GUJARAT TECHNOLOGICAL UNIVERSITY

RUBBER TECHNOLOGY (40)

THERMOSETTING RESINS & SILANE TECHNOLOGY

SUBJECT CODE: 2734004

M.E. SEM-III

Type of course: Major Elective - IV

Prerequisite: NA

Rationale: NA

Teaching and Examination Scheme:

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

Course Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction: History of Hydrocarbon Resins, Reinforcing Effect, Petroleum Resins, Polyterpene Resins, Aliphatic Resins, Cyclopentadiene Resins, Resinex Resins, Miscellaneous Resins etc.	**4**	**05**
2	Compounding: Different types of elastomers, tackifiers, fillers, plasticisers, softeners, antioxidants, curing agents and sequestering agents etc.	**5**	**05**
3	Requirements: Glass transition Temperature, Viscosity Change ,Resin Action, Obtaining Tack, Function of Tackifiers	**5**	**05**
4	Identification : Color, Compatibility, stability, observation , Effect on applications, etc.	**5**	**10**
5	Hydrocarbon Resin: Resin Manufacturing, Molecular Weight Distribution, Different Testing Methods , Properties etc.	**5**	**10**
6	Phenolic Resin: Chemistry, Manufacture, Properties , Applications etc.	**5**	**10**
7	Amino Resin : Chemistry, Characteristics, Manufacturing, Catalysts and Hardeners, Properties , Applications etc.	**5**	**10**
8	Acrylic Adhesives and Sealants : Acrylic Monomers, Production, Properties, Applications, Flocking Adhesives, Building Adhesives, Pressure Sensitive Adhesives, Acrylic Sealants etc.	**5**	**10**
9	Unsaturated Polyester Resins: Composition of Reinforced Polyester Systems, Formulation, Fabrication, Laminating, Molding, Filament Winding, Pultrusion, Properties, Applications etc.	**5**	**10**

10	Polyurethanes & Epoxy Resins: Epoxy Resins: Chemistry of preparation and Curing, Properties, Applications etc. Polyurethanes : Urethane Chemistry, Flexible and Rigid Foams, RIM Urethanes etc.	**5**	**10**
11	Silane – Coupling Agent : Definition of Silane, Importance, Benefits, Silane Chemistry, Silane description, Mode of action, Filler Treatment, Applications etc.	**5**	**15**

Reference Books:

1. Resins in Rubber by Gardner L. Brown
2. Handbook of Adhesives by Irving Skeist.
3. Textbook of Polymer Science by Fred W. Billmyer
4. Handbook of Thermoset Resins by Debdatta Ratna

Course Outcome:

After learning the course the students should be able to:

1. Understand the Importance of usage of Resin for Rubber Product.
2. Identify the different types of Resin.
3. Learn about the selection of Compounding ingredients when Resin is used.
4. Learn about the Resin Action during processing.
5. Learn about the Chemistry, Characteristics, Manufacturing Process and Properties of different types of Resin etc.
6. Importance of Silane for Rubber Compound as well Rubber Processing.
7. Learn about Silane Chemistry & Mode of its action.

List of Experiments:

1. Tutorials/Presentation/Practicals based on above topics.

Design based Problems (DP)/Open Ended Problem:

1. Development of Amino Resin for Paint Formulation .
2. Cocondensation between Resol and Amino Resins.
3. Curing Agents for Epoxy Resin .

Major Equipments: PH Meter, U Tube Viscometer, Density Meter etc.

List of Open Source Software/learning website:

- https://www.threebond.co.jp/en/technical/technicalnews/pdf
- http://www.crcpress.com
- www.academicjournals.org

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.