In addition, the course aims to develop the capacity to characterise, optimise and even create advanced functional biomaterials by

- using fundamental knowledge of strength of materials to increase a depth and breadth of understanding of biological materials and biomaterials, their mechanical properties, and their potential change in properties when used in implantable and wearable human-based applications [*understanding and application of material covered in lectures and exams*],
- carrying out root cause analyses of device and material failures [*interactive activities and assessments in TUTORIAL SET 1*], and
- applying reverse engineering strategies for creation and application of nature inspired materials [*interactive activities and assessments in TUTORIAL SET 2*].

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 professional engineering practice and engineering innovation capabilities through two sets of multi-week class tutorial projects.

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 will prepare for class in advance and attend every online class session, as critical discussion of material, tutorials, and assessments will take place in**

TEACHING & LEARNING STRATEGIES

Teaching strategies
As noted above, the course is organised as an interactive, "inverted" course. Hence, it is expected that students attend and engage actively in every 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. Watch all the lectures prior to class and if something is unclear, please ask questions in class. 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 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	Watch lecture prior to class time Download reading materials from Moodle Review lecture materials and reading provided Reflect on class problems and assignments Carry out individual assignments and upload to Moodle prior to class. Keep up with notices and marks via Moodle
Class - integrated lectures and tutorials	Come to class on time Participate actively and ask questions Listen to others Work respectfully with your fellow students on tutorials Invest yourself in class to maximise your learning and contribution to others' learning (phones and internet off unless needed for class, focus on learning)
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 Demonstrate the capacity to present information in a way that experts from other disciplines can understand and evaluate your conclusions

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

Assessment Title: Blue Sky Device or Material Design Emulating a Smart Natural Material **Tutorial Unit 2 Assessment**	
Role(s)	**Investigator** - All students (individually) before class meets ***Start Up* Roles** **Manager –** Keeps the company team on target, addressing action items and milestones in a timely manner **Technical Researcher** Seeks out new information and references to cite in technical report **Recorder and Strategist** records notes of discussion and puts them together to make a strategy for pulling together and presenting the information **Producer** responsible for production of 5-minute presentation, to be handed in at the end of the 3rd week tutorial **Technical Report Editor** - responsible for organisation and editing of final technical report, to be handed in at the end of the 3rd week tutorial
Audience	The technical report and pitch deck are being prepared for your own *Start Up*, in preparation for the Angel Investors Conference at the end of class. Each of you will receive $50,000 Angel dollars and will have the opportunity to invest those dollars in the most promising start ups, from a technical and commercial perspective.
Format	Your *Start Up* will receive three dossiers (one each sequential week of tutorial). The dossier will contain **Description** of a natural material. **Dossier of d**

How Assessments will be marked

7	30/10/2020	4B - Biological threads (structural protein fibres) & their engineered equivalents (sutures, meshes)	MKT	**LECTURE SERIES 4B – BOTTOM UP APPROACHES** **Biomaterials Case studies**	COMPANIES mechanics of material assessment
8	06/11/2020	5A Mechanics of biological composites and their engineered biomaterial equivalents - subcell to cell to tissue scale	MKT	**LECTURE SERIES 5A – BOTTOM UP APPROACHES** **Biomaterials Composites & their engineered equivalents**	COMPANIES product brainstorming

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; remember to check your student email frequently for updates or, alternatively, have your unsw student email forwarded to your private email.

Tutorial tasks and assessments will be provided online and handed in online before the end of class.

COURSE EVALUATION AND DEVELOPMENT