

LFS252 Molecular Biology

School: School of Science, Technology and Engineering

2023 | Semester 2

UniSC Sunshine Coast
UniSC Moreton Bay

**BLENDED
LEARNING**

Most of your course is on campus but you may be able to do some components of this course online.

Please go to usc.edu.au for up to date information on the teaching sessions and campuses where this course is usually offered.

1. What is this course about?

1.1. Description

You will study the basic principles of molecular biology by discovering the interplay of molecules that underpin life and enable genetic engineering, biotechnology and bioinformatics and synthetic biology fields. You will understand concepts relating to DNA structure, the genetic code, replication, and repair; and how RNA is transcribed, regulated, and functions within cells. You will also understand how proteins are translated, folded, and their myriad functions and perform key molecular techniques including PCR, cloning, sequencing, and protein production.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
BLENDED LEARNING			
Learning materials – asynchronous learning materials	1hr	Week 1	13 times
Tutorial/Workshop 1 – on campus tutorial/workshop	2hrs	Week 1	7 times
Tutorial/Workshop 2 – Online workshop	1hr	Week 1	2 times
Laboratory 1 – wet lab	3hrs	Week 2	6 times

1.3. Course Topics

Central dogma and DNA structure

The genetic code, DNA replication and PCR

DNA replication and repair

Transcription and regulation of gene expression – prokaryote and eukaryote

Noncoding RNAs

Proteins

Omics: Genomic, transcriptomic and proteomic

2. What level is this course?

200 Level (Developing)

Building on and expanding the scope of introductory knowledge and skills, developing breadth or depth and applying knowledge and skills in a new context. May require pre-requisites where discipline specific introductory knowledge or skills is necessary. Normally, undertaken in the second or third full-time year of an undergraduate programs.

3. What is the unit value of this course?

12 units

4. How does this course contribute to my learning?

COURSE LEARNING OUTCOMES	GRADUATE QUALITIES
On successful completion of this course, you should be able to...	Completing these tasks successfully will contribute to you becoming...
1 Describe the processes of nucleic acid replication, RNA transcription, protein translation and their regulation.	Knowledgeable
2 Understand the relevance and justify use of molecular biology in relation to current applications.	Ethical
3 Perform and understand basic laboratory techniques in recombinant DNA technology minipreps, gel electrophoresis and restriction digestion and mapping, PCR, DNA sequencing and cloning, and record in a standard laboratory report structure.	Empowered
4 Solve basic exercises in molecular biology processes and recombinant DNA manipulation, as listed in the learning materials and laboratory notes.	Creative and critical thinker

5. Am I eligible to enrol in this course?

Refer to the [UniSC Glossary of terms](#) for definitions of “pre-requisites, co-requisites and anti-requisites”.

5.1. Pre-requisites

LFS100 or (LFS103 and enrolled in Program SE303, AE304, SC355, SC357 or SC354)

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

Not applicable

5.4. Specific assumed prior knowledge and skills (where applicable)

Basic understanding of cell biology.

6. How am I going to be assessed?

6.1. Grading Scale

Standard Grading (GRD)

High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL).

6.2. Details of early feedback on progress

Students perform formative laboratory quizzes based on the lab content, and automatically receive their results the following week in Grade Centre. In addition, tutorials are provided every two weeks (beginning week 3), where students work through written exam-like questions and are provided face-to-face feedback on their answers in a group discussion.

6.3. Assessment tasks

DELIVERY MODE	TASK NO.	ASSESSMENT PRODUCT	INDIVIDUAL OR GROUP	WEIGHTING %	WHAT IS THE DURATION / LENGTH?	WHEN SHOULD I SUBMIT?	WHERE SHOULD I SUBMIT IT?
All	1	Quiz/zes	Individual	30%	8-10 Short answer questions (worth a total of 20 marks each time) in 1 hour	Refer to Format	Online Test (Quiz)
All	2	Examination - not Centrally Scheduled	Individual	30%	90 minutes	Week 7	Online Test (Quiz)
All	3	Examination - Centrally Scheduled	Individual	40%	2 hours	Exam Period	Exam Venue

All - Assessment Task 1: Laboratory Questions and Summary

GOAL:	You will answer simple multiple choice and short-answer questions that will help you summarise what was done in each laboratory session and why it was done in relation to the overall goal of the laboratory sessions. You will carry out experimental work as described in your laboratory manual and under the direction of your demonstrator..	
PRODUCT:	Quiz/zes	
FORMAT:	Individual. You will complete online quizzes from each laboratory	
CRITERIA:	No.	Learning Outcome assessed
	1 Correct answers to questions	1 2 4

All - Assessment Task 2: Mid-Semester Exam

GOAL:	You will demonstrate and apply knowledge, analyse relationships, and solve problems in basic principles in molecular biology..	
PRODUCT:	Examination - not Centrally Scheduled	
FORMAT:	Multiple choice and short answer format based on material covered in Weeks 1-6 (learning materials, tutorials and laboratories)	
CRITERIA:	No.	Learning Outcome assessed
	1 Describe the central dogma of molecular biology, processes of nucleic acid replication, recombination and repair, the genetic code, mobile genetic elements, genetic engineering, and recombinant DNA technology.	2 4
	2 As well as practical techniques such as DNA extractions and PCR.	3

All - Assessment Task 3: Final exam

GOAL:	Demonstrate knowledge and apply knowledge, analyse relationships, and solve problems in the basic principles of molecular biology.									
PRODUCT:	Examination - Centrally Scheduled									
FORMAT:	Multiple choice and short answer questions from weeks 7-13 learning materials, tutorials and laboratories, of a type similar to those given in the on-line formative quizzes and end of chapter questions as listed in the learning materials PowerPoint slides, as well as questions given in the laboratories and tutorials.									
CRITERIA:	<table border="1"><thead><tr><th>No.</th><th></th><th>Learning Outcome assessed</th></tr></thead><tbody><tr><td>1</td><td>Describe the processes of nucleic acid replication, transcription, translation and their regulation. Relate these processes to everyday examples and ethical situations.</td><td>1</td></tr><tr><td>2</td><td>Solve basic exercises in nucleic acid processes and recombinant DNA manipulation, as listed in the learning materials and laboratory notes.</td><td>3</td></tr></tbody></table>	No.		Learning Outcome assessed	1	Describe the processes of nucleic acid replication, transcription, translation and their regulation. Relate these processes to everyday examples and ethical situations.	1	2	Solve basic exercises in nucleic acid processes and recombinant DNA manipulation, as listed in the learning materials and laboratory notes.	3
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1	Describe the processes of nucleic acid replication, transcription, translation and their regulation. Relate these processes to everyday examples and ethical situations.	1								
2	Solve basic exercises in nucleic acid processes and recombinant DNA manipulation, as listed in the learning materials and laboratory notes.	3								

7. Directed study hours

A 12-unit course will have total of 150 learning hours which will include directed study hours (including online if required), self-directed learning and completion of assessable tasks. Student workload is calculated at 12.5 learning hours per one unit.

7.1. Schedule

PERIOD AND TOPIC	ACTIVITIES
Week 1	Content: Molecular biology an overview, Central Dogma and DNA structure, Inspiring examples of the usefulness of Molecular biology Tutorial: Questions related to Week 1
Week 2	Content: DNA: The Genetic code, DNA replication & PCR Laboratory: Basic skills, genomic DNA extraction, PCR, amplicon purification
Week 3	Content: Eukaryotic DNA replication, DNA repair and recombination Tutorial: Questions related to Weeks 2-3
Week 4	Content: Mobile genetic elements, recombinant DNA technology, Applications and ethics of genetic engineering and biotechnology Laboratory: TA cloning/BW
Week 5	Content: Transcription and regulation prokaryotes Tutorial: Questions related to Weeks 4-5
Week 6	Content: Transcription and regulation of gene expression – Eukaryotes Laboratory: Cloning into TA expression vectors. Theory of Blue-white selection
Week 7	Content: Mid-semester exam Tutorial: Questions related to Weeks 6-7
Week 8	Content: Introduction to noncoding RNAs (RNAi, short RNAs), Functional RNAs Laboratory: Sequencing
Week 9	Content: Proteins: mechanisms of translation and synthesis Tutorial: Questions related to Weeks 8-9
Week 10	Content: Proteins: understanding structure and function Laboratory: Proteins: PAGE
Week 11	Content: Omics I: Genomic, bioinformatics and proteomics Tutorial: Questions related to Weeks 10-11
Week 12	Content: Omics II: Genomic, bioinformatics and proteomics Laboratory: Proteins: WB
Week 13	Content: Course synthesis and exam preparation Tutorial: Questions related to Weeks 12-13

8. What resources do I need to undertake this course?

Please note: Course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Canvas site– Please log in as soon as possible.

8.1. Prescribed text(s) or course reader

Please note that you need to have regular access to the resource(s) listed below. Resources may be required or recommended.

REQUIRED?	AUTHOR	YEAR	TITLE	EDITION	PUBLISHER
Required	Lodish et al.	0	Molecular Cell Biology, 9e (IE)	9th edition	n/a

8.2. Specific requirements

Laboratory coat, safety glasses, closed in footwear in laboratories.

9. How are risks managed in this course?

Risk assessments have been performed for all studio and laboratory classes and a low level of health and safety risk exists. Some risk concerns may include equipment, instruments, and tools; as well as manual handling items within the laboratory. It is your responsibility to review course material, search online, discuss with lecturers and peers and understand the risks associated with your specific course of study and to familiarise yourself with the University's general health and safety principles by reviewing the [online induction training for students](#), and following the instructions of the University staff.

10. What administrative information is relevant to this course?

10.1. Assessment: Academic Integrity

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Canvas, are electronically checked through Turnitin. This software allows for text comparisons to be made between your submitted assessment item and all other work to which Turnitin has access.

10.2. Assessment: Additional Requirements

Your eligibility for supplementary assessment in a course is dependent of the following conditions applying:

The final mark is in the percentage range 47% to 49.4%

The course is graded using the Standard Grading scale

You have not failed an assessment task in the course due to academic misconduct

10.3. Assessment: Submission penalties

Late submission of assessment tasks may be penalised at the following maximum rate (the rates are cumulative):

- 5% (of the assessment task's identified value) per day for the first two days from the date identified as the due date for the assessment task.

- 10% (of the assessment task's identified value) for the third day

- 20% (of the assessment task's identified value) for the fourth day and subsequent days up to and including seven days from the date identified as the due date for the assessment task.

- A result of zero is awarded for an assessment task submitted after seven days from the date identified as the due date for the assessment task.

Weekdays and weekends are included in the calculation of days late.

To request an extension you must contact your course coordinator to negotiate an outcome.

10.4. SafeUniSC

UniSC is committed to a culture of respect and providing a safe and supportive environment for all members of our community. For immediate assistance on campus contact SafeUniSC by phone: [07 5430 1168](tel:0754301168) or using the [SafeZone](#) app. For general enquires contact the SafeUniSC team by phone [07 5456 3864](tel:0754563864) or email safe@usc.edu.au.

The SafeUniSC Specialist Service is a Student Wellbeing service that provides free and confidential support to students who may have experienced or observed behaviour that could cause fear, offence or trauma. To contact the service call [07 5430 1226](tel:0754301226) or email studentwellbeing@usc.edu.au.

10.5. Study help

For help with course-specific advice, for example what information to include in your assessment, you should first contact your tutor, then your course coordinator, if needed.

If you require additional assistance, the Learning Advisers are trained professionals who are ready to help you develop a wide range of academic skills. Visit the [Learning Advisers](#) web page for more information, or contact Student Central for further assistance: +61 7 5430 2890 or studentcentral@usc.edu.au.

10.6. Wellbeing Services

Student Wellbeing provide free and confidential counselling on a wide range of personal, academic, social and psychological matters, to foster positive mental health and wellbeing for your academic success.

To book a confidential appointment go to [Student Hub](#), email studentwellbeing@usc.edu.au or call 07 5430 1226.

10.7. AccessAbility Services

Ability Advisers ensure equal access to all aspects of university life. If your studies are affected by a disability, learning disorder mental health issue, injury or illness, or you are a primary carer for someone with a disability or who is considered frail and aged, [AccessAbility Services](#) can provide access to appropriate reasonable adjustments and practical advice about the support and facilities available to you throughout the University.

To book a confidential appointment go to [Student Hub](#), email AccessAbility@usc.edu.au or call 07 5430 2890.

10.8. Links to relevant University policy and procedures

For more information on Academic Learning & Teaching categories including:

- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Central Examinations
- Deferred Examinations
- Student Conduct
- Students with a Disability

For more information, visit <https://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching>

10.9. Student Charter

UniSC is committed to excellence in teaching, research and engagement in an environment that is inclusive, inspiring, safe and respectful. The [Student Charter](#) sets out what students can expect from the University, and what in turn is expected of students, to achieve these outcomes.

10.10. General Enquiries

In person:

- **UniSC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **UniSC Moreton Bay** - Service Centre, Ground Floor, Foundation Building, Gympie Road, Petrie
- **UniSC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **UniSC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **UniSC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- **UniSC Caboolture** - Student Central, Level 1 Building J, Cnr Manley and Tallon Street, Caboolture

Tel: +61 7 5430 2890

Email: studentcentral@usc.edu.au