

GUJARAT TECHNOLOGICAL UNIVERSITY

CHEMICAL ENGINEERING (COMPUTER AIDED PROCESS DESIGN) (16)

PROPERTY PREDICTION FOR MIXTURES (PPM)

SUBJECT CODE: 2721605

SEMESTER: II

Type of course: (Major Elective-III) (M.E.CAPD)

Prerequisite: Polymer Science & Synthesis of Polymers (PSSP)

Rationale: Learn about the Polymer Processing Methods.

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)			
					ESE	OEP	PA	RP		
3	2#	0	4	70	30	30	0	10	10	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Introduction to Polymer Processing: Polymer Processing Methods and Machinery, Analysis of Polymer Processing in Terms of Elementary Steps and Shaping Methods.	6	10
2	Mixing: Introduction, Historical, Terminology, mixing requirements with polymeric materials, Place of mixing in polymer processing.	6	10
3	Principles: General, State of admixture, Mechanisms and Kinetics of mixing, Relationships between the nature of the components of a mixture and mixing processes, General aspects of machine design and operation	6	10
4	Blending and Blending Equipment: General Considerations, Vibratory or Reciprocating blenders, Tumble blenders, Stirrer mixers, Intensive non-fluxing mixers, Ribbon blenders and related mixtures, Z-blade and related double-arm mixers, Plough mixers, Air and fluidized bed mixers, toroidal mixers, Buss continuous turbine mixer, Colloid, disc and pin mills etc., Bead mills etc., Mullers and pug mills, Roll mills, Electrostatic blending etc.	6	10
5	Batch Compounding Equipment: General considerations, Two-roll mills, Internal mixers, Kneader, Continuous mixer, Banbury Mixer, New developments etc.	6	10
6	Continuous Compounding Equipment: General considerations, General aspects of extruder compounding and extruder machine, Single screw extruder, Twin-screw extruder, Miscellaneous continuous compounding machinery, General aspects of Injection compounding and Injection Molding machine and its process etc.	6	10
7	Calendars: Types & sizes of typical machines, roll configurations, roll cambering,	6	10

	single trip & double rip arrangements for sheeting, equipments for coating of textile fabrics, friction coating, axis crossing devices, roll bending etc New developments.		
8	Molding & Casting : Molding, Review of Molding Methods, Compression Molding, Transfer Molding , Injection Molding, , Blow moulding, Rotational moulding, New developments	6	10
9	Other Processing Methods: Thermoforming, Foaming, Reinforcing, laminating, Spinning of Fibers and Mercerisation etc.	6	10

Reference Books:

1. Polymer Mixing Technology by George Mathews
2. Polymer Chemistry by B. K.SHARMA
3. Principles of Polymer Processing by Zethew Tadmor and Costas G. Gogos.
4. Rubber Technology & Manufacturing: by C. M. Blow
5. Rubber Engineering: IRI

Course Outcome:

After learning the course the students should be able to:

- Learn about the Polymer Processing Methods.
- Understand the importance of Mixing in Polymer Products..
- Learn the general aspects of machine design and operation.
- General aspects of extruder compounding and extruder machine.
- Learn about the continuous mixing components.
- Understand the roll configuration of Calender Machine.
- Differentiate between the different Molding Techniques.
- Study about the different Polymer Processing methods.

Major Equipment:

Mixing Mill, Calender Machine, Extruder, Injection Molding Machine etc.

List of Open Source Software/learning website:

- www.pauloabbe.com/mixing-blending
- www.sinoalloy.com/
- machinedesign.com/materials/polymer-castings-take-metals

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.