SEMESTER S5

POLYMER PROCESSING

Course Code	**PCPOT502**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:1:0:0	**ESE Marks**	60
Credits	4	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	Basic Knowledge in Polymer Materials and Polymer Science	**Course Type**	Theory

Course Objectives:

1 To understand the compounding ingredients used in rubbers and plastics.

2 To know about the machineries used for polymer compounding

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Compound development:** Factors to be considered for compound development, formulation of a mix, Compounding ingredients stabilizers, fillers, antioxidants, antiozonants, UV absorbers, flame retardants, peptiser, retarder, curing agents. plasticisers, process aids, extenders, factice, mould release agents, tackifying agents, blowing agents, bonding agents, fragrances, antistatic agents, colorants, and other special additives.	**11**
2	**Compounding methods:** Different methods, principles of mixing, dispersive and distributive mixing, mastication, two-roll mill mixing, internal mixers, comparison between open mill and internal mixer, Banbury mixing, continuous mixing, master batching Compounding for specific applications- ozone resistance, heat resistance, weather resistance, oil resistance, electrical, optical and medical applications.	**11**

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3	**Compression moulding:** Processing techniques, compression moulding, moulding presses, flash, positive and semi positive moulds, compression moulding cycle, trouble-shooting, automatic compression moulding.	**11**
4	**Transfer moulding:** Transfer moulding cycle, advantages, limitations, theoretical and design considerations, general mould design consideration, troubleshooting. Calenders and accessories, machineries for specific products-tyre and tubes, footwear, hoses and belting, wires and cables, latex and fibre foam.	**11**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Micro project	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

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End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
● 2 Questions from each module. ● Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	● Each question carries 9 marks. ● Two questions will be given from each module, out of which 1 question should be answered. ● Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain the main compounding ingredients in plastics	**K2**
CO2	Analyze the significance and importance of compounding ingredients used in rubbers.	**K4**
CO3	Illustrate different rubber compounding methods for rubbers and compound formulations for specific applications.	**K2**
CO 4	Compare and contrast between various processing techniques for polymers.	**K2**
CO 5	Analyze the significant machineries for specific products.	**K4**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table:

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2			1		2					1
CO2		1		3		1			1			1
CO3	1		2		2		2					1
CO4		1		2				2			2	1
CO5	2			1		1			2			1

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Science and Technology of Rubber	James E. Mark and Burak Erman	Elsevier	Ed 3 2011
2	Polymer Engineering Principles	Polymer Engineering Principles	Hanser	1993
3	Rubber Technology	M. Morton	Springer Science	2013
4	Rubber Technology and Manufacture	C. M. Blow, C.Hepburn,	Butterworths	1971

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Handbook of Applied Polymer Processing Tech	N. P. Charemisinoff and P.N Chere	Marcel Dekker Inc, NY,	1996
2	Rubber Compounding: Principles: Materials, and Techniques	Barlow	CRC Press	1993
3	An Introduction to Rubber Technology	Ciesielski,	Smithers Rapra Publishing	1999

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Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://youtu.be/cg7f3loKlmU?si=csnCvm0UxFbVD4k9
2	https://youtu.be/p27Hy9Ms_PI?si=flffzjzWk8xDV-iw
3	https://youtu.be/yK6-QNB1roo?si=XSsq6h43g7sjNZi6 https://youtu.be/pOGpXZ-UMfo?si=qGBYbHjedMoDypSa
4	https://youtu.be/2DUB9DoIoi8?si=awk-oKjE0XptMM0t