UNSW SYDNEY

FACULTY OF SCIENCE

THE SCHOOL of BIOTECHNOLOGY and BIOMOLECULAR SCIENCES

BABS3281

MOLECULAR FRONTIERS

TERM 3, 2020

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Faculty of Science -- Course Outline

1 Information about the Course

NB: Some of this information is available on the UNSW Handbook[1]

Year of Delivery	2020
Course Code	BABS3281
Course Name	Molecular Frontiers
Academic Unit	School of Biotechnology and Biomolecular Sciences (BABS)
Level of Course	3rd UG
Units of Credit	6 UOC
Session(s) Offered	T3
Prerequisites	BIOC2201
Number of Weeks	10 weeks
Commencement Date	Monday 14 Sep 2020

Summary of Course Structure (for details see 'Course Schedule')

Component	HPW	Time	Day	Location
Lecture 1	1	4-5 pm	Monday	Online (Blackboard Collaborate)
Lecture 2	1	5-6 pm	Tuesday	Online (Blackboard Collaborate)
Lecture 3	1	5-6 pm	Friday	Online (Blackboard Collaborate)
Practical/Computer Lab	2	1-3 pm	Thursday	Online (MS Teams)

Special Details	Any students with special requirements resulting from a disability should consult the course convenor by week 2 of Term 3 so that the appropriate resources can be provided. Please refer to detailed Course Schedule, on page 5 of this Manual, for allocation of practical and computer practicals in weeks 8 and 9.

2 Staff involved in the Course

Staff	Role	Name	Contact Details
Course Convenor		Dr Michael Janitz	m.janitz@unsw.edu.au
Additional Teaching Staff	Lecturers	Prof Andrew Brown Prof Robert Brink Prof Marc Wilkins A/Prof Ruiting Lan A/Prof Louise Lutze-Mann A/Prof Vladimir Sytnyk Dr Richard Edwards Dr Jai Tree	Please contact Michael Janitz for details.
	Technical Staff	Dr Elessa Marendy Dr Gee Chong Ling	
	Demonstrators	Ashton Curry-Hyde Isidora Simovic Lachlan Gray Ryan Keable	

[1] http://www.handbook.unsw.edu.au

3 Course details

Course Description[2]	This course focuses on molecular biology techniques commonly used in biomedical research. Using examples of the research performed in the School of BABS students will gain a practical experience with Western blotting, reverse transcription quantitative PCR, RNA interference, mammalian cell culture, DNA transfection, confocal microscopy, second and third generation sequencing, as well as statistical analysis, including bioinformatics of large data sets. The practical laboratory sessions will be supported by lectures presenting examples of biomedical research in the field of cholesterol metabolism, genomic surveillance, protein methylation and long non-coding RNA expression. This course is an excellent opportunity for students to acquire skills essential for successful completion of an Honours project.
Course Aims[3]	This course will provide an introduction to the key molecular experimental techniques applied to biomedical research. This course also aims at developing the experimental proficiency of undergraduate students who will enter the biomedical research field, or related fields, which also utilise similar experimental techniques.
Student Learning Outcomes[4]	By the end of this course you will be able to understand principles of modern molecular biology techniques and apply these methods in biomedical research. This will also include gaining experience in human cell culture, RNA interference, human cells transfection, DNA and RNA isolation, reverse transcriptase quantitative PCR, Western blotting, preparation of cells for microscopy and analysis of Illumina and nanopore DNA sequencing data. Further, you will become familiar with and be able to critically discuss current topics in molecular genetics including the biology of long non-coding RNAs, genome editing, post-translational protein modifications and genomic surveillance. Together, this course will provide you with the knowledge and practical skills essential for successful completion of an Honours project.

Graduate Attributes Developed in this Course[5]

Science Graduate Attributes[5]	**Select the level of FOCUS** *0 = NO FOCUS* *1 = MINIMAL* *2 = MINOR* *3 = MAJOR*	**Activities / Assessment**
Research, inquiry and analytical thinking abilities	3	Laboratory report, in-lecture presentation, participation in virtual laboratory activities.
Capability and motivation for intellectual development	2	Computer and virtual laboratory practicals, written reports.
Ethical, social and professional understanding	1	Lecture content in the context of accessibility to personal genomic information.
Communication	3	Working in team during laboratory activities, written reports, presentation of selected laboratory project topic.
Teamwork, collaborative and management skills	3	Working in team during laboratory activities and sharing records of experimental results.
Information literacy	3	Literature search for assessment tasks, development of skills in using web-based analytical tools for processing and interpretation of large biological data sets.

[2] http://www.handbook.unsw.edu.au
[3] https://student.unsw.edu.au/course-outlines
[4] https://teaching.unsw.edu.au/learning-outcomes
[5] https://www.science.unsw.edu.au/our-faculty/science-graduate-attributes

Major Topics (Syllabus Outline)	The course syllabus covers exploration of research topics in two biological systems including yeast and human cells. Students will learn conceptual frameworks and experimental approaches in molecular biology using, as examples, research projects performed by academic groups in the School of Biotechnology and Biomolecular Sciences (BABS). Specific topics comprise: • The role of protein modifications in regulation of cholesterol synthesis • Methyltransferases as modifiers of the proteome • Identification of viral DNA in real time towards monitoring of disease outbreaks • Identification of breast cancer-specific genes using nanopore direct RNA sequencing • Determination of cell type-specific expression of long non-coding RNA
Relationship to Other Courses within the Program	The course syllabus builds on students' prior knowledge and skills gained in the coursework offered by School of BABS, in particular 'Principles of Molecular Biology (Advanced)' (BIOC2201). The course is also highly recommended for students wishing to pursue an Honours project within the School of BABS programs in genetics, molecular and cell biology and microbiology.

4 Rationale and strategies underpinning the course

Teaching Strategies	The underpinning concept of this course is the implementation of elements of research projects, performed in the School of BABS, into 3rd year undergraduate science teaching. Lecture content is structured into two major components (i) scientific rationale behind the research projects, and (ii) description and application of experimental methodology to achieve research objectives for each project. Moreover, external lecturers from academia, who are leaders in their respective fields, will outline the application of methods covered in the course in the broader context of biomedical research. Virtual laboratory activities are organised to provide students with experience of real research practice. Computer laboratory sessions aim to develop analytical and interpretation skills for various types of experimental data. Assessment structure is constructively aligned to the lecture content and practical teaching components.
Rationale for learning and teaching in this course	The teaching strategies and activities of this course aim to develop graduate attributes of the Faculty of Science, UNSW, including demonstration of knowledge of research principles, as well as methods and technical skills in research and experimental design. Additionally, the course covers the demonstration of a broad understanding of a systematic and coherent body of knowledge and theoretical concepts in cell metabolism, genome engineering, transcriptomics and proteomics. The learning outcomes of this course create an essential foundation of skills for the successful completion of an Honours or postgraduate degree in research.

5 Course schedule

Week	Online lectures (Blackboard Collaborate), selected online practicals* (MS Teams)	Selected online practicals* (MS Teams)	Assignment and submission dates
Week 1	**Mon 14 Sep, 4-5 pm**: Course introduction: aims, structure, assessment (MJ) **Tue 15 Sep, 5-6 pm**: Genomic engineering using CRISPR/ Cas9 technology (RB) **Fri 18 Sep, 5-6 pm**: Analysis of next-generation sequencing data (MJ)		
Week 2	**Mon 21 Sep, 4-5 pm**: Principles of nanopore sequencing (MJ) **Tue 22 Sep, 5-6 pm**: Post-translational protein modifications (MW) **Fri 25 Sep, 5-6 pm**: Investigation of protein methylation in a yeast model (MW)	**Thu 24 Sep (1-4 pm)** Data analysis part 1 – Project A (VS)	
Week 3	**Mon 28 Sep, 4-5 pm**: Intracellular protein localization in living cells (VS) **Tue 29 Sep, 5-6 pm**: Methods for genomic surveillance of bacterial outbreaks (RL) **Fri 2 Oct, 5-6 pm**: Human transcriptome sequencing in biomedical research (MJ)	**Thu 1 Oct (1-4 pm)**: Project A – practical part 1	
Week 4	**Mon 5 Oct, 4-5 pm**: NO LECTURE (public holiday) **Tue 6 Oct, 5-6 pm**: Transcriptional regulation of bacterial virulence (JT) **Fri 9 Oct, 5-6 pm**: Protein analysis in neurobiology (VS)	**Thu 8 Oct (1-4 pm)**: Project A – practical part 2	**Fri 9 Oct**: Submission of PowerPoint presentation on E3 ligase (Moodle)
Week 5	**Mon 12 Oct, 4-5 pm**: Circular RNAs (MJ) **Tue 13 Oct, 5-6 pm**: Gene therapy (LLM) **Fri 16 Oct, 5-6 pm**: NO LECTURE; Mid-session exam (on Moodle)	**Thu 15 Oct (1-4 pm)**: Project C – practical part 1	**Fri 16 Oct (4-6pm):** Mid-session exam (on Moodle)
Week 6	NO LECTURES	NO PRACTICAL	
Week 7	**Mon 26 Oct, 4-5 pm**: The UPS and downs of protein regulation (AB) **Tue 27 Oct, 5-6 pm**: Methods investigating an E3 ubiquitin ligase in protein regulation (AB) **Fri 30 Oct, 5-6 pm**: Data analysis and statistics 1 (RE)	**Thu 29 Oct (1-4 pm)**: Protein C – practical part 2	
Week 8	**Mon 2 Nov, 4-5 pm**: Data analysis and statistics 2 (RE) **Tue 3 Nov, 5-6 pm**: *Online practical*: Project B – part 1 **Fri 6 Nov, 5-6 pm**: *Online practical:* Project B – part 2	**Thu 5 Nov (1-4 pm)**: Data analysis part 2 – Project A (VS)	
Week 9	**Mon 9 Nov, 4-5 pm**: *Online practical*: Project D - part 1 **Tue 10 Nov, 5-6 pm**: *Online practical*: Project D - part 2 **Fri 13 Nov, 5-6 pm**: Concluding remarks (MJ)	**Thu 12 Nov (1-4 pm)** Data analysis – Project C (MW)	
Week 10	NO LECTURES		**Fri 20 Nov:** Submission of OneNote laboratory records (MS Teams)

Lecturers: AB – Andrew Brown; JT - Jai Tree; LLM – Louise Lutze-Mann; MJ – Michael Janitz; MW – Marc Wilkins; RB – Robert Brink; RE – Richard Edwards; RL - Ruiting Lan; VS – Vladimir Sytnyk

*See sections 13 and 14 of the course manual for more detailed description.

6 Assessment tasks and feedback

Task	When and Where	Brief Description	% of total mark	Date of Submission
Selected topic presentation	Weeks 1-4	Prepare 3-4 slides presentation on selected E3 ligase.	10	Week 4
Mid-session exam	Week 5, Fri, 16 Oct 2020	The exam will cover all lecture material covered in weeks 1-4.	25	--
Practical Course	Weeks 2-9	Completion (in week 8) of the bioinformatics quiz (10% of the mark) as well as a practical report (90% of the mark) on OneNote used throughout the wet lab practical (in week 10).	40	Weeks 8 & 10
Final Exam	In T3 exam period	The exam will cover the lecture content given in weeks 5-8.	25	--

7 Additional resources and support

Textooks	Each module presented in this course is based on recent research being done at UNSW. Additional materials or links to scientific literature will be provided by individual lecturers. Revision of the general principles of biochemistry and molecular biology from second year courses may be useful.
Course Manual	A soft copy will be posted on Moodle and on MS Teams.
Recommended Internet Sites	PubMed is a very useful way to access peer-reviewed scientific literature http://www.ncbi.nlm.nih.gov/pubmed Galaxy is an open, web-based platform for data intensive biomedical research https://usegalaxy.org/ Ensembl is a genome browser for vertebrate genomes that supports research in genomics http://www.ensembl.org/index.html

8 Required equipment, training and enabling skills

Equipment Required	Personal protection equipment (PPE) such as safety glasses, lab coat, and enclosed shoes will be required for all laboratory classes held in teaching labs (including any computer practical sessions).
Enabling Skills Training Required to Complete this Course	It is expected that all students will have had a basic Health & Safety training and completed a safety quiz on Moodle prior to the first laboratory class (including any computer practical sessions) of Term 3.

9 Administration matters

Expectations of Students	We strongly encourage students to attend all lectures as they cover examinable theoretical material, as well as providing a backdrop for the practical component of this course. To pass the course, it is compulsory attendance for all computer practicals and wet-laboratory practicals.
Assignment Submissions	All written work must be submitted online to Moodle course site by 4:30 pm on the due date. There is no need for hardcopy submission of assignment to the BSB Student Office. If your work is submitted after a specified submission deadline, penalty of 10% per day of the total mark will be given. If medical grounds preclude the submission of a report by the due date, contact should be made with the course authority as soon as possible. A medical certificate will be required for late submission on medical grounds.

Assessment Procedures **UNSW Assessment Policy[6]**	Please refer to the specific assessment outline in section 6.		
Equity and Diversity	Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course Convenor prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (9385 4734 or http://www.studentequity.unsw.edu.au/) Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.		
Student Complaint Procedure[7]	**School Contact**	**Faculty Contact**	**University Contact**
	A/Prof Noel Whitaker Director of Teaching n.whitaker@unsw.edu.au	A/Prof Janelle Wheat Deputy Dean (Education) j.wheat@unsw.edu.au Tel: 9385 6792	Student Conduct and Appeals Officer (SCAO) Telephone 02 9385 8515 studentcomplaints@unsw.edu.au University Counselling and Psychological Services[8] Tel: 9385 5418

[6] https://www.gs.unsw.edu.au/policy/assessmentpolicy.html
[7] https://student.unsw.edu.au/complaint
[8] https://www.counselling.unsw.edu.au/

10 UNSW academic honesty and plagiarism

Plagiarism Policy

1. Introduction and definition of plagiarism

UNSW is committed to improving and transforming lives through excellence in research, outstanding education and advancing a just society. Underpinning this commitment and the pursuit of knowledge at the University are the principles of academic and research integrity.

Plagiarism involves a person using words or ideas of others and passing them off as their own[1] or republishing their own previously submitted work and presenting it as new findings or work without referencing the earlier work. It undermines academic and research integrity and is not tolerated at the University.

2. Types of plagiarism

Plagiarism includes:

Type	Description
Copying	Using the same or very similar text or idea to the original text or idea without appropriately acknowledging the source or using quotation marks. This includes copying materials, ideas or concepts from a book, article, report or other written document, presentation, composition, artwork, design, drawing, circuitry, computer program or software, website, internet, other electronic resource, or another person's assignment, without appropriate acknowledgement. This can also include combining cited and non-cited (copied) passages.
Inappropriate paraphrasing	Changing a few words and phrases while mostly retaining the original structure and/or progression of ideas of the original information without acknowledgement. This also applies in presentations where someone paraphrases another's ideas or words without credit and to piecing together quotes and paraphrases into a new whole, without appropriate referencing.
Collusion	Presenting work as independent work when it has been prepared in whole or part in through unauthorised collaboration with other people. This includes students providing their submitted work to another student for the purpose of them plagiarising, stealing or acquiring another person's academic work and copying it, offering to complete another person's work or seeking or receiving payment for completing academic work. This should not be confused with academic collaboration.

[1] Based on the definition developed for the University of Newcastle by the St James Ethics Centre and used with permission from the University of Newcastle

Contract cheating	Contract cheating is also known as engaging in 'ghost-writing'. It is a form of collusion. When a student or researcher engages another person to complete work for them and then submits the work as their own. This includes circumstances where a student or researcher submits work they may have edited which was substantially the work of another person, or where a student or researcher prepares a draft that is substantially modified by another (beyond minor editing).
Inappropriate citation	Citing sources which have not been read, not acknowledging the 'secondary' source from which knowledge of them has been obtained. This may include fabricating citations, or inaccurately citing sources which goes beyond typographical errors.
Self-plagiarism	An author republishing their own previously submitted work and presenting it as new findings or work without referencing the earlier work, either in its entirety or partially. Self-plagiarism is also referred to as 'recycling', 'duplication', or 'multiple submissions of research findings' without disclosure. In the student or researcher context, self-plagiarism includes re-using parts, or all of a body of work that has already been submitted for assessment without proper citation.[2] Where a student is repeating a course, they should seek permission from the course coordinator before re-submitting, in whole or part, the same piece of assessment.

3. Plagiarism Management Framework

The University manages plagiarism through a framework of Codes of Conduct, Policies and Procedures set out in the Supporting Information section of this Policy. An illustration of their relationship and application at UNSW found out in the Appendix.

4. Roles & responsibilities

All UNSW staff and students are responsible for adhering to the principles of academic and research integrity.

Roles and responsibilities of staff, researchers and students in maintaining and managing academic and research integrity are set out in the respective Codes of Conduct, Policy and Procedures within the Plagiarism Management Framework.

5. Communication

Staff, researchers and students will be advised about the relevant Codes of Conduct, Procedures and respective Guidelines through email, websites and publications, formal and informal training, and the ELISE online induction module and quiz on Moodle.

6. Further information and advice

Students
Guidance for students on avoiding plagiarism and getting academic skills support are available at the UNSW Current Students website.

ELISE online induction module for all undergraduate and postgraduate coursework students.

The Learning Centre
W: http://www.lc.unsw.edu.au/
E: learningcentre@unsw.edu.au
T: (02) 9385 2060

Student Conduct and Integrity Unit
E: studentconduct@unsw.edu.au.
T: (02) 9385 8515

[2] Source: M. Roig, *Avoiding Plagiarism, Self-plagiarism, and Other Questionable Writing Practices: A Guide to Ethical Writing*, The Office of Research Integrity at https://ori.hhs.gov/content/avoiding-plagiarism-self-plagiarism-and-other-questionable-writing-practices-guide-ethical-writing [accessed 24 July 2019].

11 Special consideration and further assessment

Special Consideration

Students who believe that their performance, either during the session or in the end of session exams, may have been affected by illness or other circumstances may apply for special consideration. Applications can be made for compulsory class absences such as (laboratories and tutorials), in-session assessments tasks, and final examinations.

You must submit the application prior to the start of the relevant exam, or before a piece of assessment is due, except where illness or misadventure prevent you from doing so. If you become unwell on the day of the exam or fall sick during an exam, you must provide evidence dated within 24 hours of the exam, with your application.

UNSW has a fit to sit/submit rule which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so.

You must obtain and attach Third Party documentation before submitting the application. Failure to do so may result in the application being rejected.

Further information on special consideration can also be found at:
https://student.unsw.edu.au/special-consideration

HOW TO APPLY FOR SPECIAL CONSIDERATION

The application must be made through Online Services in myUNSW (My Student Profile tab > My Student Services > Online Services > Special Consideration).

Students will be contacted via *their official university email* as to the outcome of their application.

SUPPLEMENTARY EXAMINATIONS:

The University does not give deferred examinations. However, further assessment exams may be given to those students who were absent from the final exams through illness or misadventure and received Special Consideration approval. Mid-term supplementary exam will be held during the term at the convenient period determined by the course convenor. Final supplementary exam will be run by The Exam Office and in supplementary exam period.

For Term 3 2020, Supplementary Exams will be scheduled between Monday 11 Jan – Friday 15 Jan, 2021

It is the responsibility of all students to regularly consult their official student email accounts and myUNSW in order to ascertain whether or not they have been granted further assessment. Failure to sit the appropriate exam may result in an overall failure for the course. Further assessment will NOT be offered on any alternative dates.