GUJARAT TECHNOLOGICAL UNIVERSITY

PACKAGING TECHNOLOGY (58)
PACKAGING MATERIALS
SUBJECT CODE: 715802
SEMESTER: I

Type of Course: Regular

Prerequisite: Nil

Rationale:
This course will introduce the basic information about the diversity of packaging materials and their applications.

Teaching Scheme			Credits	Examination Marks						Total Marks
L	Tutorial /Presentation	P	C	Theory Marks		Practical Marks				
				ESE(E)	PA(M)	PA(V)		PA(I)		
						ESE	OEP	PA	RP	
3	2	2	5	70	30	20	10	10	10	150

Sr. No	Contents	Total hours	% weightage
1	**Paper and Boards**: Manufacturing of paper, coated papers and specialty papers and their uses, Structural boards, Use of paper and paperboard in flexible and rigid packaging, Properties of paper boards, Corrugated board packaging, manufacturing processes for corrugated boards.	05	08%
2	**Converted Products**: Converted paper products; Pigments- types, properties and manufacturing, Lacquers, Industrial coatings, functional coating; Corrugating, laminating.	05	08%
3	**Glass and Metals**: Types and composition of commercial glass, Methods of manufacturing of glass, Glass containers- manufacture, properties, application and testing; Colored and coated glass, Annealing, surface coating, Raw materials for metal packaging, manufacture of rigid metal containers, metal closures, Production of aluminium foil, foil finishes, coatings and lacquers.	07	20%
4	**Introduction to Polymer**: Classification and nomenclature, average molar mass and distributions, size and shape, elastomers, fibres and plastics, synthetic and natural Polymers	03	03%
5	**Polymerization and Copolymerization**: Polymerization reactions initiated by metal catalysts and transfer reactions, condensation, addition polymerization and emulsion polymerization, Ring opening polymerization, Polymer Stereochemistry, reaction of polymers; Theories of visco-elasticity, visco-elastic behavior and its models, time-temperature superposition, characterization of viscoelastic nature of polymer;	10	25%

	Polyolefins and Vinyl Polymers		
6	**Polymers for Films and Sheets**: Structure, properties and morphology of film and sheet forming polymers; Types of packaging, film, sheet, and boxes, laminated packaging, packaging for electronic goods, commodity materials, medicines and food products.	05	08%
7	Mechanical Properties of Polymer: Stress-strain behaviour, models, tensile, compressive and flexural mechanical response, cold drawing, strain hardening, effect of temperature, plasticizer and additives on mechanical properties, characterization of tensile, compressive & flexural mechanical nature of polymers; effects of crosslinking, temperature and other parameters; Dynamic Mechanical Thermal Properties, characterization of dynamic mechanical properties of polymer.	07	20%
9	High Performance Polymers: Epoxy, Polyesters, Polyurethanes, Polyimide, Polyamide, Polyether-ether Ketone and Liquid Crystal Polymers; Polymers for Engineering Application. Thermocol	03	08%

Reference Books

1. Gullichsen J. and Paulapuro H., "Papermaking Science and Technology, Book 12: Paper And Paperboard Converting (Ed. Savolainen A.)", Finnish Paper Engineers' Association and TAPPI. 2012

2. Gullichsen J. and Paulapuro H., "Papermaking Science and Technology, Book 13: Printing (Ed. Oittinen P. and Saarelma H.)", Finnish Paper Engineers' Association and TAPPI.

3. Gullichsen J. and Paulapuro H., "Papermaking Science and Technology, Book 17: Pulp and Paper Testing (Ed. Levlin J.-E. and Söderhjelm L.)", Finnish Paper Engineers' Association and TAPPI. 2012
4. Mark R. E., "Handbook of Physical and Mechanical Testing of Paper and Paperboard", Vol. 1, Marcel Dekker. 2002

5. Brudson J.A., "Plastic materials", Newnes Butterworth 1989
6. Campbell I.M., "Introduction to synthetic polymers", Oxford University Press 2000
7. Erhstein G., "Polymeric materials", Hanser-Gardner 2001
8. Korschwitz J., "Polymer Characterization and Analysis", John Wiley 1990

Course Outcome:

After learning this course the student must demonstrate the knowledge and ability to:

1. To understand uses of different types of materials for packaging.
2. To provide an overview of the production processes and salient features of different packaging materials.
3. To have adequate exposure of the polymeric materials, their chemistry and manufacturing processes,

List of Experiments:

Case studies based on above syllabus.

Open Ended Problem (OEP):

Students are expected to take up and present case analysis of packaging laws and regulation of different industrial sectors.

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.