



# GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code: 3722410

Semester – II

Subject Name: Additives & Compounding

Type of course: Core IV

Prerequisite:

Rationale:

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)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Introduction to Additives: Introduction - Technological Requirements - Classification - Chemistry and Mechanism - Selection Criteria - General effect on Properties - Evaluation and functions of additives.	4
2	Additives: Antioxidants - Stabilizers (Heat & UV) - Plasticizers - Fillers and reinforcements - Impact Modifiers - Lubricants - Slip and Anti-block agents - Processing aids - Blowing agents - Flame Retardants - Anti-static & Conductive additives - Nucleating agents - Colorants - Additives for Recycling.	10
3	Compounding Techniques: Selection of Polymers and Compounding ingredients - General objectives - possibilities and limitations of mixing and compounding - Methods of incorporation of additives into polymer materials.	15
4	Compounding Equipments: Mixing and mixing equipments. Principles - Operating characteristics - Machine construction - Specifications - Process control systems and working details of Batch mixers and continuous mixers - High speed mixer - Two roll mill - Banbury Mixer - Ribbon blender - Planetary mixers - Single Screw extruder - Twin Screw extruder	15
5	End use Market for Plastics: Principles of Material selection including consideration of conventional materials competitive with plastics - Case studies on material suitability (e.g., Plastic Gears, Feeding Bottle, Bowels for micro wave ovens). Survey and uses of plastics with reasons for their importance in major industries like, Agriculture, Packaging, Building, Transport, Electrical, Electronics and Telecommunications, Medical and Furniture.	10



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## Reference Books:

1. R. Gachter and H. Muller, *Plastics Additives Hand Book*, Hanser Publishers, Munich, 1993.
2. John Murphy, *The Additives for Plastics Hand Book*, Elsevier Advanced Technology, Oxford, 1996.
3. Jesse Edenbaum, *Plastics Additives and Modifiers Hand Book*, Chapman & Hall, London, 1996.
4. Ica Manas - Zloczower and Zehev Tadmor, *Mixing and Compounding of Polymers*, Hanser Publications, Munich, 1995.
5. Nicholas P. Cheremisionoff, *Polymer Mixing and Extrusion Technology*, Marcel Dekker Inc., New York, 1995.
6. A. Brydson, *Plastics Materials*, Butterworth Heinemann, Oxford, 1999

## Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Identify various types of additives used and their functions	15
CO-2	Understand and list the Properties of various types of additives	20
CO-3	Understand various compounding techniques used for mixing and compounding	15
CO-4	Have the knowledge of construction and working various compounding equipments	15
CO-5	Differentiate between various compounding techniques and identify suitable equipment based on that	15
CO-6	Apply the principles of material selection for creating a compound suitable for end use applications	20

## List of Experiments:

Tutorials/Presentation/Practicals based on above topics.

## Major Equipment:

1. Two roll mill
2. Banbury mixers
3. Single screw extruder with mixing screws
4. Twin screw extruders[ corotating and counter rotating]
5. Compression moulding machine
6. Injection moulding machine with test specimen mould
7. Testing machines

## List of Open Source Software/learning website:

- [https://en.wikibooks.org/wiki/Plastics\\_Molding\\_%26\\_Manufacturing/Plastic\\_Additives](https://en.wikibooks.org/wiki/Plastics_Molding_%26_Manufacturing/Plastic_Additives)
- <http://www.bpf.co.uk/plastipedia/additives/default.aspx>
- [www.sciencedirect.com](http://www.sciencedirect.com)