



BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI, HYDERABAD CAMPUS
INSTRUCTION DIVISION
FIRST SEMESTER 2022-2023
Course Handout (Part II)

Date: 26/08/2022

In addition to part I (General Handout for all courses appended to the Time table) this portion gives further specific details regarding the course.

Course No : PHA G 535
Course Title : Biomaterials
Instructor-in-Charge : Dr. Nirmal J
Instructor(s) :
Tutorial/Practical Instructors : NA

1. Course Description:

Introduction to biomaterials for pharmaceutical applications; polymeric biomaterials; Natural and synthetic polymers for drug delivery, regenerative medicine and nanomedicines; Polymer properties including crystallinity, glass transition, polymer degradation influencing pharmaceutical formulations; biocompatibility; biodegradation; in-vitro and in-vivo assessment of polymer toxicity.

2. Scope and Objective of the Course:

The objective of this course is to impart knowledge on various aspects of materials used in biomedical and pharmaceutical applications. The primary focus would be on the natural and synthetic polymers, their design, characterization, properties, assessment and applications in pharmaceuticals.

3. Text Books:

1. Abraham J. Domb, Neeraj Kumar and Aviva Ezra, Biodegradable Polymers in Clinical Use and Clinical Development, Published by John Wiley and Sons, Inc
2. Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen, Jack E. Lemons, Biomaterials Science An Introduction to Materials in Medicine, 2nd Edition, Elsevier Academic Press.

4. Reference Books:

1. Sangamesh G. Kum-bar, Cato Laurencin, Meng Deng, Natural and Synthetic Biomedical Polymer (1st edition), published by Elsevier Science.
2. Johnna S. Temenoff, Antonios G. Mikos, Biomaterials: The Intersection of Biology and Materials Science, 1st edition, Published by Pearson (January 2nd 2008)
3. Deepak Chitkara, Anupama Mittal, Ram I. Mahato, Molecular Medicines for Cancer: Concepts and Applications of Nanotechnology, CRC Press; 1 edition, 2018.

5. Course Plan:

Lecture No	Learning objectives	Topics to be covered	Reference	Learning Outcome
1-8	Biomaterials for Pharmaceutical applications	What is the need for biomaterials?	T2. Section II.5 R2 Ch. 1 Journal articles	Understanding of biomaterials, their uses in pharmaceutical formulations
		Introduction to biomaterials and its applications in implants and drug delivery systems		
9-15	Polymers for	Polymers of natural origin in	T1. CH. 2, 3, 4, 5	Understanding



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	biomedical applications	pharmaceuticals- Gelatin, collagen, chitosan, alginate, Dextrans	and 6 R1. Ch 4, 5 Journal articles	polymers of different origins, their structures, and properties
		Synthetic polymers in pharmaceuticals-Polyesters, polyanhydrides, polycarbonates, etc	T1. CH. 9, 10 and 11 R1. Ch. 6, 8, 10 and 11 Journal articles	
16-22	Polymer properties influencing pharmaceutical formulations	Polymer bulk and surface characterization. Thermal/mechanical properties of polymers, surface and morphological characterization.	R1 Ch. 2, 20 R2 Ch. 3 and 4 Journal articles	Understanding properties of the polymers, different characterization techniques
23-28	Biodegradation	Degradation of materials in biological environment	T2. Section II.4	Understanding properties of the biodegradation of polymers
29-33	<i>In vitro</i> and <i>in vivo</i> assessment of polymer toxicity	Biological response to biomaterials, immune response to foreign materials, Blood-material interactions	T2 Section II.2.1, II.2.3, II.2.6 R2 Ch. 9, 12 Journal articles	Understanding the biological response towards polymers and their assessment
		Biological Testing of biomaterials, concept and assessment of biocompatibility, in vitro and in vivo assessment, evaluation of blood material interactions	T2 Section II.3 Journal articles, class notes	
34-41	Polymers for emerging clinical applications	Polymeric systems for nucleic acid delivery	R3. Ch 10, 11, 16 Journal articles, class notes	Understanding different application of biomaterials in emerging areas
		Polymers for tissue engineering and regenerative medicine		
		Polymers for nanomedicines		

6. Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Remarks
Mid-Semester Test	90 min	25		Close book
Seminars/Assignments/ Research summaries	--	40	Will be announced in the class	Open book
Comprehensive Examination	180 min	35		35% Close book



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*: Assignments/seminar topics, mode of evaluation and number will be announced in the regular class.

*Slides used during class hours provide key information for which additional supportive information is expected to be collected from sources aforementioned. Recent developments in the area/topic will be discussed in class based on their significance to healthcare delivery and hence some information on therapeutic benefits and toxicity effects, besides others, may differ from the information in text, reference material and hence students are expected to take note of such key discussions during contact hours. Such discussions held in class will be considered as primary source of information in assessments.

7. Chamber Consultation Hour: To be announced in the class.

8. Notices: Pharmacy Notice Board.

9. Make-up Policy: Make-ups are not given as a routine. It is solely dependent on the “genuineness” of the circumstances under which a student fails to appear in a scheduled evaluation component. Prior permission should be sought from the instructor-in-charge in advance.

10. Note (if any): Grading Procedure: As specified in Handout – Part I, appended to the timetable, the instructor in-charge reserves the right to award a NC report in case the student does not make himself/ herself available for any of the evaluation component mentioned above. Also it is not imperative on part of the instructor in-charge to award all the grades. Borderline cases during grading will be judged on the basis of regularity to classes and consistency or progress in the performance in evaluation components. In borderline cases subjective judgment will be exercised for pull-up's (max. 2%).

Instructor-in-charge
Course No. PHA G 535