GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Under Graduate

Branch: Plastics Engineering

Subject Code: BE05053021

Subject Name: Testing of Plastic Products – II

w. e. f. Academic Year:	2026-27
Semester:	5
Category of the Course:	PCC-09

Prerequisite:	• Basic knowledge of polymer science. • Fundamental understanding of metrology. • Basic knowledge of mathematics.
Rationale:	Testing of plastic products is essential to ensure that polymer materials and finished plastic components meet required performance, safety, durability, and quality standards. This subject introduces students to fundamental testing principles, mechanical, thermal, physical, optical, and rheological testing of plastics. The course builds a strong foundation for advanced testing methods, failure analysis, and product certification.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Understand the importance of plastic testing standards and quality assurance concepts.
02	Perform basic physical and mechanical tests on plastic raw materials and products.
03	Analyze thermal, Optical, Electrical behavior of plastic materials.
04	Interpret test results as per ASTM, ISO and BIS standards.
05	Select appropriate test methods for different plastic products and applications.

Teaching and Examination Scheme:

Teaching - Learning Scheme (in Hours per Semester)					Total Credits TH/30	Assessment Pattern and Marks					Total Marks
						Theory		Tutorial / Practical			
L	T	P	PBL	TH		ESE (E)	PA (M)	PA (I)	PBL (I)	ESE (V)	
45	00	30	15	90	03	70	30	10	10	30	150

Where L = Lecture, T = Tutorial, P = Practical, TW/SL = Term-Work / Self-Learning, TH = Total Hours, ESE = End- Semester Examination, PA = Progressive Assessment

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Mechanical Properties Testing * Hardness test * Friction and wear testing * Abrasion resistance test * Fatigue test * Burst strength test * Folding endurance	8	15
2.	Thermal Properties Testing * Specific heat and thermal conductivity * Thermal dependent properties * Thermal endurance * Glass transition temperature (Tg) * Thermal yield tests * Heat Deflection Temperature (HDT) * Vicat Softening Temperature (VST) * Martens heat resistance test * Low-temperature brittle point and flexibility test * Coefficient of thermal expansion * Shrinkage measurement * Thermal stability and thermal ageing * Flammability testing	7	15
3.	Optical Properties * Light transmission and haze * Refractive index * Gloss measurement * Color measurement	6	10
4.	Chemical and Environmental Testing * Chemical resistance tests * Solvent resistance * Water absorption tests * Environmental stress cracking * Weathering tests * UV resistance tests * Ageing behaviour of plastics	8	25

5.	Non-Destructive and Advanced Testing * Non-destructive testing methods * Ultrasonic testing * Radiography * Infrared analysis	9	25
6.	Electrical Properties * Dielectric strength * Dielectric constant * Volume resistivity * Surface resistivity * Arc resistance * Tracking resistance	7	10
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
15	20	20	5	5	5

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1) Vishu Shah – Handbook of Plastics Testing and Failure Analysis, Plastics Design Library.
2) W. A. Bryce – Plastics Technology Handbook, Industrial Press.
3) J. D. Ferry – Viscoelastic Properties of Polymers, Wiley.
4) R. J. Crawford – Plastics Engineering, Butterworth-Heinemann.
5) ASTM Standards – Plastic Testing Methods (Latest Edition).

(b) Open source software and website:

1) https://nptel.ac.in/
2) https://www.astm.org/
3) https://www.iso.org/
4) https://www.bis.gov.in/

Suggested Course Practical List:

1. Co-efficient of friction of plastic specimens.
2. Abrasion resistance of plastics.
3. HDT,VST of testing of plastics.
4. Haze,gloss testing of plastics .
5. Volume & Surface resistivity of plastics.
6. Di-Electric strength of plastics.

- **List of suggested activities for Problem Based Learning:**

S. No.	Activity	No. of Hours	Total Hours Claimed	Evaluation Criteria
1	Industry / Research laboratory visit	Visit = 5 h, Report preparation = 5 h	10	Based on report submitted
2	Poster / chart / power point preparation on technical topics	Duration = 10 h	10	Based on Poster / Chart / PPT preparation and presentation skills
3	Assignment writing	5 assignments of 2 h each	10	Based on the assignment submitted
4	Technical Video based learning related to the subject	Duration of video = 5 h Report preparation = 5 h	10	Report / presentation based on the video learning outcomes
5	Group Discussion on emerging / trending technical topics based on subject	Duration = 1 h each	-	Based on performance in group discussion, technical depth, knowledge, etc.
6	Attending Expert Lecture/Webinar/Seminar	Duration = 1 h each	-	Based on Short report
7	Self-learning on-line course	Minimum duration of the course should be 10 h	10	Examination based assessment at the end of course. Based on the certificate produced
8	Exhibition / Conference / Trade Fair / Industrial exposure for 2-3 days	Visit = 15 h, Report preparation = 5 h	20	Based on learning, observations and short report
9	Working model on technical topics	Working = 15 h	15	Based on design, understanding & presentation of the model
10	Non-working model on technical topics	Non-working = 5 h	5	Based on design, understanding & presentation of the model
11	Videos on Industrial safety aspects based on subject	Duration of video = 5 h Report preparation = 5 h	10	Based on report submitted

- Above activities are suggestive, faculty can choose any of these activities and cover up the rest of the 15 Self Learning Hours.
- The number of hours is suggestive.
- Faculty can sub-divide the number of hours based on the activity. However, the total number of hours is fixed.

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