COURSE DETAILS

Units of Credit 6
Contact hours 3 hours per week
Lecture Wednesday, 2:00 – 5:00pm  John Goodsell LG19
Laboratory Wednesday, 2:00 – 5:00pm  John Goodsell LG19
Course Coordinator Dr Jelena Rnjak-Kovacina
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Other Lecturers Dr Penny Martens
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Dr Robert Chapman
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Dr Brooke Farrugia
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INFORMATION ABOUT THE COURSE

This course is an introductory level offering in synthetic and biological polymer synthesis, characterisation and application. It is an elective course within the Master of Engineering Science and Master of Biomedical Engineering programs within Biomedical Engineering. Within the coursework Masters program, there are four main streams of study based on interest areas. BIOM9332 is recommended for three of the four streams. (http://www.engineering.unsw.edu.au/biomedical-engineering/postgraduate-coursework-programs-0). Students completing this course will be well prepared to undertake more advanced polymer courses within Chemical Engineering and Industrial Chemistry (eg. POLY3011, POLY3012) as well as graduate courses focused on aspects of biomedical materials performance; for example, Biocompatibility (BIOM9332) and Mechanical Properties of Biomaterials (BIOM9561). This course will also prepare students for conducting research projects in biomedical polymer development and characterisation.

HANDBOOK DESCRIPTION

See link to virtual handbook - for example, for BIOM9432, this would be:

OBJECTIVES

- To understand the chemical structures and physical properties of synthetic and biopolymers relevant to biomedical engineers.
- To understand the similarities in some of the physical measurements of synthetic and biopolymers relevant to biomedical applications.
- To understand biomedical applications of synthetic and biological polymers
TEACHING STRATEGIES

Each week there will be a three hour lecture. Various lecturers may incorporate small exercises, group discussions, or other methods to help facilitate student learning. The lectures are designed to provide students with the basic knowledge of the many topics covered in the class.

Suggested approach to learning

This course should not be a difficult subject; however this topic covers a range of learning areas, many of which may be outside of your normal area of study. It is extremely important to grasp the fundamental concepts as soon as possible and to ask for help if you do not understand.

Attend the lectures and if something is unclear, please ask questions.

Class participation through attendance, answering of questions and participation in class exercises is expected and will allow for alternate methods of absorbing the relevant information.

Review the lecture notes and read any other material that is distributed or suggested. There may be points in the lecture that were not clear. The suggested readings may help clarify points.

EXPECTED LEARNING OUTCOMES

Knowledge

On completion of this course, the student should be able to:

a. Describe the key steps in chain polymerization and step polymerization
b. Predict how representative biomedical polymers are synthesized
c. Explain how biological polymer synthesis is similar to synthetic polymer synthesis
d. Outline the molecular weight determination of polymers
e. Explain the different solid state properties of polymers
f. Describe the interaction between polymers and solvents
g. Explain the solution properties of different polymers
h. Provide several examples of polymer applications in biomedical engineering

Skills

On completion of this course, the student should be able to:

a. Critically review the literature and apply knowledge gained from the course to outline common polymer characterisation methods
b. Demonstrate practical understanding of natural and synthetic polymer synthesis and structure.
c. Describe how the morphology of a polymer in the solid state is influenced by the structure and the processing of the polymer
d. Compare the behaviour of different polymers in different solutions
e. Describe the influence of the structure of the polymer on solution and solid state properties
f. Clearly summarise and communicate findings from literature research using oral and written methods
g. Clearly communicate experimental findings in a scientific report format

These learning outcomes relate most strongly to the following UNSW graduate capabilities:

- capable of independent and collaborative enquiry
- capable of effective communication
- information literate
- digitally literate
- collaborative and effective team workers

They are also moderately related to the following UNSW graduate capabilities:

- understanding of their discipline in its interdisciplinary context
- rigorous in their analysis, critique and reflection
- able to apply their knowledge and skills to solving problems
- enterprising, innovative and creative
This course will be assessed by **Quizzes**, **Small presentations**, a **Group project involving a report and an oral presentation** and a **Final Theory Exam**. In general, marks are given for content, presentation, and proper referencing (where appropriate). Specific criteria for individual tasks will be supplied when the assessment task is handed out.

**Quizzes (20%)**
Two short answer/multiple choice Quizzes will be scheduled. Each quiz will be made up of 5-10 short answer and/or multiple choice questions in a similar format to that given in the final exam. This assessment is a direct measure of the knowledge based learning outcomes listed above. The aims of this assessment are to encourage student revision during the course, and to allow students to gauge their progress in different topics and receive feedback on that progress.

**Final Theory Exam (40%)**
The final exam may be made of any of the following: true/false, multiple choice, matching, short answer and an essay question. This assessment is a direct test of the degree to which the knowledge based learning outcomes listed above have been achieved. The aims of this assessment are to encourage students to review the entire course, and to allow students to apply all of the knowledge disseminated to solve problems.

**“5-minute” presentations (5%)**
The purpose of the “5 minute” presentation is to provide an interactive break during the middle of class which expands on the knowledge given in the lectures. The presentation should be related to a polymer characterisation technique. Students are encouraged to use powerpoint slides, or other visual aids. Students should provide a one-page summary of their presentation. Marks will be given for content of presentation and summary, as well as presentation skills. Students will work in groups of 2 or 3. Class periods for presentation will be assigned in week 2.

**Group Project (25%)**
The objectives of the group project are to consolidate and expand on information learned in class and to develop literature research skills. Specific literature research skills developed and reinforced are critical review of the medical, scientific and engineering literature, written communication of literature research, application of knowledge from literature and course materials. This assessment is a direct measure of the degree to which the skills bases learning outcomes listed above have been achieved.

**Report (15%), Presentation (10%)**
Topic, report and presentation details will be provided in class.
Groups will give a presentation on their reports in week 12. Individual marks will be given for the presentations.
Topic selections for the group project are due in class, week 4.

**Lab Report (10%)**
Students will undertake a practical lab. Students will need to collect, analyse, and present their data in the report. In addition, the data will need to be compared back to scientific literature to demonstrate the relevance. More details will be provided in class.
This assessment will allow students to practically apply some of the knowledge gained in earlier lectures.
# COURSE PROGRAM

**Session 2 2016**  
*Wednesdays 2pm to 5pm, John Goodsell LG19*

<table>
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<tr>
<th>Week</th>
<th>Date</th>
<th>Topics</th>
<th>Lecturer</th>
<th>Assessment Task</th>
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| 1    | 27<sup>th</sup> July | Course Introduction  
Lecture – Intro to Polymers | JRK      |                                  |
| 2    | 3<sup>rd</sup> Aug  | Lecture – Synthetic Polymer Chemistry 1     | PM       |                                  |
| 3    | 10<sup>th</sup> Aug | Lecture – Synthetic Polymer Chemistry 2     | PM       |                                  |
| 4    | 17<sup>th</sup> Aug | Lecture – Biological Polymers 1             | JRK      | Project Proposals  
5minute Presentations |
| 5    | 24<sup>th</sup> Aug | Lecture – Biological Polymers 2             | JRK      | 2 x 5minute Presentations        |
| 6    | 31<sup>st</sup> Sept | Journal club                               | JRK      | Quiz 1  
5minute Presentations            |
| 7    | 7<sup>th</sup> Sept | Lecture - Polymer physics 1                 | RC       | 5minute Presentations            |
| 8    | 14<sup>th</sup> Sept | Lecture - Polymer physics 2                 | RC       | 2 x 5minute Presentations        |
| 9    | 21<sup>st</sup> Sept | Lab – Biopolymers                           | JRK      |                                  |
| 28<sup>th</sup> Sept | Mid-semester break                         |          |                                  |
| 10   | 5<sup>th</sup> Oct  | Lecture – Polymer degradation                | BF       | 5minute Presentations            |
| 11   | 12<sup>th</sup> Oct | Lecture – Polymer processing                | BF       | Lab report Due  
Quiz 2  
5minute Presentations |
| 12   | 19<sup>th</sup> Oct | Group Presentations                         | JRK      | Presentations, Report Due       |

**EXAM**  
Final Exam during Examination period

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**Course Coordinator:** Dr Jelena Rnjak-Kovacina (JRK), j.rnjak-kovacina@unsw.edu.au

**Other Lecturers:** Dr Penny Martens (PM), p.martens@unsw.edu.au, Dr Robert Chapman (RC), r.chapman@unsw.edu.au, Dr Brooke Farrugia (BF), b.farrugia@unsw.edu.au

**Venue:** John Goodsell LG19  
**Time:** 2pm-5pm, Wednesdays.

**Assessment:**  
- Quizzes 20%  
- “5-minute” Presentations 5%  
- Group Project 25% (15% Report, 10% Presentation)  
- Lab Report 10%  
- Theory Examination 40%
**RELEVANT RESOURCES**

Moodle is the main resource for this class. [http://moodle.telt.unsw.edu.au/my/](http://moodle.telt.unsw.edu.au/my/)

Many of the lecture notes will be provided on this website, as well as other references and information. You should check Moodle regularly. Any announcements or other important information for the class will be posted here. Marks will also be made available on Moodle.

The **suggested text** for the course is available from the UNSW Bookshop and there are some copies held in the UNSW library:


The area is very broad and this book is to be treated as an introduction and a guide to further and more detailed reading in each area available at the UNSW library.

Suggested additional reading, in addition to the following, will be provided in lectures.

- *Fundamentals of Biochemistry: Life at the Molecular Level*, Voet, Wiley
- *Textbook of Polymer Science*, Billmeyer, F W 3rd Ed, Wiley
- *Principles of Polymer Systems*, Rodriguez, F, 3rd Ed., hpc
- *Plastics Materials*, Brydson, J A, 5,6 or 7th Ed, Butterworths
- *Introduction to Physical Polymer Science*, Sperling, L H, 2nd Ed, Wiley

**Internet resources**

Glycoforum

Macrogalleria (Cyber Wonderland of Polymer Fun)
[http://www.pslc.ws/macrog.htm](http://www.pslc.ws/macrog.htm)

Students seeking resources can also obtain assistance from the UNSW Library. One starting point for assistance is: [http://www.library.unsw.edu.au/](http://www.library.unsw.edu.au/)

**COURSE EVALUATION AND DEVELOPMENT**

Student feedback has helped to shape and develop this course, including feedback obtained from on-line evaluations as part of UNSW’s Course and Teaching Evaluation and Improvement (CATEI) process. The major student comments for improvement involved feedback, assessments and lecture structure. As such, labs and a lab report have been introduced which will provide another source of feedback for the students, as well as the chance to practically apply their knowledge.

**DATES TO NOTE**

Refer to MyUNSW for Important Dates available at: [https://my.unsw.edu.au/student/resources/KeyDates.html](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/biological-engineering/