



Course Outline

Code: ENS324 **Title: Advanced Genetics**

School of:	Science & Engineering
Teaching Session:	Semester 2
Year:	2020
Course Coordinator:	Dr Nguyen Nguyen Email: nnguyen@usc.edu.au Tel: 5456 5138
Course moderator:	Associate Professor Scott Cummins Email: scummins@usc.edu.au Tel: 5456 5501

Please go to the USC website 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 Course topics

This course will examine the following themes: genetics and applications in society, population and evolution genetics, ecological genetics in natural populations, quantitative genetics, agricultural breeding programs, genetic evaluation systems, bacterial and viral genetics, medical genetic methods (human genome, cancer genetics, pharmacogenetics and epigenetics), applied bioinformatics, genetic software and its application.

2. What level is this course?

300 level Graduate - Independent application of graduate knowledge and skills. Meets AQF and professional requirements. May require pre-requisites and developing level knowledge/skills. Normally taken in the 3rd or 4th 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?

Specific Learning Outcomes On successful completion of this course you should be able to:	Assessment Tasks You will be assessed on the learning outcome in task/s:	Graduate Qualities or Professional Standards mapping Completing these tasks successfully will contribute to you becoming:
Evaluate the sustainability implications of applied genetics in agriculture and medicine, breeding and selection strategies	Tasks 1, 2 and 3	Sustainability-focussed. Ethical.
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.	Tasks 1, 2 and 3	Knowledgeable. Empowered.
Search the scientific literature for information, critically evaluate the literature, and present this information in an appropriate written and oral format.	Task 2	Creative and critical thinkers. Empowered.
Use data sets and software to examine and interpret genetic information, and use scientific analysis skills to interpret scientific results.	Tasks 1 and 3	Creative and critical thinkers. Empowered.

5. Am I eligible to enrol in this course?

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

5.1 Enrolment restrictions

Nil

5.2 Pre-requisites

LFS100 or SCI102 or (LFS103 and enrolled in Program SXC355 or SC357 or SC354)

5.3 Co-requisites

Nil

5.4 Anti-requisites

Nil

5.5 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 – 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

Task No.	Assessment Tasks	Individual or Group	Weighting %	What is the duration / length?	When should I submit?	Where should I submit it?
1	Practical reports	Individual	40	Max 500 words per lab report × 5 reports	Weeks 2, 4, 6, 8 and 12	Online via Blackboard
2	Research plan and oral presentation	Individual	40	2,000 words for the research plan and 7-10 minutes oral presentation	Weeks 9-13	Research plan via Blackboard site Oral presentation via Zoom
3	End of semester exam	Individual	20	2 hours - open book	Central exam period	Central exam Online
			100%			

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:	Lab report
Format:	5 reports (max 500 words per report or following the tutorial materials) from practicals in weeks 2, 4, 6, 8 and 12. 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 Blackboard.
Criteria:	Reports will require the ability to demonstrate practical and theoretical knowledge of genetics in selection and breeding programs, genomics and bioinformatics

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:	Research proposal/plan and oral presentation
Format:	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 Blackboard. 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:	Review and synthesis of relevant literature; writing in a scientific format; presenting scientific information in an oral and visual format as required for a university lecture; evaluating the sustainability and ethical implications of genetics or breeding strategies

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:	Final examination
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 both multiple choice and short answer questions.
Criteria:	Short answer questions require the ability to demonstrate practical and theoretical knowledge of genetics. Essay questions will be graded on the use of reasoned arguments to analyse complex issues of sustainability and ethics in applied genetics.

7. What are the course activities?

7.1 Directed study hours

The directed study hours listed here are a portion of the workload for this course. A 12 unit course it 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. Directed study hours may vary by location. Student workload is calculated at 12.5 learning hours per one unit.

This course will be delivered via technology-enabled learning and teaching. All lectures will remain in this mode for Semester 2 2020. When government guidelines allow, students that elected on-campus study via the class selection process will be advised when on campus tutorials and practical sessions will resume.

Location: Specific Campus(es) or online:	Directed study hours for location:
USC Sunshine Coast	Lecture 2 hours per week Laboratory/computer labs (practicals) 2 hours per week

7.2 Course content

Week # / Module #	What key concepts/content will I learn?
1	Introduction to advanced genetics and genetics in society
2-3	Population and evolution genetics
4	Ecological genetics in natural populations, DNA markers and translocation of threatened species
5-6	Quantitative genetics: Understanding metric traits, inbreeding and crossbreeding, heritability, selection, breeding values, correlations, genomic selection, genetic and genomic analysis
7	Genomics and bioinformatics: Human genome and medical genetics
8-9	Advanced medical genetics: Cancer genetics, pharmacogenetics, epigenetics and ENCODE
10	Genetics applied to agriculture: animals/aquaculture/crop/plant/forestry improvement
11	Bacterial and viral genetics and bioinformatics
12	Genomics and Phylogenetics
13	Revision, additional topic on emerging genetic technologies and students' oral presentations

Please note course content is subject to variation.

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

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

8.1 Prescribed text(s)

Nil

8.2 Specific requirements

Nil

9. Risk management

Health and safety risks for this course have been assessed as low.

It is your responsibility as a student 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. It is also your responsibility to familiarise yourself with the University's general health and safety principles by reviewing the [online Health Safety and Wellbeing training module 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 Blackboard, are electronically checked through SafeAssign. This software allows for text comparisons to be made between your submitted assessment item and all other work that SafeAssign has access to.

10.2 Assessment: Additional requirements

Eligibility for Supplementary Assessment

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

- a) The final mark is in the percentage range 47% to 49.4%
- b) The course is graded using the Standard Grading scale
- c) You have not failed an assessment task in the course due to academic misconduct

10.3 Assessment: Submission penalties

Late submission of assessment tasks will 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 and supply the required documentation to negotiate an outcome.

10.4 Study help

In the first instance, you should contact your tutor, then the Course Coordinator. Additional assistance is provided to all students through Academic Skills Advisers. To book an appointment or find a drop-in session go to [Student Hub](#).

Contact Student Central for further assistance: +61 7 5430 2890 or studentcentral@usc.edu.au

10.5 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
- Administration of Central Examinations
- Deferred Examinations
- Student Academic Misconduct
- Students with a Disability

Visit the USC website:

<http://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching>

10.6 General Enquiries

In person:

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

Tel: +61 7 5430 2890

Email: studentcentral@usc.edu.au