SEMESTER S3

BIOMEDICAL & BIOPOLYMERS

Course Code	PBPOT304	CIE Marks	60
Teaching Hours/Week (L: T:P: R)	3:0:0:1	ESE Marks	40
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. Objective of this course is to explain the importance and applications of biopolymers and biomedical materials with its research and development.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Biomaterials** – Definition, requirements, Classification, Bioactive, Bio inert and Bioresorbable biomaterial, sterilisation methods of biomaterials. Typical examples for polymers used as biomaterials: ultrahigh molecular weight polyethylene, poly (methyl methacrylate), hydrogels, silicone, polyurethanes, polylactic acid, polyglycolic acid and its copolymers, polycaprolactone, chitin and chitosan.	9
2	**Biomedical applications of polymers**- orthopaedics, cardio vascular, silicone implants, polymer membranes, polymer skin, contact lens types and materials, biodegradable polymers and its applications, polymeric tissue engineering scaffolds.	9
3	**Dental applications**: - denture base, crown and bridge resins, plastic teeth, mouth protectors, restorative materials, dental adhesives, dental impression and duplicating materials.	9
4	**Chemistry of peptides**, polypeptides and proteins, structural organisation in proteins. Nucleic acids, RNA, DNA, chemistry of polysaccharides, starch and cellulose, chemical modifications of cellulose, regenerated cellulose	9

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Course Assessment Method

(CIE: 60 marks, ESE: 40 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Project	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	30	12.5	12.5	60

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 2 marks **(8x2 =16marks)**	• Each question carries 6 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 2 sub divisions. **(4x6 = 24 marks)**	**40**

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Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain different types of biopolymer materials and their properties	**K2**
CO2	Analyze biomedical applications of polymers	**K4**
CO3	Analyze the use of biomaterial as a dental material	**K4**
CO4	Explain chemistry of biomaterials like protein, nucleic acids	**K5**
CO5	Explain chemistry of polysaccharides	**K5**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2			2						1
CO2	2	1	2			1	1					1
CO3	1	1	1	1	1	1	1					1
CO4	1		1	1	2							1
CO5	1		1	1	2							1

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Biomaterials: An Introduction	Joon Park, R. S. Lakes	Springer Science, New York	3rd Edn, 2007
2	Biomaterials Science: An Introduction to Materials Science	Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen, Jack E. Lemons	Elsevier Academic Press	3rd Edn, 2004

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Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Encyclopedia of polymer science and engineering	H.F. Mark (Ed)	John Wiley and Sons	1989
2	Soft compact Lenses clinical and applied Technology	Galin and M. Ruben Ed.	John Wiley and Sons	1978
3	Principles of protein structure	Shulz and Bhirmer	Academic Press	

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://youtu.be/3CnNEiUrhZw?si=AfmuquqDHES35KlE
2	https://www.youtube.com/live/9dQRrMoykg8?si=gTa_0HLzaznqdVmc
3	https://youtu.be/g-FzzdfDDLs
4	https://youtu.be/COyTQmNIeAM?si=TvK7vA92L_RRUsAk

PBL Course Elements

L: Lecture (3 Hrs.)	**R: Project (1 Hr.), 2 Faculty Members**		
	Tutorial	**Practical**	**Presentation**
Lecture delivery	Project identification	Simulation/ Laboratory Work/ Workshops	Presentation (Progress and Final Presentations)
Group discussion	Project Analysis	Data Collection	Evaluation
Question answer Sessions/ Brainstorming Sessions	Analytical thinking and self-learning	Testing	Project Milestone Reviews, Feedback, Project reformation (If required)
Guest Speakers (Industry Experts)	Case Study/ Field Survey Report	Prototyping	Poster Presentation / Video Presentation: Students present their results in a 2 to 5 minutes video

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Assessment and Evaluation for Project Activity

Sl. No	Evaluation for	Allotted Marks
1	Project Planning and Proposal	**5**
2	Contribution in Progress Presentations and Question Answer Sessions	**4**
3	Involvement in the project work and Team Work	**3**
4	Execution and Implementation	**10**
5	Final Presentations	**5**
6	Project Quality, Innovation and Creativity	**3**
Total		**30**

Project Assessment and Evaluation criteria (30 Marks)

Project Planning and Proposal (5 Marks)

- Clarity and feasibility of the project plan
- Research and background understanding
- Defined objectives and methodology

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Contribution in Progress Presentation and Question Answer Sessions (4 Marks)

- Individual contribution to the presentation
- Effectiveness in answering questions and handling feedback

Involvement in the Project Work and Team Work (3 Marks)

- Active participation and individual contribution
- Teamwork and collaboration

Execution and Implementation (10 Marks)

- Adherence to the project timeline and milestones
- Application of theoretical knowledge and problem-solving
- Final Result

Final Presentation (5 Marks)

- Quality and clarity of the overall presentation
- Individual contribution to the presentation
- Effectiveness in answering questions

Project Quality, Innovation, and Creativity (3 Marks)

- Overall quality and technical excellence of the project
- Innovation and originality in the project
- Creativity in solutions and approaches

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