

TRIPURA UNIVERSITY

**DOCTOR OF PHILOSOPHY (Ph.D.)
IN
CHEMICAL & POLYMER ENGINEERING**



Ph.D. PROGRAMME STRUCTURE

**Tripura University (A Central University)
Suryamaninagar, Agartala, Tripura West-799022**

Ph.D. Programme

Since the Department of Chemical and Polymer Engineering's inception in 2016, the department's mission has been focused on lending to the growth and development efforts in India and the world via research in different chemical and polymer engineering fields. The emphasis of the Ph.D. programme since its beginning at dept. Chemical and Polymer Engineering has been on academic development, firm knowledge, independent research, and learning.

Under the guidance of Tripura University with its unique vision of learning, decisive thinking, and interdisciplinary education, the dept. of Chemical and Polymer Engineering offers an exciting research environment to its students and scholars.

The Ph.D. programme is designed to allow students to explore their research field independently and through proper guidance. The programme is committed to providing an appropriate research environment and train research scholars to become world leaders, academicians, and scientists.

Programme Objectives

1. To train students to become influential researchers in chemical and polymer engineering and address technical challenges and difficulties in concerning fields.
2. To educate students for careers as scientists and engineers in academia, industry, and government.
3. To attain and maintain the current and latest research in delivering academic knowledge and discussion to society.

Programme Outcomes

1. **Research:** The ability to conceptualize, design, and enforce research for the genesis of the novel knowledge, applications, and accommodation of research methodologies considering unanticipated problems. The ability to make effective judgments on complicated issues in specialized fields and produce original research to value publications.
2. **Methods:** An understanding of methods of research or creative activities, or both, in the area of study enables the students to measure distinct approaches for problem-solving using well-demonstrated techniques, invent, affirm statements, and remark on current research.
3. **Communication:** Distinctly and effectively communicate the scientific activities to peers and the general public, both written and orally. Pursue effectively with the scientific community through conferences, meetings, and workshops engagement.

- 4. Professionalism:** Building characters and skills necessary for employment, such as personal responsibility, self-reliant initiatives under challenging situations, ethical behavior with academic integrity, and appropriate guidelines for responsible conduction of research.

Admission in Ph.D. Programme

The Ph.D. admission in the Department of Chemical and Polymer Engineering, Tripura University, happens through Research Eligibility Test (RET). The qualified candidate in RET subsequently appears for the Viva-Voce examination to secure final admission into the Ph.D. programme.

Duration of Ph.D. Programme

The minimum duration of Ph.D. programme is three (3) years, including Ph.D. coursework, and the maximum of six (6) years from the date of admission into the Ph.D. programme. However, the women candidates and persons with disabilities (more than 40% disability) may be allowed a relaxation of two (2) years for the Ph.D. in the maximum duration.

Eligibility Criteria for Ph.D. Admission

Interested candidates shall have a master's (M.Tech./M.Sc.) or equivalent degree with at least 55% marks in Chemical and Polymer Engineering/Science or other relevant fields (rubber technology, environmental engg., food technology, nanotechnology, fiber science and technology, textile engg, biotechnology, etc.). Relaxation of 5%, from 55% to 50%, maybe allowed for those belonging to SC/ST/OBC (non-creamy layer) / differently-abled and other categories of candidates.

Credits, Credit Distribution and Semesters in Ph.D. Programme

In the Ph.D. programme, each six-month duration comprises a semester. Usually, the odd semester starts w.e.f. 1st day of July every year and the even semester from 1st day of January every year.

**Minimum credits to be earned to qualify for subsequent semester/activities of
Ph.D.Programme**

Codes	Semester/Particulars	Minimum Credits required to be qualified
	Passing Ph.D. Coursework	16
PHD-9005	Semester-1 (1 st progress report)	8
PHD-9006	Semester-II (2 nd progress report)	8
PHD-9007	Semester-III (3 rd progress report)	8
PHD-9008	Semester-IV (4 th progress report)	8
PHD-9009	Semester-V (5 th progress report)	8
PHD-9010	Successful submission of synopsis	8
PHD-9011	Successful submission of summary (5000 words)	16
PHD-9012	Successful submission of a thesis (positive comments of all adjudicators)	16
PHD-9013	Successful defense of a thesis through Viva- Voce examination	8
PHD-9014	Teaching assistantship /evaluation of answer scripts	2 + 2 = 4
Total credits required for awarding Ph.D. degree		100

Ph.D. Coursework
Chemical and Polymer Engineering, Tripura University

Paper Code	Paper Name	Credit Distribution			Total Credits	Marks	Remarks
		L	T	P			
PHD-9001	Research Methodology-I	4	0	0	4	100	Common course for all science and engineering Ph.D. students offered by the university
PHD-CP 9002 (Paper-II)	Research Methodology-II	4	0	0	4	100	
PHD-CP 9003 (Paper-III)	Polymer Characterization and Testing	4	0	0	4	100	
PHD-CP 9004 (Paper-IV)	Seminar/practical/project and assignments	0	0	4	4	100	
Total		12		4	16	400	

* L - Lecture; T – Tutorial, P – Practical/Project

Ph.D. Coursework Syllabus

Chemical and Polymer Engineering, Tripura University

Paper Code	Paper Name	L	T	P	Total Credits	Marks
PHD-CP 9002	Research Methodology - II	4	0	0	4	100

Course Outcomes:

1. Students will understand the processes by which the research has been conducted.
2. It will help in minimizing the mistakes commonly made during the research.
3. Create a positive attitude towards research.

Course Contents:

Research in Chemical and Polymer Science: introduction, a history, importance, outlook, and future; define a research problem in Polymer Science; Computational methods in Chemical Engg. and Polymer Science.

Experimental in chemical and polymer research: laboratory formalities, instruments handling and maintenance, laboratory safety, and troubleshooting; Materials Science research: development of a research idea, methods to perform experiments, data collections, errors in data collections, interpretation of results, and related discussions, reproducibility of data.

Preparation of research reports/manuscript: authorship, graphical abstract, introduction, experimental/computational methods, results and discussion, conclusions.

Few important sections in Chemical and Polymer research: acknowledgment, conflict of interest, copyright, ethics of research and publications; Patents; Post-publication: citation of an article, profile of a researcher, communication with scientist, and collaboration.

Recommended Books:

1. C.R. Kothari, Research Methodology Methods and Techniques, 2/e, Vishwa Prakashan, 2006.
2. Donald H.McBurney, Research Methods, 5th Edition, Thomson Learning, ISBN:81- 315-0047-0,2006.

Paper Code	Paper Name	L	T	P	Total Credits	Marks
PHD-CP 9003	Polymer Characterization and Testing	4	0	0	4	100

Course Outcomes:

1. Students will be familiarized with different polymer characterized techniques such as DSC, TGA, SEM, FTIR, NMR, etc.

2. They will be able to identify a polymer structure and their other properties such as optical, morphological, chemical, mechanical properties, etc.
3. Understanding and importance of sample preparation methods and sample handling.
4. It will enhance the ability to analyze the data obtained from the characterization techniques.

Course Contents:

Introduction: Polymer solution thermodynamics, molecular weight, weight distribution, and molecular dimensions end group analysis, osmometry, light scattering, viscometry, and gel permeation chromatography. Infra-red, UV-Vis, Raman spectroscopy techniques and nuclear magnetic resonance (NMR).

Microscopy techniques: optical, scanning electron microscope (SEM) and transmission electron microscope (TEM).

Scattering Techniques: X-Ray diffraction, small angle light scattering.

Thermal analysis: differential scanning calorimetry (DSC), differential thermal analysis (DTA), thermogravimetric analysis (TGA).

Mechanical analysis: tensile, compressive, impact, flexural, etc., testing. Dynamic mechanical analysis (DMA), rheometer.

Particle size analysis: laser diffraction, dynamic light scattering, image particle analysis, acoustic spectroscopy.

Recommended Books:

1. Introduction to polymers, Young & Lovell, Nelson Thrones.
2. Thermal analysis of polymer materials, Wunderlich, springer.
3. Handbook of plastic technology, Allen & Baker, CBS publication.
4. Handbook of Plastics Testing and Failure Analysis, Vishu Shah, 3rd Edition, John-Willey & Sons, New York, 2007.
5. Testing and Evaluation of Plastics, A. B. Mathur, I. S. Bharadwaj, Allied Publishers Pvt. Ltd., New Delhi, 2003.