**Name of the module: Biomaterials**

**Number of module: 365-1-4999**

BGU Credits 3.5

ECTS credits: 4.5

Academic year: every year

Semester: Spring semester

Hours of instruction 2013: Sunday 11:00-14:00

Location of instruction: Building 34 room 214

Language of instruction: Hebrew (or English if requested by students)

Cycle: B.Sc.

Position: Elective course for Materials Engineering..

Field of Education: Materials Engineering

Responsible department: Materials Engineering

General prerequisites: Students should complete the following courses before their registration to the module: Physical metallurgy 2 (365-1-3021), Materials selection (361-1-3491)

Grading scale: the grading scale would be determined on a scale of 0 – 100 (0 would indicate failure and 100 complete success 0 to 100), passing grade is 56.

Course Description: This course introduces the various classes of biomaterials in use and their application in selected medical applications. The course will focus on understanding the requested material properties, with an emphasis on various biological responses to the materials, the clinical context of their use, manufacturing processes, cost, sterilization, packaging and regulatory issues.

Aims of the module: Introduce the basic scientific and engineering of biomaterials

 Objectives of the module: Introduce the concepts of biomaterials and biocompatibility. Introduce relevant biological and biomedical process. Classify biomaterials, explain their important properties and methodologies to characterize them. Describe important applications. At the final part of the course basic concepts related to bio-nanotechnology will be provided.

Learning outcomes of the module: On successful completion of the course, the student should be able to:

1. Differentiate the various classes of biomaterials on the basis of structure and function;
2. Analyze and characterize bulk and surface properties of biomaterials;
3. Describe the molecular and cellular events that follow interactions of materials with body fluids and contact with various tissues of the human body;
4. Differentiate various biomedical devices based upon function, biomaterial composition, and clinical application; and patient risk.
5. Implement various practical aspects of biomedical device design, fabrication and testing
6. Describe basic concepts and advances in bionanotechnology

Lecturer: Professor Nurit Ashkenasy

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Office hours:

Lecturer:

Sunday 16:00-17:00,

Thursday 16:00-17:00

Module evaluation: at the end of the semester the students will evaluate the module, in order to draw conclusions, and for the university's internal needs.

Confirmation: the syllabus was confirmed by the faculty academic advisory committee to be valid on 2012-2013.

Last update: 26-Nov-13

Attendance regulation: Attendance in class is mandatory in 80% of the lecturer lectures and 100% in students' seminar presentation.

Teaching arrangement and method of instruction: Lectures and students seminars

Assessment:

Grading will be based on seminar and assay in an advanced topic in biomaterials according to the following criteria:

1. topic title and table of contents 10%
2. Seminar presentation 45%
3. Written assay 45%

 100%

Work and assignments: The students are expected to follow classes by looking over the lecture notes, and supplement by reading in the textbook of the course, as well as complementary literature**.** Each student will provide a title of advanced topic related to the course outline that will be the topic of his assay 1 1/2 month after the semester begins. Two weeks later he/ she will provide abstract or table of contents of the topic. Each student will present orally his topic in one of the last weeks of the semester (25 minutes). A written assay (10 pages ) will be handed to the lecturer by the first Sunday after the end of the semester.

The students will prepare a written assay (10 pages) and

Time required for individual work: in addition to attendance in class, the students are expected to do their assignment and individual work: 1 h per week for the first half of the semester, and 5 hours per week during the second part of the semester.

Module Content\ schedule and outlines:

1. Introduction: motivation and basic definitions (3h).
2. Surface interactions (3h).
3. Surface interactions with proteins (2h).
4. Surface coatings (3h)
5. Host reactions with biomaterials (4h).
6. Degradable materials (3h).
7. Tissue engineering (2h).
8. Applications of biomaterials (8)
9. Device regulation, development and testing (2h)
10. Advanced applications, novel materials and processes (students lectures) (9h)

Required reading: Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen, and Jack E. Lemons, Biomaterial Science: An introduction to Materials in Medicine, 2nd Edition, Elsevier Academic Press, 2004

\* Learning material will be available to the students on the module's website (high-learn)/ library/ electronic documents available to BGU students.