

## EEL 5934

### Micro and Nanotechnologies for Medicine, Biology, and Agriculture

**Class Periods:** Tuesday (1:55 to 2:45 pm) and Thursday (1:55 to 3:50 pm)

**Location:** Larsen 239

**Academic Term:** Spring 2023

**Instructor:**

Jack Judy

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382-846-1275

Office Hours: Tuesday and Thursday (for the hour right after lecture), Location: 210 NRF

**Teaching Assistant/Peer Mentor/Supervised Teaching Student:**

Please contact through the Canvas website

- None

**Course Description**

(3 credits): The focus of this course is in use and adaptation of microtechnologies and nanotechnologies to improve medical devices, enhance clinical therapies, advance fundamental biological science, and progress agricultural methods. Interactive discussion topics will include the materials, fabrication processes, design considerations, characterization methods, and end-use applications for microtechnologies and nanotechnologies in medicine, biology, and agriculture. The course is suitable for graduate students from many different backgrounds (e.g., ECE, MSE, CHE, BME, AEB, MAE, ESSIE, etc.) that have an interest in the medical, biological, and agricultural applications of advanced microscale and nanoscale engineering. A major component of this course will be a project that allows students to focus on a topic of interest and develop professional skills, including performing a literature search, developing a new concept, composing a persuasive proposal for a federal agency, delivering an effective presentation pitch, and reviewing proposals.

**Course Pre-Requisites / Co-Requisites**

Basic knowledge of physics, chemistry, and math.

**Course Objectives**

To gain an understanding of state-of-the-art micro and nano technologies and their medical, biological, and agricultural applications. Knowledge will be gained through a review of micro/nano fabrication process as well as the design considerations imposed by those processes and the medical, biological, and agricultural applications in which they are used. Although each student will be permitted to focus their work on a topic of personal interest, all students will improve several key professional skills: literature search, idea development, persuasive concept pitching, proposal writing, and proposal reviewing.

**Materials and Supply Fees**

None.

**Required Textbooks and Software**

Yock, Paul G., et al. *Biodesign: the process of innovating medical technologies*. Cambridge University Press, 2015.

## Recommended Materials

- Papers from current literature to be provided by the instructor.
- Books with valuable relevant information
  - Fundamentals of Microfabrication and Nanotechnology by 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	Lecture Topic	Assignments
Week 1	Introduction, Motivation, Course Overview, Microtechnology	HW 1: Student Profile Presentation
Week 2	Microtechnology Applications: Medical, Biological, and Agricultural	
Week 3	Top-Down Nanotechnology	HW 2: Microtechnology and its Applications
Week 4	Top-Down Nanotechnology Applications: Medical, Biological, and Agricultural	
Week 5	Bottom-Up Nanotechnology	HW 3: Top-Down Nanotechnology and its Applications
Week 6	Bottom-Up Nanotechnology Applications: Medical, Biological, and Agricultural	
Week 7	Literature Reviews, Resources at UF, Presenting Technical Information, Translation: Identifying Needs & Screening	HW 4: Bottom-Up Nanotechnology and its Applications
Week 8	Challenges with the Translation and Commercialization of Micro/Nano-technology, Translation: Concept Generation and Selection	Literature Review: Source Material
Week 9	Literature Review Presentations	Literature Review: Presentation
Week 10	Developing Persuasive Concept Pitches	Literature Review: Document Proposed Concept: Source Materials
Week 11	Translation: Development Strategies and Integration	Proposed Concept: Presentation Draft
Week 12	Proposal Concept-Pitch Presentations	Proposed Concept: Presentation
Week 13	Developing Specific Aims	Proposed Concept: Document
Week 14	Developing Effective Proposals Discussion of Specific Aims Pages	Proposed Concept: Specific Aims Page
Week 15	Regulatory Processes and Challenges	Proposed Concept: Full Proposal
Finals Week	Proposal Reviewing	Proposed Concept: Reviews

### ***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***

<b>Assignment</b>	<b>Percentage of Final Grade</b>
Class Participation	10%
Homework Sets (3)	10%
Literature Review Presentation	10%
Literature Review Document	10%
Proposed Concept: Presentation	15%
Proposed Concept: Document	10%
Proposed Concept: Specific Aims Page	10%
Proposed Concept: Full Proposal	15%
Proposed Concept: Reviews	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 feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/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](mailto:rbielling@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto: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](mailto: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](mailto: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://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

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