

BMME 540 Course Syllabus

BME 540 Nanobiotechnology Processing, Characterization, and Applications Section 001

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 seven ten-minute audioslides based on assigned nanobiotechnology papers. Details on the preparation of the audio slides can be found in the attachment "example.pptx"

Instructors

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Office Hours: 3:30-4:30 Tuesdays and Thursdays (available by phone or video)

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. Arsenault, L. Cademartiri)

Cellular Response To Biomaterials (L. Di Silvio)

Nanotoxicology: Characterization, Dosing, and Health Effects (N. A. Monteiro-Riviere, C. L. Tran)

Nanotechnology in Therapeutics: Current Technology and Applications (N. A. Peppas, J. Z. Hilt, J. B. Thomas)

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)

All of these textbooks 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

Component	Weight	Details
Grade Calculation:	see below	Your grade will be based on your eight weekly PPT audio slide presentations (12.5% each presentation).
Grading Scale:	see below	Course grades will be based on the conventional university scale.
Examination Contents:	see below	n/a

Letter Grades

97 ≤ **A+** ≤ 100
93 ≤ **A** < 97
90 ≤ **A-** < 93
87 ≤ **B+** < 90
83 ≤ **B** < 87
80 ≤ **B-** < 83
77 ≤ **C+** < 80
73 ≤ **C** < 77
70 ≤ **C-** < 73
67 ≤ **D+** < 70
63 ≤ **D** < 67
60 ≤ **D-** < 63
0 ≤ **F** < 60

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/req-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

How to Guide for BME 540

Hello everyone:

This is the "How To" Guide for BME 540, which is being taught asynchronously (at your own pace) for Fall 2021.

The goals of this course are as follows:

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.

The course is graded on seven audioslide assignments, which are each worth 14.2% of the final grade. The assignments should be submitted by 11:59 pm on December 2nd, 2021.

It is suggested that you complete the course as follows:

Video #1- introduction to nanobiotechnology

Video #2- introduction to the biological basis of nanobiotechnology

Video #3- student presentations related to the biological basis of nanobiotechnology

Video #4- BioMEMS and BioNEMS Part 1

Video #5- student presentations related to BioMEMS and BioNEMS

Complete Homework #1

Video #6- BioMEMS and BioNEMS Part 2 and electron microscopy

Video #7- student presentations related to electron microscopy of nanomaterials

Video #8- electron microscopy and analytical testing

Complete Homework #2

Video #9- analytical methods

Video #10- student presentations related to analytical testing of nanomaterials

Complete Homework #3

Video #11- analytical methods and corrosion

Video #12- student presentations related to corrosion of nanomaterials

Video #13- corrosion, wear, and hardness

Complete Homework #4

Video #14- student presentations related to biocompatibility of nanomaterials

Video #15- biocompatibility testing and case studies

Complete Homework #5

Video #16- student presentations related to blood compatibility of nanomaterials

Video #17- blood compatibility testing

Video #18- student presentations related to antimicrobial nanomaterials

Video #19- blood compatibility testing

Complete Homework #6

Video #20- antimicrobial materials and sterilization of materials

Complete Homework #7

* Please prepare a 10 minute PPT based on the information covered in the hw article; please feel free to include background from the accompanying video lecture. The attached student presentations provide examples of completed assignments.

-You do not need to read additional information beyond the hw article and the preceding video lecture to prepare a complete summary.

- Each summary should be named “Lastname_AssignmentNumber” (e.g., Smith_1.ppt or pptx).

-All nine assignments should be placed in a single zipped folder (<https://www.youtube.com/watch/Ipn-T5Um3d4> shows how to create a zipped folder in Windows) with the name “BME590assignments_Lastname.”

-Please upload the folder to www.wetransfer.com and create a https link

-Please email me (at rjnaraya@ncsu.edu) with the heading “BME540assignments_Lastname” and share the https link no later than 11:59 pm on December 2nd, 2021.

Please let me know if any questions arise. I can be reached at rjnaraya@ncsu.edu or 919-696-8488 if you have any questions or need any additional information.

Assignment of Presentations

1.pdf Ballance

2.pdf Dhaliwal

3.pdf Requarth

4.pdf Sahota

5.pdf Scanlon

6.pdf Slota

7.pdf Teemojin

ADDITIONAL SYLLABUS LANGUAGE, Fall 2021

Due to the COVID-19 pandemic, public health measures continue to be implemented across campus. Students should stay current with these practices and expectations through the [Protect the Pack](https://www.ncsu.edu/coronavirus/) website (<https://www.ncsu.edu/coronavirus/>). The sections below provide expectations and conduct related to COVID-19 issues.

Health and Participation in Class

We are most concerned about your health and the health of your classmates and instructors/TAs.

- If you test positive for COVID-19, or are told by a healthcare provider that you are presumed positive for the virus, you should not attend any hybrid or face-to-face (F2F) classes and work with your instructor on any adjustments necessary; also follow other university guidelines, including self-reporting ([Coronavirus Self Reporting](#)): Self-reporting is not only to help provide support to you, but also to assist in contact tracing for containing the spread of the virus.
- If you feel unwell, even if you have not been knowingly exposed to COVID-19, please do not come to a F2F class or activity.
- If you are in quarantine, have been notified that you may have been exposed to COVID-19, or have a personal or family situation related to COVID-19 that prevents you from attending this course in person (or synchronously), please connect with your instructor to make alternative plans, as necessary.
- If you need to make a request for an academic consideration related to COVID-19, such as a discussion about possible options for remote learning, please talk with your instructor.

Health and Well-Being Resources

These are difficult times, and academic and personal stress are natural results. Everyone is encouraged to [take care of themselves](#) and their peers. If you need additional support, there are many resources on campus to help you:

- Counseling Center ([NCSU Counseling Center](#))
- Student Health Services ([Health Services | Student](#))
- If the personal behavior of a classmate concerns or worries you, either for the classmate's well-being or yours, we encourage you to report this behavior to the NC State CARES team: ([Share a Concern](#)).
- If you or someone you know are experiencing food, housing or financial insecurity, please see the Pack Essentials Program ([Pack Essentials](#)).

Community Standards related to COVID-19

We are all responsible for protecting ourselves and our community. Please see the [community standards](#) (which have been updated for 2021) and Rule 04.21.01 regarding Personal Safety Requirements Related to COVID-19 [RUL 04.21.01 – Personal Safety Requirements Related to COVID-19 – Policies, Regulations & Rules](#)

Course Expectations Related to COVID-19:

- **Face Coverings:** All members of the NC State academic community are expected to follow all university policies and guidelines, including the [Personal Safety Rule](#) and [community standards](#), for the use of face coverings. Face coverings are required in instructional spaces. Face coverings should be worn to cover the nose and mouth and be close fitting to the face with minimal gaps on the sides.
- **Course Attendance:** NC State attendance policies can be found at: [REG 02.20.03 – Attendance Regulations – Policies, Regulations & Rules](#). Please refer to the course's attendance, absence, and deadline policies for additional details. If you are quarantined or otherwise need to miss class because you have been advised that you may have been exposed to COVID-19, you should not be penalized regarding attendance or class participation. However, you will be expected to develop a plan to keep up with your coursework during any such absences. If you become ill with COVID-19, you should follow the steps outlined in the health and participation section above. COVID 19-related absences will be considered excused; documentation need only involve communication with your instructor.
- **Technology Requirements:** This course may require particular technologies to complete coursework. Be sure to review the syllabus for these expectations, and see the [syllabus technical requirements](#) for your course. If you need access to additional technological support, please contact the Libraries' Technology Lending Service: ([Technology Lending](#)).

Course Delivery Changes Related to COVID-19

Please be aware that the situation regarding COVID-19 is frequently changing, and the delivery mode of this course could change accordingly, including from in-person to remote. Regardless of the delivery method, we will strive to provide a high-quality learning experience.

NO LONGER AVAILABLE - Grading/Scheduling Changing Options Related to COVID-19

Two policies, (1) enhanced S/U Grading Option, and (2) Late Course Drops, were put in place at the beginning of the COVID-19 pandemic to ease student stress and promote course completion. Those two policies **have been discontinued** and thus are no longer available to students. For situations where relief may be needed, and depending on the details, students should explore the applicability of an "incomplete" grade in the course. If you are experiencing difficult or extenuating circumstances, you should discuss possible options with your instructor and your academic advisor.

Need Help?

If you find yourself in a place where you need help, academically or otherwise, please review these [Step-by-Step Help Topics](#).

Other Important Resources

- **Keep Learning:** [Keep Learning](#)
- **Protect the Pack FAQs:** [Frequently Asked Questions | Protect the Pack](#)
- **NC State Protect the Pack Resources for Students:** [Resources for Students | Protect the Pack](#)
- **Academic Success Center** (tutoring, drop in advising, career and wellness advising): [Academic Success Center](#).
- **NC State Keep Learning, tips for students opting to take courses remotely:** [Keep Learning Tips for Remote Learning](#)
- **Introduction to Zoom for students:** <https://youtu.be/5LbPzzPbYEW>
- **Learning with Moodle, a student's guide to using Moodle:** <https://moodle-projects.wolfware.ncsu.edu/course/view.php?id=226>
- **NC State Libraries** [Technology Lending Program](#)