



**INSTRUCTION DIVISION
SECOND SEMESTER 2015-16
Course Handout (Part II)**

Date: 12/01/2016

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: BITS F418
Course Title: Introduction to biomedical engineering
Instructor-in-Charge: BANASRI ROY
Shibasish Chowdhury

1. Course Description:

This course provides an introduction to the biomedical engineering and its application. We will focus on the topics at the interface between engineering and biomedical science; engineering principles for physiological phenomena. Engineering theories will be applied to explain interaction of the metals, polymers, and ceramics biomaterials with the bodily environment and corresponding surface modifications. Working principles and applications of biosensors, biomedical imaging, and tissue engineering processes will be examined. Application of nanotechnology in biomedical applications will be covered.

2. Scope & Objective:

In this course we will discuss:

- Application of engineering theories and principles (mass transfer, fluid mechanics, thermodynamics, heat transfer etc.) in human physiology
- Biocompatibility (blood compatibility as well as bone compatibility) of different implants.
- Biomechanics
- Tissue engineering
- Biomedical imaging
- Biomedical sensors
- Biomedical nanotechnology.

3. Text Book:

Currently no text book will be recommended. Reference books and class notes will cover the course.

4. Reference Books:

1. J. Enderle, S. Blanchard, and J. Bronzino, " Introduction to Biomedical Engineering," Academic Press, 3rd ed, 2011, ISBN 13: 9780123749796 ISBN 10: 0123749794.





2. Ronald L. Fournier, "Basic Transport Phenomena In Biomedical Engineering (Chemical Engineering), CRC Press, 3rd ed, 2011, ISBN-10: 1439826706, ISBN-13: 978-1439826706.
3. Temenoff & Mikos, "Biomaterials: The Intersection of Biology and Materials Science, " Prentice Hall, 1st ed., ISBN-13: 9780130097101
4. B H Brown, MEDICAL PHYSICS AND BIOMEDICAL ENGINEERING, Institute of Physics Publishing Bristol and Philadelphia.
5. J. D. Bronzino, The Biomedical Engineering HandBook, 1st & 2nd volume, 2nd Edition, CRC press 2000, ISBN 0-8493-0461-X
6. S.V. Bhat, "Biomaterials", Narosa Publishing house, 2nd Edition, 2005, ISBN-10:1842652079, ISBN-13: 978-1842652077.
7. W. Mark Saltzman and Veronique Tran, "Biomedical Engineering," CAMBRIDGE UNIVERSITY PRESS, 2009, ISBN 13: 9780521840996, ISBN 10: 0521840996.
8. S. N. Sarbadhikari, A Short Introduction to Biomedical Engineering, Universities Press, 2007.
9. Charles Stephen Lessard and Fidel Fernandez, " Introduction to Biomedical Engineering," Kendall Hunt Publishing Company, 2009, ISBN: 075755234X, 9780757552342.
10. G.S. Sawhney, "Fundamentals of Biomedical Engineering", New Age Publications, 2007, ISBN: 8122425496
11. Sherwood, Lauralee and others, "Text Book of Animal physiology", Cengage L, 2008

5. Course Plan:

Lec. Num.	Learning Objectives	Topics to be covered	Book chapter
1	Introduction	Course Introduction, Biomedical Engineering Defined,	
2-12	Human systems and compatibility with foreign bodies	Basic physiology, Fluid systems, Biocompatibility (blood compatibility as well as bone compatibility) of different materials & related characterization	R11
13-17	Engineering principles applied to biomedical	Mass transfer (hemodialysis), fluid mechanics (cardiovascular engineering, vessels and valves), thermodynamics (work cycles and	R1 (Ch 14) R2 (Ch3,





	transport	artificial hearts)	4,5) + class note
18-20	Biomechanics	Mechanics of materials, Viscoelastic properties, Cartilage, Ligament, tendon and muscle	R1 (Ch 4) + class note
21-24	Bio materials	Classification of materials; Metallic, ceramics, Polymers. Properties; Physical, Mechanical. Surface properties, Protein, cell interaction with materials. Wound healing.	R3 + class note
25-27	Tissue engineering	Scope of tissue engineering. Polymers as biomaterials for tissue engineering design and fabrication of engineered tissues. Bioreactors for tissue engineering	R1 (Ch 6) + class note
28-30	Biomedical imaging	X-ray imaging, MRI, PET, Ultrasound imaging	R1 (Ch 15, 16) + class note
31-33	Biomedical sensors	Physical measurements, Bio-analytical measurements, Acoustic wave biosensors, Optical biosensors, Magnetic biosensors, Electrochemical biosensors	R1 (Ch 10) + class note
34-37	Biomedical nanotechnology	Nano for Diagnostics-in vivo and in vitro	Class notes

6. Evaluation Scheme:

No.	Component	Duration	Weightage (300 marks/100%)	Remarks
1.	Mid-Sem	1½ hrs	90 (30%)	16/3 2:00 - 3:30 PM
2.	Project	--	60 (20%)	--
3.	Assignments/ Quiz	--	30 (10%)	CB and/or OB
4.	Comprehensive	3 hrs	120 (40%)	9/5 FN

CB - Close book OB - Open book

- Chamber consultation hour will be announced in the class.
- The notices will be displayed on the Chemical Engineering Group notice board only.
- Make-up will be granted for genuine cases only. Certificate from authenticated doctor from the Medical Center must accompany make-up application (*only prescription or vouchers for medicines will not be sufficient*). Prior permission of IC is compulsory.
- No make up for tutorial tests.





BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
Instruction Division

Instructor-in-charge
(BITS F418)



Please Do Not Print Unless Necessary

