

SUBJECT DESCRIPTION FORM

Subject Title: Nanobiotechnology

Subject Code: HTI5127

Credit Value: 3

Date of Submission: Feb 2007

Originating Staff & Department: Dr. Thomas M.H. Lee (HTI)

Pre-requisite: Nil

Recommended Background Knowledge: General Chemistry and Biology

Exclusions: Nil

Learning Approach:

Contact hours:

Lecture/Tutorial/Laboratory	39 hours
Project Presentation	3 hours
Sub-total:	42 hours

Independent Study hours:

Self-study	70 hours
Assignments	8 hours
Project Preparation	20 hours
Sub-total:	98 hours

Total hours: 140 hours

Assessment:

Continuous Assessment	60%
Assignments	
Presentation	
Final Examination	40%

Learning Outcomes:

At the completion of the subject, students should be able to:

- discuss the fundamentals of biofunctionalized nanostructured materials;
 - apply the unique properties of these bio-nanomaterials for novel biomedical, biotechnological, as well as electronics applications;
 - analyze the performance of these nanoscale technologies as compared to their macro- or micro-scale counterparts;
 - integrate knowledge of chemistry, biology, and engineering to design nano-enabled devices;
 - identify promising areas/future directions in the nanobiotechnology field;
 - appraise the value of nanobiotechnology in scientific, economic, social, and environmental contexts.
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Syllabus:

Introductory overview; preparation, characterization, and properties of nanostructured materials (e.g., metal nanoparticle, quantum dot, carbon nanotube, polymeric nanocarrier, and silica nanoparticle); biofunctionalization of nanomaterials (e.g., cell, nucleic acid, and protein); applications of biofunctionalized nanomaterials (e.g., diagnostics and screening technologies, drug delivery); nanofabrication/nanopatterning techniques and applications in implants, prostheses, and tissue engineering; DNA nanostructures and DNA-templated electronics; toxicity, health, and environmental issues.

Reading List:

1. Niemeyer, C.M. and Mirkin, C.A., *Nanobiotechnology: Concepts, Applications, and Perspectives*, John Wiley & Sons, 2004.
2. Malsch, N.H., *Biomedical Nanotechnology*, Taylor & Francis, 2005.
3. Jain, K.K., *Nanobiotechnology in Molecular Diagnostics: Current Techniques and Applications*, Horizon Bioscience, 2006.
4. Rosenthal, S.J. and Wright, D.W., *Nanobiotechnology Protocols*, Humana Press, 2005.
5. Nalwa, H.S., *Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology*, American Scientific Publishers, 2005.
6. Stroschio, M. and Dutta, M., *Biological Nanostructures and Applications of Nanostructures in Biology: Electrical, Mechanical, and Optical Properties*, Springer, 2004.
7. Kumar, C.S.S.R., *Biofunctionalization of Nanomaterials*, John Wiley & Sons, 2006.
8. Kelsall, R., Hamley, I.W. and Geoghegan, M., *Nanoscale Science and Technology*, John Wiley & Sons, 2005.
9. Poole, C.P. and Owens, F.J., *Introduction to Nanotechnology*, John Wiley & Sons, 2003.
10. Wilson, M., Kannangara, K., Smith, G., Simmons, M. and Raguse, B., *Nanotechnology: Basic Science and Emerging Technologies*, Chapman & Hall/CRC, 2002.