

Biopolymers: Manufacture, Stability, and Biocompatibility

EMA 4062 Class Number 11911

Class Periods: Tuesday (10:40am - 11:30am) and Thursday (10:40am -12:35pm)

Location: Tuesday - FLG 285 ; Thursday FAC 127

Academic Term: Spring 2025

I. Instructor:

Renato Sam Navarro

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Office: Rhines Hall Room 206

Office Hours: Tuesday 9 am – 10 am

II. Teaching Assistant/Peer Mentor/Supervised Teaching Student:

- N/A

III. Course Description

(3 credit hours) – Polymer manufacturing processes and biochemical/biophysical behavior are considered from the perspective of achieving those properties needed for the engineering of polymeric implants and devices. Unique economic, ethical, and regulatory issues are also presented.

IV. Course Pre-Requisites / Co-Requisites

EMA3066

V. Course Objectives

This course will provide an overview of polymeric biomaterials used in the design of medical devices, and to augment or replace soft and hard tissues. Discussion will include the manufacturing, applications, and *in vivo* behavior of different classes of natural and synthetic biomaterials. Analysis of the regulatory process as well as failure analysis of implantable polymeric biomaterials/devices. Finally, evaluations of relevant case studies covering biomaterial approaches will be conducted.

VI. Materials and Supply Fees

None

VII. Relation to Program Outcomes (ABET):

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not part of the course.

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Low
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	High
3. An ability to communicate effectively with a range of audiences	Medium
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the	Medium

impact of engineering solutions in global, economic, environmental, and societal contexts	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Low
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	N/A
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

VIII. Required Textbooks and Software

Biomaterials Science: An Introduction to Materials in Medicine
Buddy D. Ratner et al.
2020, (4th Edition) ISBN: 978-0128161371

Recommended Materials

Handbook of Biopolymers
Sabu Thomas et al.
2013, (1st Edition) ISBN: 978-3527328840

Biopolymers for Biomedical Applications
Addu
2024, (1st Edition) ISBN: 9781119865438

IX. Required Computer

UF student computing requirement: <https://news.it.ufl.edu/education/student-computing-requirements-for-uf/>

X. Course Schedule

Week 1: Module I: Welcome, Biomaterials Overview, Project guidance
Week 2-5: Module II: Polymeric biomaterials for soft tissue applications
Week 6-9: Module III: Polymeric biomaterials for hard tissue applications
Week 10-13: Module IV: Polymeric biomaterials for drug delivery applications
Week 14-15: Module VI: Clinical Translation of Biomaterials: Sterilization, Commercialization, Regulation

XI. Attendance Policy, Class Expectations, and Make-Up Policy

- A. Attendance Policy- Lecture attendance is highly recommended. During certain parts of the class, attendance will be mandatory and a lack of attendance will affect your grade. Experience has shown that those who attend lectures earn higher grades in the course. Arrival on time is expected. Excused absences are consistent with university policies in the undergraduate catalog <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx> and require appropriate documentation.
- B. Class Expectations- Please turn off all cell phones upon entering class. Reading of newspapers, work on assignments for this or other classes, or other activities that are not part of the class are not allowed during lecture. Students who do not comply with these requirements or who behave disorderly or disrespectfully may be asked to leave the classroom.
- C. Exams- There will be 4 equally weighted exams. Exams will be administered during the regular class time,

which should avoid exam conflicts. There will be no final exam. Exam dates will be announced.

- D. Make-up exams- Make up exams will be provided only with the prior approval of the instructor in accordance with university policies. (In general, acceptable reasons for excused absence include illness, serious family emergencies, special curricular requirements, military obligation, court-imposed legal obligations, and religious holidays. In all cases, you will be required to provide written documentation, and obtain prior instructor approval. In the case of an emergency that prevents prior notification of an anticipated missed exam, you must notify the instructor as soon as possible. You will not be excused from any exam without following the policy above, with no exceptions. Students not in attendance for the scheduled exam will receive a score of zero. To be clear, Make-up exams will only be allowed in exceptional cases, with prior instructor approval, sufficient documentation, and in accordance of university policies. (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>)

You must notify the instructor no less than 1 week of the scheduled exam.

Make-up exams for excused absences must occur within 1 week of the missed exam and may occur before the missed exam.

XII. Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Exams (x4)	100 each	70%
Concept Check/HW exercises	100 each	20%
Participation (discussion Board, attendance, journal club)	100	10%
		100%

XIII. Grading Policy

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

XIV. Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

XV. 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.bluer.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

XVI. In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

XVII. 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://sccr.dso.ufl.edu/process/student-conduct-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.

XVIII. Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University’s core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

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 Undergraduate Coordinator
- HWCoe Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

XIX. 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.

XX. 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>

XXI. 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: <https://counseling.ufl.edu>, 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](mailto:title-ix@ufl.edu), 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://elearning.ufl.edu/>.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; <https://career.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://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

On-Line Students Complaints: <https://distance.ufl.edu/getting-help/>; <https://distance.ufl.edu/state-authorization-status/#student-complaint>.