DP)/Open Ended Problem:

Students are free to select any area of science and technology based on chemical technology applications to define Projects.

Some suggested projects are listed below:

1. Literature survey on Injection moulding

2. Carry out synthesis of Injection moulding
3. Product profile and its manufacturing process of Injection moulding
4. PPT on Injection moulding.

List of Open Source Software/learning website:

1. Literature available on internet
2. Polymer & Rubber dictionaries
3. Delnet
4. Literature available under R&D in Polymer & Rubber industry.
5. Polymer & Rubber journals

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics 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.