MSE404
Biomaterials Synthesis and Properties
Spring 2021

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Course Materials:
Available for free as an online resource at:
https://www.taylorfrancis.com/books/9781420075823

Available for free as an online resource at:

Website: http://compass2g.illinois.edu

Class Meetings:
There will be no in-person lecture for MSE404-BS. Instead, lectures will be delivered online as pre-recorded videos that will be uploaded to the website prior to the scheduled lab. It is the students’ responsibility to view these video lectures prior to lab and to contact the instructor if there are any problems or questions. Zoom and other means of videoconferencing will be used as needed for office hours, requested meetings, etc. Labs will meet in person, but group will attend one-by-one to decrease the room occupancy to acceptable levels. While in lab, both students and instructors are required to wear face masks/appropriate PPE and maintain appropriate social distancing. Aside from the absence of in-person lecture, the lab work and topics for the class remain largely unchanged from previous years.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Section</th>
<th>Time</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>Laboratory</td>
<td>BS1</td>
<td>2:00 – 4:50 PM, Mon/Wed</td>
<td>218/220 Kiln House</td>
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<tr>
<td></td>
<td>BS2</td>
<td>2:00 – 4:50 PM, Tues/Thurs</td>
<td>218/220 Kiln House</td>
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<td>BS3</td>
<td>8:00 – 10:50 AM, Tues/Thurs</td>
<td>218/220 Kiln House</td>
</tr>
<tr>
<td>Office Hours</td>
<td>By appointment (or speak with me during your scheduled lab)</td>
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Course Objectives:
1. To learn laboratory science, methods and skills that are necessary for biomedical science and engineering.
2. To develop the written and oral communication skills essential for a clear, concise and persuasive presentation of research findings and results.
3. To facilitate critical thinking about research design, experimental observations and data analysis.
4. To gain experience working as part of a team.
Grading:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Lab reports, executive reports</td>
<td>75%</td>
</tr>
<tr>
<td>Pre-lab quizzes</td>
<td>15%</td>
</tr>
<tr>
<td>Lab participation/attendance</td>
<td>10%</td>
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</tbody>
</table>

Grading Scale:

- 98-100 = A+
- 92-97 = A
- 90-91 = A-
- 88-89 = B+
- 82-87 = B
- 80-81 = B-
- 78-79 = C+
- 72-77 = C
- 70-71 = C-
- 68-69 = D+
- 62-67 = D
- 60-61 = D-
- ≤59 = F

*the lower number of the grading ranges may be lowered but not raised

Grading Notes:
1. This course consists of three modules. An individually written lab report or executive summary will be required for each module. Lab reports will be submitted online. Late submission will receive an automatic point deduction of 5 points per day.
2. You are required to read the lab procedures/watch the lecture video before attending the lab session. A brief quiz will be given at the beginning of each lab session. The quiz will focus on the fundamental concepts of each lab, not on minute experimental details.
3. Everyone is required to keep a lab notebook which will be subjected to daily inspection.

Laboratory Policies:
1. No food or beverages are allowed in the lab. Chewing gum is discouraged.
2. Long pants (covers the legs to the ankle) and closed-toed shoes are required for entry into the lab.
3. Avoid wearing your “best” clothes and consider wearing a lab coat.
4. Confine long hair, loose clothing and dangling jewelry.
5. Cover any cuts or scrapes with a bandage before attending lab.
6. Goggles/safety glasses are available and must be worn at all times in lab.
7. Wear disposable gloves at all times.
9. Do not pick up broken glass with your hands, use a dust pan and broom.
10. Clean your lab space and equipment before departing.
11. Please exit the lab when making personal calls or sending texts or email messages. Abuse of this rule will result in cell phones being banned from the lab. Smartphones may be used during the lab exercises as references, calculators and other similar tools.
12. While in lab, both students and instructors are required to wear face masks/appropriate PPE and maintain appropriate social distancing.
13. Thoroughly wash hands with soap prior to leaving the laboratory.

Academic Integrity:
Don’t cheat. Anyone caught cheating during a quiz, on a lab report, or on the group project will be given a failing grade on the exercise and is subject to further disciplinary action. This policy also includes any acts of plagiarism. If you do not understand this policy, please see your instructor. For more details on the University’s policy on academic integrity, see [http://admin.illinois.edu/policy/code/article1_part4_1-401.html](http://admin.illinois.edu/policy/code/article1_part4_1-401.html).
**Description of Course Modules:**

*Module I. Controlled release*
A model protein, bovine serum albumin (BSA), is encapsulated in a matrix of biodegradable poly(lactic-co-glycolic acid) (PLGA) through a double emulsion process. The encapsulation efficiency and drug loading of the resulting microspheres are evaluated. An in vitro controlled release study is subsequently performed, with data being collected throughout the semester.

*Module II. Natural biomaterials*
Collagen is extracted from bovine calf skin and purified. The dual nature of collagen as both a natural biomaterial and a protein are studied. Chitosan, another natural biomaterial, is used with collagen to form a collagen/chitosan composite material.

*Module V: Bioceramics*
Hydroxyapatite (HA) and fluoroapatite (FA) are synthesized. Porous composites of HA/FA and PLGA are fabricated and studied for their morphology, mechanical strength and degradability.

**COVID:**
Following University policy, all students are required to engage in appropriate behavior to protect the health and safety of the community, including wearing a facial covering properly, maintaining social distance (at least 6 feet from others at all times), disinfecting the immediate seating area, and using hand sanitizer. Students are also required to follow the campus COVID-19 testing protocol. Students who feel ill must not come to class. In addition, students who test positive for COVID-19 or have had an exposure that requires testing and/or quarantine must not attend class. The University will provide information to the instructor, in a manner that complies with privacy laws, about students in these latter categories. These students are judged to have excused absences for the class period and should contact the instructor via email about making up the work. Students who fail to abide by these rules will first be asked to comply; if they refuse, they will be required to leave the classroom immediately. If a student is asked to leave the classroom, the non-compliant student will be judged to have an unexcused absence and reported to the Office for Student Conflict Resolution for disciplinary action. Accumulation of non-compliance complaints against a student may result in dismissal from the University.

Other:
https://emails.illinois.edu/files/2056962258/gcoe_syllabusstatement_artf.pdf