

ENS324 Advanced Genetics

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

Genetics play a crucial role in addressing societal challenges - solving medical mysteries & feeding the world's population. This course focusses on 5 main areas: medical genetics to improve health, population genetics to understand evolutionary forces & changing environments, agriculture to produce quality food, bacterial/viral genetics & bioinformatics to overcome disease challenges, & genetics & applications in society. You will learn modern concepts & apply acquired knowledge to undertake your own inquiry into the nature of future research & development in this area of science.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
BLENDED LEARNING			
Learning materials – Learning materials (online) will introduce the advanced methods and techniques in genetics and genomics	2hrs	Week 1	13 times
Laboratory 1 – On campus computer-based practicals	2hrs	Week 1	13 times
Seminar – On campus seminar	1hr	Week 8	Once Only

1.3. Course Topics

1. Introduction to advanced genetics
2. Overview of ecological genetics in natural populations
3. Bacterial genetics and bioinformatics
4. Overview of viral genetics and bioinformatics
5. Human genome, cancer genetics and personalised medicine
6. Quantitative genetics
7. Genetic and Genomic analysis
8. Guest lecture seminar
9. Population genomics and human evolution
10. Phylogenetics
11. Epigenetics – class discussion
12. Applications of genetics in society
13. Students' seminars: Emerging technologies and advanced topics in genetics and genomics

2. What level is this course?

300 Level (Graduate)

Demonstrating coherence and breadth or depth of knowledge and skills. Independent application of knowledge and skills in unfamiliar contexts. Meeting professional requirements and AQF descriptors for the degree. May require pre-requisites where discipline specific introductory or developing knowledge or skills is necessary. Normally undertaken in the third or fourth full-time study year of an undergraduate program.

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	Evaluate the sustainability implications of applied genetics in agriculture and medicine, breeding and selection strategies	Ethical Sustainability-focussed
2	Describe and evaluate genetic and reproductive processes in animals and plants, recognize applications of genetics, genomics and genome sequencing to medical research, relate genetic information such as breeding vales and selection indices to new situations.	Knowledgeable Empowered
3	Search the scientific literature for information, critically evaluate the literature, and present this information in an appropriate written and oral format.	Creative and critical thinker Empowered
4	Use data sets and software to examine and interpret genetic information, and use scientific analysis skills to interpret scientific results.	Creative and critical thinker Empowered

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 SCI102 or (LFS103 and enrolled in program 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)

You will have prior knowledge and skills in cell biology or biodiversity that can be used to interpret the results of genetic studies with human, animals and plants.

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 will receive early and ongoing feedback via Practical Reports.

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	Report	Individual	40%	Max 500 words per lab report X 8 reports	Refer to Format	In Class
All	2	Oral and Written Piece	Individual	40%	2,000 words for the research plan and 7-10 minutes oral presentation	Refer to Format	In Class
All	3	Examination - Centrally Scheduled	Individual	20%	2 hours	Exam Period	Exam Venue

All - Assessment Task 1: Practical reports

GOAL:	To complete practical reports to demonstrate the essential learning of concepts and methods in genetics, genomics and bioinformatics					
PRODUCT:	Report					
FORMAT:	8 reports (max 350-400 words per report or following the tutorial materials) from practicals in 8 different weeks. The practicals will be held in science lab during the tutorial time slot and will be comprised of both laboratory and computer-based questions. Topics of the report include ecological genetics in natural populations, evolution, human genome/cancer genetics/or pharmacogenetics, quantitative genetics, genetic and genomic analyses, viral genetics and phylogenetics, as well as genomic, statistic and bioinformatics skills applied to medical and agricultural genetics. The exact format of the report will be detailed in Canvas.					
CRITERIA:	No.					Learning Outcome assessed
	1	Reports will require the ability to demonstrate practical and theoretical knowledge of genetics in selection and breeding programs, genomics and bioinformatics				1 2 3 4

All - Assessment Task 2: Research plan and oral presentation

GOAL:	To develop scientific research, writing and presentation skills and gain an in-depth understanding of the state of the scientific literature on a given topic in genetics/genomics/or bioinformatics					
PRODUCT:	Oral and Written Piece					
FORMAT:	Submit: Weeks 9-13. You will submit a half-page draft research proposal in week 3 and then an individual 2000 word research plan (excluding figures, tables and references) in weeks 9-10 and give an oral presentation in week 13 (10 minutes) based on the scientific literature covering aspects of genetics. A list of topics will be made available during the first tutorial class. Example of the research plan will be given in Canvas. Assessments will include a draft research plan in week 3 (5%), a full report in weeks 9-10 (25%) and oral presentation in week 13 (10%).					
CRITERIA:	No.					Learning Outcome assessed
	1	Review and synthesis of relevant literature; writing in a scientific format				3 4
	2	presenting scientific information in an oral and visual format as required for a university lecture				1 2 3 4
	3	evaluating the sustainability and ethical implications of genetics or breeding strategies				1 2 3

All - Assessment Task 3: Written exam - End of Semester

GOAL:	To demonstrate your cumulative learning of the concepts in this course including genetics in society, heritability, selection, breeding values, selection index and genomic selection, genetic improvement programs, reproductive strategies, functional genomics, bioinformatics, animal/crop/plant/forestry improvement, medical genetics, genetic engineering and sex manipulation.		
PRODUCT:	Examination - Centrally Scheduled		
FORMAT:	You will undertake a 2-hour examination based on material covered in the lectures, practicals and tutorials. This examination will be held under official exam conditions in a centralised exam venue. The exam will be comprised of short answer, short essay questions and some calculations.		
CRITERIA:	No.		Learning Outcome assessed
	1	Short answer questions require the ability to demonstrate practical and theoretical knowledge of genetics	1 2 4
	2	Essay questions will be graded on the use of reasoned arguments to analyse complex issues of sustainability and ethics in applied genetics	1 2 3 4

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.

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

There are no required/recommended resources for this course.

8.2. Specific requirements

Nil

9. How are risks managed in this course?

Health and safety risks for this course have been assessed as low. It is your responsibility to review course material, search online, discuss with lecturers and peers and understand the health and safety 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

Eligibility for Supplementary Assessment

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:

- 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