BMME 540 Course Syllabus

BMME 540 Nanobiotechnology Processing, Characterization, and Applications

Section 001

4:30 PM - 5:45 PM, 2220 Engineering Building 3

3 Credit Hours

Course Description
Topics at the interface of nanoscale science and biotechnology will be discussed. Chemical, physical, and biological properties of nanostructured biomaterials, devices, and systems.

Course Structure
This course involves a combination of weekly instructor-led introductory presentations on nanotechnology characterization methods and student-delivered PPT audio slide presentations on recent advances in nanobiotechnology related to these nanotechnology characterization methods. Each student will prepare 11 ten minute audioslides on assigned nanobiotechnology papers. Details on the preparation of the audio slides can be found in the attachment “example.pptx”

Instructors
Roger Narayan (rjnaraya) - Instructor
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Phone: 919 696 8488
Fax: 919 513 3814
Office Location: 4204 D Engineering Building Three
Office Hours: 3:30-4:30 Tuesdays and Thursdays

Course Materials

Textbooks

Nanotechnology: Applications and Markets (L. Gasman)
Biomedical Nanotechnology (N. H. Malsch)
Biomedical Nanostructures (K. E. Gonsalves, C. R. Halberstadt, C. T. Laurencin, L. S. Nair)
Nanochemistry: A Chemical Approach to Nanomaterials (G. A. Ozin, A. C. Arssenault, L. Cademartiri)
Cellular Response To Biomaterials (L. Di Silvio)
Nanotoxicology: Characterization, Dosing, and Health Effects (N. A. Monteiro-Riviere, C. L. Tran)
Nanotherapeutics: Drug Delivery Concepts in Nanoscience (A. Lamprecht)
Nanomedicine: Design of Particles, Sensors, Motors, Implants, Robots, and Devices (M. J. Schulz, V. N. Shanov, Y. Yun)

Biomedical Applications of Nanotechnology (V. Labhasetwar, D. L. Leslie-Pelecky)

Nanotechnology in Food Products (Institute of Medicine)

Methods in Bioengineering: Nanoscale Bioengineering and Nanomedicine (K. Rege, I. L. Medintz)

*These textbook are optional.*

### Requisites and Restrictions

#### Prerequisites

Introduction to the Materials Science of Biomaterials (BME (MSE) 203), Human Physiology for Engineers I (BME 301) and Human Physiology for Engineers II (BME 302)

### Grading

#### Grade Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Details</th>
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<tbody>
<tr>
<td>Grade Calculation:</td>
<td>see below</td>
<td>Your grade will be based on your eleven weekly PPT audio slide presentations (9.1% each presentation).</td>
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<tr>
<td>Grading Scale:</td>
<td>see below</td>
<td>Course grades will be based on the conventional university scale.</td>
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<tr>
<td>Examination Contents:</td>
<td>see below</td>
<td>n/a</td>
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### Letter Grades

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Requirements for Credit-Only (S/U) Grading

In order to receive a grade of S, students are required to take all exams and quizzes, complete all assignments, and earn a grade of C- or better. Conversion from letter grading to credit only (S/U) grading is subject to university deadlines. Refer to the Registration and Records calendar for deadlines related to grading. For more details refer to http://policies.ncsu.edu/regulation/reg-02-20-15.

Requirements for Auditors (AU)

Information about and requirements for auditing a course can be found at http://policies.ncsu.edu/regulation/reg-02-20-04.

Policies on Incomplete Grades

If an extended deadline is not authorized by the instructor or department, an unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. The university policy on incomplete grades is located at http://policies.ncsu.edu/regulation/reg-02-50-3.

Late Assignments

Unexcused late assignments or missed examinations may not be made up.

Attendance Policy

For complete attendance and excused absence policies, please see http://policies.ncsu.edu/regulation/reg-02-20-03

Attendance Policy

Student attendance is strongly encouraged.

Absences Policy

Documentation of excused absences must be provided by the class meeting immediately after the absence.

Makeup Work Policy

Make up of excused absences must take place within three weeks of the absence. Make up of unexcused absences is at the discretion of the instructor.

Additional Excuses Policy

None.

Academic Integrity

Academic Integrity

Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at http://policies.ncsu.edu/policy/pol-11-35-01

Academic Honesty

See http://policies.ncsu.edu/policy/pol-11-35-01 for a detailed explanation of academic honesty.
**Honor Pledge**

Your signature on any test or assignment indicates "I have neither given nor received unauthorized aid on this test or assignment."

**Electronically-Hosted Course Components**

There are no electronically-hosted components for this course.

**Accommodations for Disabilities**

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, student must register with the Disability Services Office (http://www.ncsu.edu/dso), 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation at http://policies.ncsu.edu/regulation/reg-02-20-01.

**Non-Discrimination Policy**

NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at http://policies.ncsu.edu/policy/pol-04-25-05 or http://www.ncsu.edu/equal_op/. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.

**Course Schedule**

- introduction-1/7
- how to access library research resources related to nanotechnology-1/12
- transmission electron microscopy presentations (instructor presentation first day, student presentations both days)-1/14 and 1/19
- scanning electron microscopy (instructor presentation first day, student presentations both days)-1/21 and 1/26
- atomic force microscopy (instructor presentation first day, student presentations both days)-2/2 and 2/4
- x-ray diffraction (instructor presentation first day, student presentations both days)-2/9 and 2/11
nanoindentation and nanomechanical testing (instructor presentation first day, student presentations both days) - 2/18 and 2/25

corrosion/degradation (instructor presentation first day, student presentations both days) - 3/1 and 3/3

cell viability (instructor presentation first day, student presentations both days) - 3/15 and 3/17

blood compatibility (instructor presentation first day, student presentations both days) - 3/22 and 3/24

protein adsorption (instructor presentation first day, student presentations both days) - 4/5 and 4/7

interactions with microorganisms (instructor presentation first day, student presentations both days) - 4/12 and 4/14

sterilization of nanomaterials (instructor presentation first day, student presentations both days) - 4/19 and 4/21

PDF’s for audioslide presentations by assigned by name:

1- Ana B.
2- Shannon D.
3- Allison D.
4- Brittany H.
5- Andrea L.
6- Andrew M.
7- Caleb M.
8- Pinaki N.
9- Erinn N.
10- Haripriya R.
11- Alexis S.
12- Ryan S.