

Micro and Nanotechnologies for Medical Devices and Biological Science

EEL 6935

Class Periods: Tuesday, Period 7 (1:55 – 2:45 pm), Thursday, Period 7-8 (1:55 – 3:50 pm)

Location: CHE 316

Academic Term: Spring 2020

Instructor:

Jack Judy

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382-846-1275

Office Hours: Tuesday, Time: after lecture, Location: 210 NRF

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Please contact through the Canvas website

- None

Course Description

(3 credits): Microtechnologies and nanotechnologies used to improve medical devices, enhance clinical therapies, and advance fundamental biological science. The materials, fabrication processes, design considerations, characterization methods, and end-use applications for microtechnologies and nanotechnologies useful for medical and biological science purposes will be explained. Although the analysis of nanotechnologies produced with top-down fabrication processes will be emphasized, some nanotechnologies produced with bottom-up processes will also be discussed.

Course Pre-Requisites / Co-Requisites

EEL 5225: Principles of MEMS Transducers

or EEE 5405: Microelectronic Fabrication Technology

Course Objectives

To gain a thorough understanding of state-of-the-art and future nanotechnologies used for medical and biological science applications. Knowledge will be gained through exploration of nanotechnology design, fabrication, characterization, and translation for use at the lab bench and the bedside.

Materials and Supply Fees

None.

Required Textbooks and Software

None required.

Recommended Materials

- Papers from current literature to be provided by the instructor.
- Books with valuable relevant information
 - Fundamentals of Microfabrication and Nanotechnology:
March Madou
Volume I: Solid-State Physics, Fluidics, and Analytical Techniques in Micro- and Nanotechnology
Volume II: Manufacturing Techniques for Microfabrication and Nanotechnology
Volume III: From MEMS to Bio-MEMS and Bio-NEMS: Manufacturing Techniques and Applications
2011, CRC Press
 - Nanotechnology for Biology and Medicine
Gabriel A. Silva and Vladimir Parpura
2012, Springer

Course Schedule

The following represent current plans and objectives. However, these plans may change to enhance the class learning opportunity. Such changes, communicated clearly, are not unusual and should be expected:

- Week 1: Course Overview, Motivation, Introduce Medical Devices and Biological Science Applications
- Week 2: Microtechnology and the Biomedical Applications of Microtechnology
- Week 3: Top-Down Nanotechnology and the Biomedical Applications of Top-Down Nanotechnologies
- Week 4: Bottom-Up Nanotechnology and the Biomedical Applications of Bottom-Up Nanotechnologies
- Week 5: Challenges with Translating Bio-Micro-Nano Technologies
- Week 6: Review and Midterm Exam
- Week 7: Class Project, Range of Topics, Reviewing Bio-Micro-Nano Literature
- Week 8: Presenting Review of Bio-Micro-Nano Literature (Journal Club)
- Week 9: Spring Break
- Week 10: Proposal Pitching and Writing for Advanced Micro-Nano-Bio Research
- Week 11: Literature-Review Documents
- Week 12: Presentation of Literature Review (Journal Club)
- Week 13: Engaging Government to Fund Advanced Bio-Micro-Nano Technology Development and Private Capital for Funding and Commercialization Support
- Week 14: Presentation of Advanced Micro-Nano-Bio Technology Development Pitch & Questions
- Week 15: Reviewing Advanced Research and Development Proposals
- Week 16: Reviewing Student Proposals for Advanced Micro-Nano-Bio Technology Development

Attendance Policy, Class Expectations, and Make-Up Policy

State whether attendance is required and if so, how will it be monitored? What are the penalties for absence, tardiness, cell phone policy, laptop policy, etc. What are the arrangements for missed homework, missed quizzes, and missed exams? This statement is required: Excused absences must be in compliance with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets	10 / question	15 %
Midterm Exam	100	20 %
Topics Selection Abstract, Intro Presentation, and Questions	100	5 %
Project Literature- Review Document	100	5 %
Project Literature- Review Presentation, Journal Club, and Questions	100	10 %
Project Pitch Presentation	100	15 %
Project Proposal	100	20 %
Review of Project Proposals	100	10 %
		Total: 100 %

More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [Office of Title IX Compliance](#), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: <https://care.dso.ufl.edu>.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.