

Biological Applications of Nanostructures and Nanomaterials – Fall 2003

Lecturer

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Textbooks

There is no textbook that covers all of the topics in this course, however the following are useful reference texts:

Biomaterials Science, Buddy D. Ratner (First Editor), Academic Press, 1st edition (1996), ISBN 0125824610

Nanomedicine, Vol. I: Basic Capabilities, Robert A. Freitas Jr, Landes Bioscience, 1st Edition (1999), ISBN 1570596808 (also on the web at <http://nanomedicine.com/>)

Biomaterials: Principles & Applications, Joon Bu Park (First Editor), CRC Press, 1st Edition (2002), ISBN 0849314917

Additional supporting material is available through the course website (Rutgers University webCT).

Syllabus

The course consists of 24 lectures each 1 hour 20 minutes long. These are divided amongst the following topics:

Nanoscale in biology and biomimetic materials (8 lectures)-

Mineralized tissues, apatite crystals, organic/inorganic matrix, precipitation, artificial bone, cell structure, membranes, actin, macromolecules, bioadhesion, ligand-receptor interactions, collagen structure, bone morphogenic proteins, cell migration, cell attachment, phagocytosis, macrophage response.

Characterization and fabrication of nanoscale systems and devices (4 lectures) -

Scanning probe microscopy, nanotweezers electron microscopy, molecular manufacture, nanofabrication, nanolithography, focused ion beam, electron beam lithography, fullerenes.

Nanodevices in medicine (6 lectures) -

Navigation, manipulation, locomotion, power, specificity, design parameters, capabilities, limitations, surface and intermolecular forces, viscous forces

Current applications (6 lectures) -

DNA manipulation, artificial skin, nanosensors, communication, drug delivery, molecular sorting, hard tissue engineering, soft tissue engineering, cell response to nanotexturing, nanoparticles for magnetic imaging

Course Grading

2 Assignments (20% each), 2 Quizzes (20% each), 1 Final (20%)