Syllabus of 4 + 1 Year Integrated UG and PG Programme

w. e. f 2024-25 Academic Year

GRADUATE SCHOOL

Mahatma Gandhi University

P. D. Hills P O

Kottayam, Kerala

www.gs.mgu.ac.in

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Schools offering Majors

SL.No	School/Centre
1	School of Bio Sciences
2	School of Chemical Sciences
3	School of Computer Sciences
4	School of Environmental Sciences
5	School of Gandhian Thought and Development Studies
6	School of International Relations and Politics
7	School of Pure and Applied Physics
8	School of Social Sciences

Sl. No.	Major	Intake
SCIENCE		
1	Bio Sciences	6**
2	Chemistry	6
3	Computer Science	6
4	Environmental Science	6
5	Physics	6
SOCIAL SCIENCES		
1	Development Studies	5
2	Gandhian Studies	5
3	History	10
4	International Relations and Politics	10

Majors offered and Intake *1 seat shall be sanctioned over and above the intake in each major in the 3rd semester for students who opt for a change of major after two semesters.

**Progression to PG Shall be based on the specialization selected by students as Biochemistry (2 seats) Biotechnology (2 seats) and Microbiology (2 seats) based on merit.

Schools offering Minors/MDCs/AECs/VACs/SECs

SL.No	School/Centre
1	School of Artificial Intelligence And Robotics
2	School of Behavioural Sciences
3	School of Biosciences
4	School of Chemical Sciences
5	School of Computer Sciences
6	School of Data Analytics
7	School of Energy Materials
8	School of Environmental Sciences
9	School of Food Science And Technology
10	School of Gandhian Thought And Development Studies
11	School of Gender Studies
12	School of Indian Legal Thought
13	School of International Relations And Politics
14	School of Letters
15	School of Mathematics And Statistics
16	School of Nanoscience And Nano Technology
17	School of Pedagogical Sciences
18	School of Polymer Science And Technology
19	School of Pure And Applied Physics
20	School of Social Sciences
21	School of Tourism Studies
22	International and Inter University Centre for Nanoscience and Nanotechnology
23	K N Raj School of Economics

Scheme for 4 + 1 Integrated UG and PG Programme

Graduate School

Mahatma Gandhi University

School of Polymer Science and Technology

Course Code	Title	Credits	Hours/Week		Level	Type
		Theory	Practical			
SEMESTER I						
MG1MDCUPL101	Polymers: A Boon to Our World	3	3	0	Foundation (100-199)	MDC
MG1MDCUPL102	Rubber Fundamentals: Properties to Processing	3	2	2	"	MDC
MG1MDCUPL103	Basic Concepts of Computational Material Design for Polymers	3	3	0	"	MDC
SEMESTER II						
MG2MDCUPL101	The Science of Polymers: Synthesis, Processing, and Characterization	3	3	0	"	MDC
MG2MDCUPL102	Polymers From Renewable Resources	3	3	0	"	MDC
MG2MDCUPL103	Polymer Nanotechnology: Big Things from A Tiny World	3	3	0	"	MDC
SEMESTER III						
MG3MDCUPL201	Polymers in Waste Water Management	3	3	0	Intermediate (200-299)	MDC
MG3MDCUPL202	Polymer Composites and Nanocomposites	3	3	0	"	MDC
MG3MDCUPL203	The Basics of Polymer Blends: A Gateway to Material Science	3	3	0	"	MDC
MG3VACUPL201	Polymer Recycling and Upcycling	3	3	0	"	VAC
MG3VACUPL202	Computational Methods for Macromolecular Modelling	3	3	0	"	VAC
MG3VACUPL203	Rubber Technology: From Rubber to Tyre	3	2	2	"	VAC
SEMESTER IV						
MG4SECUPL201	Characterization of Polymers and Polymer Composites	3	3	0	Intermediate (300-399)	SEC
MG4SECUPL202	Nanotechnology of Rubber	3	2	2	"	SEC
MG4VACUPL201	Computational Chemistry Software: Hands-on Approach	3	3	0	"	VAC
MG4VACUPL202	Polymers for Biomedical Applications	3	3	0		VAC
SEMESTER V						
MG5SECUPL301	Software for Chemistry	3	3	0	"	SEC

MG5SECUPL302	Latex Technology	3	2	2	"	SEC
MG5SECUPL303	Polymer Product Development on Laboratory Scale	3	3	0	"	SEC
MG5VACUPL301	Polymers in Packaging Smart and Stimuli Responsive Polymers	3	3	0	"	VAC
MG5VACUPL302	Smart and Stimuli Responsive Polymers		3	0	"	VAC
MG5VACUPL303	Polymers in Electronics	3	3	0	"	VAC
SEMESTER VI						
MG6SECUPL301	3D Printing with Polymers and Polymer Composites	3	3	0	"	SEC
MG6SECUPL302	Polymers in energy storage and conversion	3	3	0	"	SEC
MG6SECUPL303	Advanced Polymer Processing Techniques	3	3	0	"	SEC
Total Credits						

*Only for 4-Years Honours Students

**Only for students who opt for theory courses instead of Research Project

Note: General foundations courses shall be offered by different schools. Students can flexibly choose the courses across disciplines.

Level	Foundation (100-199	Intermediate (200-299)	Higher (300-399)	Advanced (400-499)	PG Level (500-599)

Type	Major	Minor	MDC	SEC	VAC	AEC

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Polymer Science and Technology (SPST)		
Programme	4 + 1 Integrated UG and PG Programme		
Course Title	**Polymers: A Boon to Our World**		
Course Type	MDC		
Course Level	100-199		
Course Code	MG1MDCUPL101		
Course Overview	This course provides a fundamental understanding of the structure, properties, classification, and applications of polymer materials. Students will gain knowledge about the relationship between polymer structure and the properties and applications of polymers. They will develop critical thinking skills to identify different types of plastic in everyday life.		
Semester	1	**Credit**	3
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/fieldwork**	
	45 (L) + 15(T)	NA	
Pre-requisite	All Disciplines		

COURSE OUTCOMES (CO)

CO No.	**Expected Course Outcome**	**Learning Domains**	**PSO No.**
	*Upon completion of this course, students will be able to**;***		

1	Understand the fundamental ideas of polymers, their structure, and their formation.	R, U	
2	Study the various classifications of polymers.	R, U	
3	Gain knowledge about the properties of polymers.	U, An	
4	Identify common polymers in everyday objects.	U, An	
5	Recognize various applications of polymers in everyday life.	A, An, E, S	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	**Hours**	**CO No**
A World Made of Giants Introduction: Monomers and polymers, Examples of polymers in our daily lives, Polymerization: Addition and Condensation. Classification of Polymers: based on source: Natural, Synthetic, and Semi-synthetic polymers with examples, based on structure: Linear, Branched, and Cross-linked polymers. Polymer structure: linear, branched, cross-linked, and network polymers. Molecular Weight of Polymers: Number-average and weight-average molecular weight, Polydispersity index.	15	1,2
Module 2	**Hours**	
Physical and Chemical Properties Physical Properties of Polymers, Thermal Properties, Chemical Properties of Polymers. Structure-Property Relationship of Polymers, Real-World Examples of How Polymer Properties are Used in Engineering	15	3

Applications (Flexible Pipes, Strong Fibers).		
Module 3	**Hours**	
Applications of Polymers in Everyday Life Polymers In Daily Life: Packaging Materials, Clothing and Textiles, Building and Construction Materials, Consumer Electronics, Household Goods, Sports and Leisure Equipment. Polymers in Healthcare. Polymers in Electronics and Computing, Polymers in Energy Storage and Batteries, Optical Polymers for Lenses and Displays, Membranes. Emerging Applications of Polymers: Self-Healing and Smart Polymers, Polymers in 3D Printing.	15	4,5

Mode of Transaction	**Classroom Activities:** • Interactive lectures • Group discussions and problem-solving exercises • Quizzes and Assignments **Field activities:** NA **Lab based activities:** NA
Mode of Assessment	• Assignments and Seminars 20% • Internal Exams 20% • Semester Exam 60%

Learning Resources

1. Textbooks: Basic polymer chemistry textbooks such as Polymer Science by V. R. Gorwarikar, N. V. Vishwanathan, and J. Sreedhar and other basic chemistry books cover these topics of polymers.
2. Online resources – Online polymer introductory courses from websites like Khan Academy, National Institute of Open Schooling (NIOS), MOOC, and NPTEL offer free learning modules on polymers

3. Invited lectures by visiting academic and industrial scientists. Held regularly on Wednesday afternoon and Saturday morning throughout the academic year.

Relevance of Learning the Course/ Employability of the Course
Learning basics about them opens doors to exciting careers and empowers the students to solve global challenges. These are some of the diverse sectors offering jobs for those who have a polymer background: • Biomedical engineering • Textiles and materials science • Packaging and food science • Energy storage and electronics

	MAHATMA GANDHI UNIVERSITY **Graduate School** **4 + 1 Integrated UG and PG Programme**
School	School of Polymer Science and Technology
Programme	4 + 1 Integrated UG and PG Programme
Course Title	**Rubber fundamentals: Properties to Processing**
Course Type	MDC
Course Level	100-199
Course Code	MG1MDCUPL102
Course Overview	The course provides a basic understanding of the important aspects of Rubber Technology by making students thoroughly familiar with natural and synthetic rubber materials, their properties that make them suitable for definite applications and the processing pathway through which they are converted to useful

	products.		
Semester	1	**Credit**	3
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/fieldwork**	
	45 (L) + 15(T)	NA	
Pre-requisite	All Discipline		

COURSE OUTCOMES (CO)

CO No.	**Expected Course Outcome**	**Learning Domains**	**PSO No.**
	*Upon completion of this course, students will be able to**;***		
1	Develop an understanding of the production, properties and uses of natural rubber and its synthetic alternatives.	U	
2	Learn about the manufacturing processes, properties, and applications of various specialty rubbers and thermoplastic elastomers.	U, A	
3	Develop an understanding of the important steps in rubber processing like compounding, mixing and vulcanization.	U, A, C	
4	Have a clear idea about the production of different types of rubber products through appropriate moulding/curing processes.	U, An	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	**Hours**	**CO No**
Rubbers: Natural and Synthetic Natural Rubber – Latex: Source, Composition, Collection, Preservation, Concentration, Conversion to Dry Rubber: Ribbed Smoked Sheet, Block Rubber.	15	1,2

General Purpose Synthetic Rubbers: Manufacture, Properties and Applications of SBR, Polybutadiene Rubber, Polyisoprene Rubber		
Module 2	**Hours**	
Special Purpose and Specialty Rubbers Manufacture, Properties and Applications of Neoprene Rubber, EPDM, Butyl Rubber, Nitrile Rubber, Polyurethanes, Silicone Rubber, and Fluorocarbon Rubber. Thermoplastic Elastomers.	15	2
Module 3	**Hours**	
Rubber Processing Rubber Compounding: Compounding Ingredients. Vulcanization: Sulfur and Non-Sulfur. Mixing: Two Roll Mills, Internal Mixers. Extrusion. Molding: Compression, Transfer, and Injection. Other Curing Methods - Batch Curing: Autoclave, Oven Curing. Continuous Curing: Fluidized Bed, LCM, Continuous Drum Cure. High-Energy Radiation Curing	15	3, 4

Mode of Transaction	**Classroom activities:** Lecture, Tutorial, Discussion, Student Seminar **Field activities:** Industrial Visit **Lab-based activities:** Analysis of samples and basic processing steps
Mode of Assessment	Internal examination, seminars, assignments, projects, continuous assessment, external examination

Learning Resources

1 C.M.Blow and C. Hepburn,- Rubber Technology and Manufacture, Buttenvorths, London,3nd edition, 2009.

2 Maurice Morton, Rubber Technology, Springer Science + Business Media, 1999

3 Handbook of Elastomers by Anil K. Bhowmick, Howard Stephens, CRC Press, 2000

Relevance of Learning the Course/ Employability of the Course
Rubber materials science and technology represent a wide spectrum of industries, including tyres, conveyor belts, prophylactics, footwear, and specialty products. Expertise in rubber technology will help the students to enter these industries and build a fulfilling career.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Polymer Science and Technology
Programme	4 + 1 Integrated UG and PG Programme
Course Title	**Basic Concepts of Computational Material Design for Polymers**
Course Type	MDC
Course Level	100-199
Course Code	MG1MDCUPL103
Course Overview	In this course, students will gain a solid grasp of computational methods in material design, with a specific focus on polymers. By studying theoretical principles and engaging in practical exercises, students will develop the skills to utilize computational techniques for designing and assessing polymer materials for a wide range of applications.

Semester	1	**Credit**	3
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/fieldwork**	
	45 (L) + 15(T)	NA	
Pre-requisite	A basic understanding of chemistry and physics concepts, along with proficiency in algebra and computer skills, is recommended for this course.		

COURSE OUTCOMES (CO)

CO No.	**Expected Course Outcome**	**Learning Domains**	**PSO No.**
	*Upon completion of this course, students will be able to**;***		
1	Grasp the fundamental principles of polymers, including their structure, properties, and classifications.	R, U	
2	Gain proficiency in using computational methods such as molecular modeling and simulation for material design in polymer science.	A, An	
3	Familiar with commonly used software tools in polymer research, enabling them to effectively simulate polymer structures and properties.	U, A	
4	Apply computational methods to analyze and design polymer materials for various real-world applications in fields such as healthcare, automotive, and electronics.	A, An, E	

5	Develop problem-solving skills by tackling case studies and real-world challenges, demonstrating their ability to apply computational approaches to solve complex polymer design problems.	An, E, C	
6	Enhance their critical thinking abilities and learn to evaluate the effectiveness of computational methods in polymer research and development.	An, E, C, S	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	**Hours**	**CO No**
Introduction To Polymers Definition, Types of Polymers, Basics of Polymer Structure and Properties, Application of Polymers in Different Fields.	15	1
Module 2	**Hours**	
Fundamentals Of Computational Approaches in Polymers Introduction to Computational Methods in Material Design, Basics of Molecular Modeling and Simulation: Introduction to Molecular Mechanics, Quantum Mechanics, and Statistical Mechanics Modeling.	15	2
Module 3	**Hours**	
Polymer Modeling Techniques and Software Familiarization Introduction to Software Tools Commonly Used in Polymer Research, Hands-On Exercises to	15	3,4,5,6

Familiarize Students with Polymer Modeling Software and Application of Software Tools in Simulating Polymer Structures and Properties.		

Mode of Transaction	**Classroom activities:** Interactive lectures, discussions, and presentations. **Field activities:** NA **Lab based activities:** NA
Mode of Assessment	• Assignments and Seminars (20%) • Internal Exams (20%) • Semester Exam (60%)

Learning Resources

1. Errol G. Lewars. Computational Chemistry

2. Textbooks: Basic polymer chemistry textbooks such as Polymer Science by V. R. Gorwarikar, N. V. Vishwanathan, and J. Sreedhar and other basic chemistry books cover these topics of polymers.

Relevance of Learning the Course/ Employability of the Course
Data Analyst

SEMESTER II

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Polymer Science and Technology		
Programme	4 + 1 Integrated UG and PG Programme		
Course Title	**The Science of Polymers: Synthesis, Processing, and Characterization**		
Course Type	MDC		
Course Level	100-199		
Course Code	MG2MDCUPL101		
Course Overview	This course provides a fundamental understanding of the synthesis, processing, and characterization techniques used in polymer science and engineering. Students will explore the principles behind various polymerization reactions, delve into different processing methods used to create polymer products and learn about techniques for analyzing and characterizing polymer properties. The course emphasizes the connection between these areas, allowing students to appreciate the interplay between creating, shaping, and understanding polymers.		
Semester	2	**Credit**	3
Total Student Learning	**Instructional hours for theory**	**Instructional hours for practical/lab work/field**	

Time		**work**
	45 (L) + 15(T)	NA
Pre-requisite	Basic understanding of organic chemistry	

COURSE OUTCOMES (CO)

CO No.	**Expected Course Outcome**	**Learning Domains**	**PSO No.**
	*Upon completion of this course, students will be able to**;***		
1	Explain different types of polymerization reactions and their mechanisms.	R, U	
2	Describe various polymer processing techniques and their applications.	R, U, A	
3	Analyze data obtained from common polymer characterization techniques. (Analysis)	R, U, An, E	
4	Interpret the relationship between polymer structure, processing, and properties.	R, U, An, E, S	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E) , Create (C), Skill (S))

COURSE CONTENT

Module 1	**Hours**	**CO No**
Introduction to Polymer Synthesis: Polymerization Reactions: Types, Mechanisms, Factors Influencing Polymer Structure, Polymerization Techniques for Different Types of Polymers	15	1,4
Module 2	**Hours**	
Polymer Processing Techniques:	15	2,4

Processing Methods: Introduction, Extrusion, Injection Molding, Compression Moulding, Blow Molding Etc. Processing Parameters, Additives Used in Polymer Processing and Their Functions		
Module 3	**Hours**	
Polymer Characterization Techniques: Introduction: Spectroscopy, Chromatography, Thermal Analysis, Mechanical Analysis	15	3,4

Mode of Transaction	**Classroom Activities:** • Interactive lectures • Group discussions and problem-solving exercises • Quizzes and Assignments **Field activities:** NA **Lab-based activities:** NA
Mode of Assessm	• Assignments and Seminars 20% • Internal Exams 20% • Semester Exam 60%

Learning Resources

1. Textbooks: Basic polymer chemistry textbooks such as Polymer Science by V. R. Gorwarikar, N. V. Vishwanathan, and J. Sreedhar and other basic chemistry books cover these topics of polymers.
2. Online resources – Online polymer introductory courses from websites like Khan Academy, National Institute of Open Schooling (NIOS), MOOC, and NPTEL offer free learning modules on polymers

3. Invited lectures by visiting academic and industrial scientists. Held regularly on Wednesday afternoon and Saturday morning throughout the academic year.

Relevance of Learning the Course/ Employability of the Course
Learning basics about them opens doors to exciting careers and empowers the students to solve global challenges. These are some of the diverse sectors offering jobs for those who have a polymer background: • Biomedical engineering • Textiles and materials science • Packaging and food science Energy storage and electronics

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Polymer Science and Technology
Programme	4 + 1 Integrated UG and PG Programme
Course Title	**Polymers from Renewable Resources**
Course Type	MDC
Course Level	100-199
Course Code	MG2MDCUPL102
Course Overview	This course delves into the exciting world of polymers derived from renewable resources. Students will gain knowledge about the depletion of fossil fuels, the environmental impact of traditional polymers, and the

	growing importance of sustainable alternatives. They will explore various bio-based polymers, their production methods, properties, and potential applications in diverse fields. The course also emphasizes the life cycle assessment of polymers and responsible practices for a sustainable future.		
Semester	2	**Credit**	3
Total Student Learning Time	**Instructional hours for theory**	**Instructional hours for practical/lab work/fieldwork**	
	45 (L) + 15(T)	NA	
Pre-requisite	All Discipline		

COURSE OUTCOMES (CO)

CO No.	**Expected Course Outcome**	**Learning Domains**	**PSO No.**
	*Upon completion of this course, students will be able to**;***		
1	Explain the environmental concerns connected with conventional polymer production and the need for renewable resources and analyze the properties of bio-based polymers	R, U	
2	Identify and classify different types of polymers derived from renewable resources.	R, U, An	
3	Describe the production methods and processing techniques for bio-based polymers.	R, U, C	
4	Discuss the potential applications of bio-based polymers in various industries.	R, U, A	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S)

COURSE CONTENT

Module 1	**Hours**	**CO No**
Sustainability and Bio-Based Polymers: Environmental Concerns About Conventional Polymers, Life Cycle Assessment of Polymers (LCA), The Need for Renewable Resources, Biobased Polymers: Introduction, Source, Structure and Properties, Advantages, Classification.	15	1,2
Module 2	**Hours**	
Production And Processing of Bio-Based Polymers: Extraction and Purification, Polymerization Methods, Processing Techniques for Bio-Based Polymers.	15	3
Module 3	**Hours**	
Applications, Challenges and Future Prospects of Bio-Based Polymers: Packaging of Food Containers, Agriculture and Waste Management, Textiles and Clothing, Emerging Applications in Biomedicine, Electronics, and Construction, Challenges in Scaling Up Production of Bio-Based Polymers, Cost Competitiveness with Conventional Polymers, Life Cycle Assessment of Bio-Based Polymers and their Sustainability, Future Trends and Advancements in Bio-Based Polymers.	15	4

Mode of Transaction	**Classroom Activities:** • Interactive lectures

	• Group discussions and problem-solving exercises • Quizzes and Assignments **Field activities:** NA **Lab-based activities:** NA
Mode of Assessment	• Assignments and Seminars 20% • Internal Exams 20% • Semester Exam 60%

Learning Resources

1. Biopolymers: Renewable Resources for Sustainable Development" by David Kaplan et al.

2. Green Polymer Chemistry: Biocatalysis and Materials II" edited by H.N. Cheng and Richard A. Gross

3. Renewable Resources for Industrial Materials: Chemicals, Fibers, and Polymers" by Wallace F. Watson

Relevance of Learning the Course/ Employability of the Course
Learning about polymers from renewable resources is crucial as it aligns with global sustainability goals and the increasing demand for eco-friendly materials. This expertise opens diverse career opportunities in industries such as bioplastics, automotive, aerospace, packaging, and textiles, which are all seeking sustainable alternatives. Additionally, it prepares individuals for roles in research and development, quality control, sustainability consulting, and regulatory compliance. The knowledge gained also fosters entrepreneurship, enabling the creation of innovative, sustainable products and businesses.

	MAHATMA GANDHI UNIVERSITY **Graduate School**
	4 + 1 Integrated UG and PG Programme

School	School of Polymer Science and Technology (SPST)		
Program	4 + 1 Integrated UG and PG Programme		
Course Title	**Polymer Nanotechnology: Big Things from a Tiny World**		
Course Type	MDC		
Course Level	100-199		
Course Code	MG2MDCUPL103		
Course Overview	This course provides a fundamental understanding of nanoscience, polymer science, and polymer-based nanoparticles, etc. Students will learn about synthesis methods, characterization techniques, and the relationship between the structure and properties of polymer-based nanoparticles.		
Semester	2	**Credit**	3
Total Student Learning Time	**Instructional hours for theory** 45 (L) + 15(T)	**Instructional hours for practical/lab work/fieldwork** NA	
Pre-requisite	Knowledge of basic physics and chemistry		

COURSE OUTCOMES (CO)

CO	Expected Course Outcome	Learning	PSO

No.	*Upon completion of this course, students will be able to;*	Domains	No.
1	Understand the fundamentals of nanoscience and nanotechnology	R, U	
2	Study different synthesis and characterization methods of nanoparticle	R, U	
3	Gain knowledge about the concept and properties of polymer-based nanotechnology	U, An, E	
4	Identify common polymer-based nanoparticles in everyday life and their applications.	U, A, C	

*(Learning Domains: Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S))

OURSE CONTENT

Module 1	**Hours**	CO No
Introduction to nanoscience and nanotechnology Nature nanotechnology, properties of nanoparticles, size-scale effects, classification of nanoparticles, synthesis and characterization.	15	1, 2
Module 2	**Hours**	
Polymer Based Nanoparticles Natural, Synthetic Polymer-Based Nanoparticles, and Biopolymers: Types and Uses.	15	3
Module 3	**Hours**	
Applications of Polymer Nanotechnology Application of Polymer Nanoparticles in Various Fields: Medicine, Agriculture, Defence, and Aerospace	15	4

Mode of	**Classroom Activities:**

Transaction	• Interactive lectures • Group discussions and problem-solving exercises • Quizzes and Assignments **Field activities:** NA **Lab-based activities:** NA
Mode of Assessment	• Internal Exams • Semester Exam • Assignments and Seminars

Learning Resources

- Textbooks: Hussain, C. M., & Thomas, S. (Eds.). (2021). Handbook of polymer and ceramic nanotechnology. Berlin/Heidelberg, Germany: Springer.
- Narain, R. (Ed.). (2020). Polymer science and nanotechnology: fundamentals and applications. Elsevier.
- Online resources – Online introductory courses on polymer nanotechnology from websites like Khan Academy, National Institute of Open Schooling (NIOS), MOOC, and NPTEL offer free learning modules on polymers
- Invited lectures by visiting academic and industrial scientists. Held regularly on Wednesday afternoon and Saturday morning throughout the academic year.

Relevance of Learning the Course/ Employability of the Course

Learning polymer nanotechnology is crucial because it drives innovation across diverse fields like medicine, electronics, and materials science. This course offers career opportunities in cutting-edge research and development, quality control, and product design in high-tech industries. Additionally, it equips individuals with the skills needed for emerging roles in nanomedicine, advanced manufacturing, and sustainable technology solutions, making them highly sought after in the job market.