UNSW Course Outline

BABS3281 Molecular Frontiers - 2024

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General Course Information

Course Code : BABS3281
Year : 2024
Term : Term 3
Teaching Period : T3
Is a multi-term course? : No
Faculty : Faculty of Science
Academic Unit : School of Biotechnology and Biomolecular Sciences
Delivery Mode : Multimodal
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This course focuses on molecular biology techniques commonly used in biomedical research. Using examples from research performed in the School of BABS, students will gain practical experience in a variety of experimental methods including cell culture, RNA interference, second

and third generation sequencing technologies, and statistical data analysis. The practical laboratory sessions will be supported by lectures that will introduce students to the latest technologies and methodologies in a variety of fields in biomedical sciences and present examples of how these are applied in research. This course is an excellent opportunity for students to acquire skills essential for successful completion of an Honours project in the molecular biology sciences.

Course Aims

This course will provide a theoretical and practical 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.

Relationship to Other Courses

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.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Describe key molecular biology techniques commonly used in biomedical research and the relevant theoretical concepts.
CLO2 : Critically interpret and evaluate experimental methods and findings in biomedical research and communicate them in written and verbal formats.
CLO3 : Design and/or evaluate experimental techniques and data analysis methods, currently applied in molecular biology and genetics, to address specific biological questions.
CLO4 : Conduct experiments safely and effectively while engaging with best practices in data collection and record keeping.
CLO5 : Apply appropriate bioinformatic and statistical methods to analyse and evaluate experimental data and critically interpret the results.

Course Learning Outcomes	Assessment Item
CLO1 : Describe key molecular biology techniques commonly used in biomedical research and the relevant theoretical concepts.	• Final Exam • Presentation • Mid-Term Test
CLO2 : Critically interpret and evaluate experimental methods and findings in biomedical research and communicate them in written and verbal formats.	• Practical Work • Final Exam • Presentation • Mid-Term Test
CLO3 : Design and/or evaluate experimental techniques and data analysis methods, currently applied in molecular biology and genetics, to address specific biological questions.	• Practical Work • Final Exam • Mid-Term Test
CLO4 : Conduct experiments safely and effectively while engaging with best practices in data collection and record keeping.	• Practical Work
CLO5 : Apply appropriate bioinformatic and statistical methods to analyse and evaluate experimental data and critically interpret the results.	• Practical Work

Learning and Teaching Technologies

Moodle - Learning Management System | Microsoft Teams

Learning and Teaching in this course

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. 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.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Final Exam Assessment Format: Individual	25%	Due Date: Not Applicable
Presentation Assessment Format: Individual	10%	Start Date: Not Applicable Due Date: 04/10/2024 12:00 AM
Practical Work Assessment Format: Individual Short Extension: Yes (7 days)	40%	Start Date: Not Applicable Due Date: 15/11/2024 12:00 AM
Mid-Term Test Assessment Format: Individual	25%	Start Date: Not Applicable Due Date: Not Applicable

Assessment Details

Final Exam

Assessment Overview

This examination is designed to assess your knowledge of the material presented in lectures and practical sessions from Weeks 5-9 inclusive. The exam is 2 hours in duration and is scheduled during the formal examination period. The exam will be in-person, invigilated, and conducted through an online safe exam browser. The exam typically consists of essay-type questions. Additional information will be provided during the course. Feedback is available through inquiry with the course convenor.

Course Learning Outcomes

- CLO1 : Describe key molecular biology techniques commonly used in biomedical research and the relevant theoretical concepts.
- CLO2 : Critically interpret and evaluate experimental methods and findings in biomedical research and communicate them in written and verbal formats.
- CLO3 : Design and/or evaluate experimental techniques and data analysis methods, currently

applied in molecular biology and genetics, to address specific biological questions.

Assessment Length

2 hours

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.
For more information on Generative AI and permitted use please see here.

Presentation

Assessment Overview

For this assessment task, you will need to choose one human E3 ligase enzyme and prepare an infographic along with an audio presentation which is due in Week 4. This task is designed to assess your ability to find and interpret published literature on experimental findings and communicate to a scientific audience. Additional information will be provided on Moodle. Mark and feedback will be provided within 10 working days from the due date.

Course Learning Outcomes

- CLO1 : Describe key molecular biology techniques commonly used in biomedical research and the relevant theoretical concepts.
- CLO2 : Critically interpret and evaluate experimental methods and findings in biomedical research and communicate them in written and verbal formats.

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see here.

Practical Work

Assessment Overview

The practical component of the course consists of four separate projects that will introduce you to experimental and data analysis methods currently used in biomedical research. You will need to maintain an electronic lab notebook for record-keeping throughout the term. At the end of each project, you will need to prepare a comprehensive lab report including a brief introduction to the project, materials and methods used, a summary of your results, and a discussion of your observations. All four lab reports are due in Week 10. Details will be confirmed during the course. The lab reports should be submitted individually. You will have the opportunity to discuss and receive feedback on your work from the convenor and your demonstrators during the practical classes. Results will be released within 10 working days of submission.

Course Learning Outcomes

- CLO2 : Critically interpret and evaluate experimental methods and findings in biomedical research and communicate them in written and verbal formats.
- CLO3 : Design and/or evaluate experimental techniques and data analysis methods, currently applied in molecular biology and genetics, to address specific biological questions.
- CLO4 : Conduct experiments safely and effectively while engaging with best practices in data collection and record keeping.
- CLO5 : Apply appropriate bioinformatic and statistical methods to analyse and evaluate experimental data and critically interpret the results.

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

Simple Editing Assistance

In completing this assessment, you are permitted to use standard editing and referencing functions in the software you use to complete your assessment. These functions are described below. You must not use any functions that generate or paraphrase passages of text or other media, whether based on your own work or not.
If your Convenor has concerns that your submission contains passages of AI-generated text or media, you may be asked to account for your work. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.
For more information on Generative AI and permitted use please see here.

Mid-Term Test

Assessment Overview

This test is designed to assess your knowledge of the material presented in lectures and practical sessions from Weeks 1-4 inclusive. The test is 2 hours in duration and is scheduled in Week 5. The test will be in-person, invigilated, and conducted through an online safe exam browser. The test typically consists of essay-type questions. Details will be confirmed during the course. Mark/grade, along with generalised class feedback will be provided 10 working days after the test.

Course Learning Outcomes

- CLO1 : Describe key molecular biology techniques commonly used in biomedical research and the relevant theoretical concepts.
- CLO2 : Critically interpret and evaluate experimental methods and findings in biomedical research and communicate them in written and verbal formats.
- CLO3 : Design and/or evaluate experimental techniques and data analysis methods, currently applied in molecular biology and genetics, to address specific biological questions.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.
For more information on Generative AI and permitted use please see here.

General Assessment Information

Grading Basis

Standard

Requirements to pass course

To pass the course, compulsory attendance for all data analysis practicals and lab practicals on Thursdays 2pm - 6pm in weeks 1-5 and 7-9 is required.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 9 September - 15 September	Lecture	Tue 10 Sep, 9-10 am: Course introduction: aims, structure, assessment (Michael Janitz) Wed 11 Sep, 4-5 pm: Genomic engineering using CRISPR/ Cas9 technology (David Zahra) Fri 13 Sep, 1-2 pm: Intracellular protein localization in living cells (Vladimir Sytnyk)
	Laboratory	Thu 12 Sep, 2-6 pm (Lab 10, D26) Project A – Fluorescence data analysis part 1 (Vladimir Sytnyk)
Week 2 : 16 September - 22 September	Lecture	Tue 17 Sep, 9-10 am: Principles of nanopore sequencing (Michael Janitz) Wed 18 Sep, 4-5 pm: Methods for genomic surveillance of bacterial outbreaks (Ruiting Lan) Fri 20 Sep, 1-2 pm: Data analysis and statistics 1 (Fatemeh Vafaee)
	Laboratory	Thu 19 Sep, 2-6 pm (Lab 10, D26) Project A – Practical part 1
Week 3 : 23 September - 29 September	Lecture	Tue 24 Sep, 9-10 am: Analysis of Illumina sequencing data (Michael Janitz) Wed 25 Sep, 4-5 pm: NO LECTURE Fri 27 Sep, 1-2 pm: Data analysis and statistics 2 (Fatemeh Vafaee)
	Laboratory	Thu 26 Sep, 2-6 pm (Lab 10, D26) Project A – Practical part 2 Project B – Practical part 1
Week 4 : 30 September - 6 October	Lecture	Tue 1 Oct, 9-10 am: Circular RNAs (Michael Janitz) Wed 2 Oct, 4-5 pm: Post-translational protein modifications (Marc Wilkins) Fri 4 Oct, 1-2 pm: Investigation of protein methylation in a yeast model (Marc Wilkins)
	Laboratory	Thu 3 Oct, 2-6 pm (Lab 10, D26) Project A – Practical part 3 and fluorescence data analysis part 2
	Assessment	Fri 4 Oct, 5pm Submission of graphical abstract on E3 ligase (on Moodle)
Week 5 : 7 October - 13 October	Lecture	Tue 8 Oct, 9-10 am: NO LECTURE Fri 11 Oct, 1-2 pm: RNA-based regulation of bacterial virulence (Jai Tree)
	Laboratory	Thu 3 Oct, 2-6 pm (Lab 10, D26) Project A – Practical part 3 and fluorescence data analysis part 2
	Assessment	Wed 9 Oct, 3-5 pm Mid-session exam (on campus, Mathews 307)
Week 7 : 21 October - 27 October	Lecture	Tue 22 Oct, 9-10 am: Human transcriptome sequencing in biomedical research (Michael Janitz) Wed 23 Oct, 4-5 pm: Organoids technology (Natalia Castano Rodriguez, lecture recording) Fri 25 Oct, 1-2 pm: Applications of AI in medical research (Fatemeh Vafaee)
	Laboratory	Thu 24 Oct, 2-6 pm Project C – practical part 2
Week 8 : 28 October - 3 November	Lecture	Tue 29 Oct, 9-10 am: The UPS and downs of protein regulation (Andrew Brown) Wed 30 Oct, 4-5 pm: Protein analysis in neurobiology (Vladimir Sytnyk) Fri 1 Nov, 1-2 pm: Methods investigating an E3 ubiquitin ligase in protein regulation (Andrew Brown)
	Laboratory	Thu 31 Oct, 2-6 pm, (Lab 10, D26) Project C – MS data analysis (MW)
Week 9 : 4 November - 10 November	Lecture	NO LECTURES
	Laboratory	Thu 7 Nov, 2-6 pm (Lab 10, D26) Project D – Illumina sequencing data analysis Project B - nanopore sequencing data analysis (Part 1)
Week 10 : 11 November - 17 November	Lecture	Tue 5 Nov, 9-10 am: NO LECTURE Wed 6 Nov, 4-5 pm: NO LECTURE Fri 15 Nov, 1-2 pm: Concluding remarks (Michael Janitz)
	Laboratory	Thu 14 Nov, 2-6 pm (Lab 10, D26) Project B – nanopore sequencing data analysis (Part 2) Q&A session on lab report writing

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

General Schedule Information

We strongly encourage students to attend all lectures live as they cover examinable theoretical material, as well as providing a backdrop for the practical component of this course.

To pass the course, compulsory attendance for all data analysis practicals and lab practicals on Thursdays 2pm - 6pm in weeks 1-5 and 7-9 is required.

Course Resources

Prescribed Resources

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.

Recommended Resources

Revision of the general principles of biochemistry and molecular biology from second year courses may be useful.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
	Michael Janitz					No	Yes
	Joel Brame					No	No

Other Useful Information

Academic Information

Upon your enrolment at UNSW, you share responsibility with us for maintaining a safe, harmonious and tolerant University environment.

You are required to:

- Comply with the University's conditions of enrolment.
- Act responsibly, ethically, safely and with integrity.

- Observe standards of equity and respect in dealing with every member of the UNSW community.
- Engage in lawful behaviour.
- Use and care for University resources in a responsible and appropriate manner.
- Maintain the University's reputation and good standing.

For more information, visit the UNSW Student Code of Conduct Website.

Academic Honesty and Plagarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.
Further information about referencing styles can be located at https://student.unsw.edu.au/referencing

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage. At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.
Further information about academic integrity, plagiarism and the use of AI in assessments can be located at:

- The Current Students site,
- The ELISE training site, and
- The Use of AI for assessments site.

The Student Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: https://student.unsw.edu.au/conduct

Submission of Assessment Tasks

Penalty for Late Submissions

UNSW has a standard late submission penalty of:

- 5% per day,
- for all assessments where a penalty applies,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Any variations to the above will be explicitly stated in the Course Outline for a given course or assessment task.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Special Consideration

If circumstances prevent you from attending/completing an assessment task, you must officially apply for special consideration, usually within 3 days of the sitting date/due date. You can apply by logging onto myUNSW and following the link in the My Student Profile Tab. Medical documentation or other documentation explaining your absence must be submitted with your application. Once your application has been assessed, you will be contacted via your student email address to be advised of the official outcome and any actions that need to be taken from there. For more information about special consideration, please visit: https://student.unsw.edu.au/special-consideration

Important note: 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 and cannot later apply for Special Consideration. This is to ensure that if you feel unwell or are faced with significant circumstances beyond your control that affect your ability to study, you do not sit an examination or submit an assessment that does not reflect your best performance. Instead, you should apply for Special Consideration as soon as you realise you are not well enough or are otherwise unable to sit or submit an assessment.

Faculty-specific Information

Additional support for students

- The Current Students Gateway
- Student Support
- Academic Skills and Support
- Student Wellbeing, Health and Safety
- Equitable Learning Services
- UNSW IT Service Centre
- Science EDI Student Initiatives, Offerings and Guidelines