COURSE DETAILS

Units of Credit: 6
Contact hours: 3 hours per week
Integrated Lecture and Tutorial: Weeks 1 to 10, Fridays, 10:00 - 13:00, Room, Tyree Energy Technology G16 (K-H6-G16)

Course Coordinator: Professor Melissa Knothe Tate, Inaugural Paul Trainor Chair of Biomedical Engineering
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Demonstrators:
Anton Nathanson
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INFORMATION ABOUT THE COURSE

Background

This course addresses the interlinked theme of engineering tissues, smart materials and devices by learning from Nature’s paradigms. The course goal is to use fundamentals of mechanics and strength of materials to understand the remarkable material and mechanical properties of biological materials. In addition, the course aims to develop the capacity to characterise, optimise and even create advanced functional materials using fundamental knowledge of strength of materials and by applying reverse engineering strategies for creation of nature inspired materials. Mechanical properties inherent to specific manufacturing methods will be addressed as well as materials different properties in in vivo and other environments. This course aims to provide students with a foundation, based on nature’s design and optimisation criteria for engineering tissues and smart materials, as well as to give students the opportunity to develop their engineering innovation capabilities through a class project.

Units of Credit: 6

BIOM9561 is a 6 Units of Credit (UOC) course. The course is organised as an interactive, "inverted" course. Hence, it is expected that students attend every class, as all assignments and assessments will take place in class. Reading and lecture materials will be provided at least one week prior to each class. You should spend several hours each week prior to class to prepare for class, by reading and studying these materials. This is particularly the case if you have not been engaged recently with the engineering concepts underpinning the course.
**Prerequisites and presumed knowledge**

Students taking this course should have had prior exposure to mechanics and strength of materials.

**How this course relates to other courses**

This course aligns well with all four broad categories of study and research in the Graduate School of Biomedical Engineering as well as different programs offered by the Schools of Mechanical Engineering, Materials Science, and Chemical Engineering. In particular, it complements courses of study integrating elements of biomaterials and tissue engineering, biomechanics, modeling and instrumentation, and medical technology. The course integrates concepts of engineering innovation and entrepreneurship, integrated within the scientific and engineering themes.

**HANDBOOK DESCRIPTION**

See link to virtual handbook:


**OBJECTIVES**

Course Objectives (C.O.):

1. to use fundamentals of mechanics and strength of materials to understand the remarkable material and mechanical properties of biological materials
2. to develop the capacity to characterise, optimise, and even create advanced functional materials using fundamental knowledge of strength of materials and reverse engineering strategies for engineering of biomaterials
3. to understand mechanical properties inherent to specific manufacturing methods
4. to understand effects of *in vivo* and other environments on mechanical properties
5. to develop your own engineering innovation capabilities

These objectives link to the following programme outcome attributes and the assessment strategies for the course:

Programme attributes' relationship to course objectives (C.O.):

- An in-depth engagement with the relevant disciplinary knowledge in its interdisciplinary context (C.O. 1-5, Assessments)
- Capacity for analytical and critical thinking (C.O. 1-4, Assessments)
- Capacity for creative problem solving (C.O. 5, Group assignment)
- Skills for collaborative and cross-disciplinary work (C.O. 5, Group assignment)
- Skills for effective communication (C.O. 5, Group assignment)

**TEACHING STRATEGIES**

Teaching strategies

As noted above, the course is organised as an interactive, “inverted” course. Hence, it is expected that **students attend every class, as all assignments and assessments will take place in class**. Reading and lecture materials will be provided at least one week prior to each class. You should spend several hours each week prior to class to prepare for class, by reading and studying these materials. This is particularly the case if you have not been engaged recently with the engineering concepts underpinning the course.

**Suggested approach to learning**

This course requires you to understand the lecture material and then apply the knowledge to scenarios using creative and analytical approaches. It is important to understand the fundamental concepts as soon as possible and to ask for help if you do not understand. Attend all the lectures and
if something is unclear, please ask questions. Make sure you review all the lecture notes and read all material that is suggested or handed out. Class participation through attendance at lectures and participation in class exercises and group work is expected.

The material is diverse and not as tightly linked into an overall analytical structure as might be the case in some other subjects. You will need to be prepared to assimilate facts relating to a large number of different materials and measurement principles. Emphasising principles and developing an intuitive understanding of the principles in different engineering scenarios is a the best strategy for success in the course.

Summary of the teaching strategies that will be used and their rationale, with suggested approaches to learning in the course

| Private study | Review lecture materials and reading provided  
| | Reflect on class problems and assignments  
| | Download reading materials from Moodle  
| | Keep up with notices and marks via Moodle |
| Class - integrated lectures and tutorials | Come to class on time  
| | Ask questions  
| | Follow worked examples  
| | Listen to announcements  
| | Be guided by tutorial demonstrators  
| | Work respectfully with your fellow students on tutorials  
| | Invest all of yourself in class to maximise your learning and contribution to others’ learning (phones and internet off, focus on learning class materials) |
| Assessments (tests, exams, assignments, reports, etc.) | Demonstrate your knowledge and skills (literacy)  
| | Demonstrate higher understanding and problem solving  
| | Demonstrate analytical thinking and critical analysis  
| | Demonstrate developing innovation skills |

**EXPECTED LEARNING OUTCOMES**

Expected learning outcomes, their association with the teaching strategies and with the suggested approaches to learning. Student-centred and self-directed learning (expectations of the students where relevant). For each hour of contact, it is expected that students will put in at least 1.5 hours of private study, i.e. 4.5 hours per week outside of class.

**ASSESSMENT**

Overall rationale for assessment components and their association with course objectives. The final mark for the course will be based

- 10% on participation in class  
- 25% on average score from the in class assessment tasks excluding the Final Group Project Presentation (if you do not attend class, your score for the corresponding class assessment will be 0)  
- 15% Group Project Presentation - in class  
- 20% on Mid-term Examination  
- 30% on Final Examination

A minimum of 80% attendance of of tutorials is required to pass the course.

A mark of at least 50% on the final examination is required to pass the class. The exam scripts will not be returned.
Students who perform poorly on assignments or exams are recommended to discuss progress and to get coaching from Prof Knothe Tate during the term.

**Overall rationale for assessment components and their association with course objectives**
The in class assessment tasks are designed to foster
- in depth engagement with the discipline as well as its relationship to other disciplines
- the capacity to practice and hone analytical and critical thinking as well as creative problem solving
- honing of skills for collaborative and multidisciplinary work and
- the development and refinement of skills for effective communication

The Mid-term and Final Examinations are designed to assess information literacy and the capacity for analytical and critical thinking as well as to demonstrate in-depth engagement and gaining of knowledge, both within and across disciplines.

Details of each assessment component, the marks assigned to it, the criteria by which marks will be assigned will be provided with each assessment, which will be completed individually and/or as part of a company (a group organised in company structure)

**Late submission - make up work - missed class policy**
All work will be completed and assessed in class. No late submissions will be accepted. Students will be given one "free pass" for missing class due to unforeseen circumstances including sickness. Make up work will not be possible due to the nature of the class.

### COURSE PROGRAM

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RELEVANT RESOURCES

Online course material can be accessed through Moodle, which is managed by the UNSW Technology Enabled Learning and Teaching unit: https://moodle.telt.unsw.edu.au. Once you are enrolled in the course, BIOM9561 will be visible to you after the session starts, when you log into Moodle using your zPass.

Group discussions, lecture notes and resource materials will be made available on this site during session. Announcements made on Moodle will be forwarded to your student email; you are required to check your student email frequently for updates.

Tutorial tasks and assessments will be paper based and provided and handed in in class.

COURSE EVALUATION AND DEVELOPMENT

Student feedback has helped to shape and develop this course, including feedback from online evaluations as part of UNSW’s Course Evaluation program. Changes to the course have resulted from changes in course coordination as well as the goal to include more innovation activities in the curriculum.

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:
https://my.unsw.edu.au/student/resources/KeyDates.html

PLAGIARISM

Beware! An assignment that includes plagiarised material will receive a 0% Fail, and students who plagiarise may fail the course. Students who plagiarise will have their names entered on plagiarism register and will be liable to disciplinary action, including exclusion from enrolment.

It is expected that all students must at all times submit their own work for assessment. Submitting the work or ideas of someone else without clearly acknowledging the source of borrowed material or ideas, is plagiarism.

All assessments which you hand in must have a Non Plagiarism Declaration Cover Sheet. This is for both individual and group work. Attach it to your assignment before submitting it to the Course Coordinator or at the School Office.

Plagiarism is the use of another person’s work or ideas as if they were your own. When it is necessary or desirable to use other people’s material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at: https://student.unsw.edu.au/plagiarism

ACADEMIC ADVICE

For information about:
- Notes on assessments and plagiarism,
- Special Considerations,
- School Student Ethics Officer, and
• BESS

Refer to the School website available at:
http://www.engineering.unsw.edu.au/biomedical-engineering/