



SARVAJANIK  
UNIVERSITY

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SARVAJANIK UNIVERSITY  
Sarvajani College of Engineering and Technology



Bachelor of Technology (B.Tech)

B. Tech. Semester V

Subject Name: Polymer Science & Technology

Subject Code: BTCH14503

Type of course: PEC

Prerequisite (if any): 12<sup>th</sup> standard Chemistry, Chemical process technology-I &II.

Rationale: This course offers in depth knowledge related to different polymers, their synthesis, characterization and application.

Teaching and Examination Scheme:

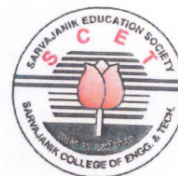
TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	0	3	60	25	15	0	0	100

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests) CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	<b>Introduction to Polymers</b> Polymers, Polymerization, History of polymers, Pioneers in Polymer Science, polymer structure and its properties, Chemistry of Polymerization –Addition, Condensation, Coordination Polymerization –Mechanism and Kinetics, Degree of Polymerization, Polymerization Conditions (Bulk, Solution, Precipitation, Suspension, Emulsion, Interfacial), Crystallinity– Polymer Single Crystals.	4	9%
2.	<b>Thermoplastics, Thermosetting and Elastomers</b> Thermoplastic Polymers, Poly-Olefins, Vinyl Polymers, Polystyrene, PMMA, Pan, Teflon, Polyamides, Polycarbonates and their Applications, Thermosetting Polymers, Phenolic Resins –Polyesters – Epoxies – Polyurethanes and their Applications, Elastomers- Natural rubber, Synthetic Rubbers.	7	16%
3.	<b>Manufacturing of polymers</b> like HDPE, LDPE and CPVC. Idea of Initiator and Terminator in polymeric reaction.	3	7%
4.	<b>Polymer Processing</b> Processing of Thermoplastics and Thermosetting plastics; Compounding and Processing Aids, Different Moulding methods, Processing of Rubbers; Vulcanization, Mastication; Calendaring, Reaction Injection Moulding; Solution Casting, Fiber Spinning and Drawing.	5	11%
5.	<b>Testing &amp; Characterization of Polymers</b> Polymer Characterization Tests; Melt Flow Index, Capillary Rheometer Test, Viscosity Test, GPC, Thermal Analysis Techniques; DSC, TGA and TMA, Morphology; SEM, TEM,	7	15%





	XRD, Mechanical Properties; Tensile Test, Impact Test, Hardness, Electrical properties; Di-Electric Strength & Di-Electric Constant, Thermal Properties-HDT.		
6.	<b>Specialty Polymers</b> Poly-Electrolytes and Ionomers, Conducting Polymers – Electro-Luminescent Polymers, High temperature Polymers and Polymer Blends, Polymer Composites and Nano-Composites, Interpenetrating Polymer Networks, Liquid Crystalline Polymers, Biomedical Polymers.	8	18%
7.	<b>Biopolymers:</b> Synthesis , characterization and application	5	11%
8.	<b>Development in degradation &amp; stabilization techniques:</b> Different approach for polymer reuse, recycle and regeneration for waste minimization.	6	13%

**Suggested Specification table with Marks (Theory/Practical):**

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	30	30	05	05	

**Legends:** R: Remembrance, U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create and above Levels (**Revised Bloom's Taxonomy**)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Text books:**

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Polymer Science	V R Gowariker, Vasant R. Gowariker, N V Viswanathan, Jayadev Sreedhar	New Age International	-	2nd Edition
2	Polymer Science and Technology	Joel R. Fried	PHI, Eastern Economy Edition	-	2nd Edition
3	Polymer Degradation and Stabilization		Harwood, H. J. (Ed.), Springer ISBN 978-3-642-69376-2	-	-

**Course Outcome:**

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Identify polymer properties and it's processing.	13%
CO-2	Classify different types of polymers and their testing	12%
CO-3	Synthesize of polymer and characterization of their properties.	35%
CO-4	Propose appropriate synthesis methods.	25%
CO-5	Evaluate and compare the performance of various polymers, their degradation and stability studies.	15%





**Mapping with POs:**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO-1	3	3	3	1	1	2	2	3	3	3	2	2	2	2	2
CO-2	3	3	3	3	3	2	3	3	2	2	2	2	2	2	2
CO-3	3	3	3	3	3	2	3	3	2	2	2	2	2	2	2
CO-4	3	3	3	3	3	2	3	3	2	2	2	2	3	3	3
CO-5	3	3	3	3	3	2	3	3	2	2	2	2	3	3	3
CO-6	3	3	3	3	3	2	3	3	2	2	2	2	3	3	3
Rational e*	18	18	18	16	16	12	17	18	13	13	12	12	15	15	15

**Rationale\*:** Explaining why it is matching this particular program outcome

**Reference books:**

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Text book of Polymer Science	Billmeyer F. W.	Wiley, Singapore,	1984	3rd edn.,
2	Speciality Polymers	R.W. Dyson	Chapman and Hall, New York	1987	-
3	Handbook of Plastics Testing Technology	Vishu Shah	Wiley international publication	-	-
4	Stabilization of Polymeric Materials,	Zweifel Hans	Springer, ISBN 978-3-642-80305-5	-	-

**List of Open Source/learning website:**

- <https://nptel.ac.in/courses/113/105/113105028/>
  - Detail of coverage as per syllabus
- <https://nptel.ac.in/courses/104/105/104105124/>
  - Detail of coverage as per syllabus

