

Subject Code: 09CH1506

Subject Name: Polymer Technology

Semester: 5th

Objective: To learn various quantitative methods to manufacture various polymer products.

Credits Earned: 4 Credits

Course Outcomes: After completion of this course, student will be able to:

1. Summarize properties of various polymers.
2. Apply unit operations to manufacture Rubber, Plastic and Fiber.
3. Apply Different Polymer Processing Techniques.

Pre-requisite of course: Basics of chemical process industries.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Practical Exam (V)	Term work (TW)	
3	0	2	4	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	Properties of Polymers : Polymerization, Types: Bulk polymerization, Solution polymerization. Suspension polymerization, Emulsion polymerization. Molecular weight, Crystallinity and Glass transition temperature. Properties of Plastics: Electrical Resistance, Chemical Resistance, Thermal Stability, Biodegradability. Properties of Rubbers: Elasticity, Electric Conductivity, Resistance to fatigue. Properties of Fibers: Resiliency, Elongation, Strength.	12
2	Rubbers : Classification of Rubber and its Properties, Various types of rubber, Applications and Manufacturing of: Ethylene Propylene Terpolymers Butyl rubber Polyurethane, Silicone rubber	08
3	Plastics : Properties, applications and manufacturing of: Polyethylene by high pressure ICI process for LDPE, Polyethylene by Ziegler low pressure process for HDPE, Polypropylene, Polystyrene, ABS, Polytetrafluoro Ethylene (PTFE /Teflon), Urea Formaldehyde.	10

4	Fibres: Properties, applications and manufacturing of: Viscose rayon fibres, Cellulose Acetate fibre, Nylon-6, Glass fibres	06
5	Processing of polymers : Nylon-6 and Nylon 6 6 and their difference, Mastication, Mixing, Moulding, Extrusion, Calendaring, Vulcanization, Compounding Coating	06
Total Hours		42

References:

• **ReferenceBook:**

1. Polymer science Gowarikar, V, R., Viswanathan, N.V.Sreedhar, Jayadev New Age International Pvt. Ltd., New Delhi
2. Outlines of Chemical Technology –Rao, M.Gopal, Sittig, Marshall, Affiliated East West Press (Pvt) Ltd. New Delhi 3rd Edition.
3. Chemical Technology, Vol. I & II – Pandey, G.N. and Shukla, Vani books company, Hyderabad 2nd Edition
4. Shreve's Chemical process Industries – Austin, G.T, McGraw Hill Publication, 5th Edition.

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyse	Evaluate	Create
40%	40%	10%	10%	-	-

List of Experiments:

1. Prepare classification chart based on properties and uses.
2. Demonstrate thermosetting and thermoplastic properties
3. Test the effects of solvents on plastic, rubber and fibre
4. Test the effects of acids and alkalies on plastic, rubber and fibre
5. Test effects of temperature on plastic, rubber and fibre
6. Prepare thermo-plastics PMMA(Poly Methyl Methacrylate)
7. Prepare Polystyrene from styrene
8. Prepare Phenol Formaldehyde resin from Phenol
9. Prepare Urea Formaldehyde resin from Urea
10. Prepare Melamine Formaldehyde
11. Prepare primary cellulose acetate from cellulose
12. Perform Vulcanization of Rubber

Instructional Method:

- a) The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCsetc.

- b) The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c) Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d) Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory