BIOL2110

Genetics

Session 1, In person-scheduled-infrequent, North Ryde 2022

School of Natural Sciences

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General Information

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Credit points
10

Prerequisites
(BIOL1110 or BIOL115) and ((BIOL1310 or BIOL114) or (BIOL1210 or BIOL108) or (BIOL1610 or BIOL116) or (BIOL1620))

Corequisites
(STAT1170 or STAT170) or (STAT1371 or STAT171) or FOSE1015

Co-badged status
BIOL6110, BIOX2110

Unit description
Genetics occupies a central role in modern sciences, with profound implications for basic and applied research in biology, medicine and agriculture, as well as for a number of philosophical issues in human affairs. This unit offers a balanced approach to teach introductory principles of genetics. It combines sections on classical, molecular and population genetics presented in an integrative way. The practical sessions offer students the possibility of learning essential techniques and skills in modern molecular genetics.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

ULO1: Describe how genetic processes apply to agriculture, human health, society, and the environment

ULO3: Describe routine techniques used to assay genetic variation in populations

ULO2: Apply numeracy and basic principles of genetics to solve problems and draw conclusions from genetic data

ULO4: Demonstrate proficiency in the use of genetic research tools (pipettes, gel electrophoresis, sequence analysis)

ULO5: Analyse genetic data using some common population genetic software and bioinformatic tools

ULO6: Source, synthesise and critically evaluate information from the literature in written and oral formats

General Assessment Information

Submission Deadlines:

Online quizzes, in-class activities, or scheduled tests and exam must be undertaken at the time given. Should these activities be missed due to illness or misadventure, students may apply for Special Consideration.

Unless otherwise stated, all other assessments must be submitted by 5:00 pm on their due date. Should these assessments be missed due to illness or misadventure, students should apply for Special Consideration.

Assessments not submitted by the due date will receive a mark of zero unless late submissions are specifically allowed as indicated in here or on iLearn. If late submissions are permitted as indicated in the unit guide or on iLearn a consistent penalty will be applied for late submissions as follows:

- A 12-hour grace period will be given after which deductions will be applied to the awarded assessment mark;
- 12 to 24 hours late = 10% deduction;
- for each day thereafter, an additional 10% per day or part thereof will be applied until **five days** beyond the due date. After this time, a mark of zero (0) will be given.

Assessment Tasks

Name	Weighting	Hurdle	Due
Practical Report	25%	No	13 April
Problem Sets	5%	No	Open in Weeks 3,4,6,8,9
Seminar Poster	15%	No	4 May

Name	Weighting	Hurdle	Due
Test	10%	No	May 14
Final Exam	45%	Yes	Exam Period

Practical Report

Assessment Type [1]: Report
Indicative Time on Task [2]: 20 hours
Due: **13 April**
Weighting: **25%**

A major component of this unit is the preparation of a practical report. This practical report should be presented in the style of a scientific publication and describe the procedures and results from the first two practical sessions. It is recommended that you start drafting your report at the commencement of the first practical session. In these practical sessions you will learn essential skills, including: how to isolate DNA, visualize DNA using gel electrophoresis, perform PCR amplification, and sequence a mitochondrial gene. You will learn to identify unknown DNA samples by comparing their sequences with those available in DNA sequence databases. After this, you will align all the DNA sequences collected and build a phylogenetic tree as a complementary method for species identification. Your report will include the activities undertaken within Practicals 1 and 2 within a scientific paper format, with Introduction, Methods, Results and Discussion.

On successful completion you will be able to:

- Describe how genetic processes apply to agriculture, human health, society, and the environment
- Demonstrate proficiency in the use of genetic research tools (pipettes, gel electrophoresis, sequence analysis)
- Analyse genetic data using some common population genetic software and bioinformatic tools
- Source, synthesise and critically evaluate information from the literature in written and oral formats

Problem Sets

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 10 hours
Due: **Open in Weeks 3,4,6,8,9**
Weighting: **5%**

The problem sets are designed to assist you to understand topics covered in the course and to provide you with feedback on your understanding of those topics. It is essential that you complete the problem sets as the test and the final examination will cover similar topics to the problems. Answers to the problem sets will be provided. A good and reasonable attempt at each of the problem sets is required to obtain the full marks for each problem set (problems will not be individually graded).

On successful completion you will be able to:

- Apply numeracy and basic principles of genetics to solve problems and draw conclusions from genetic data
- Analyse genetic data using some common population genetic software and bioinformatic tools

Seminar Poster

Assessment Type [1]: Presentation
Indicative Time on Task [2]: 10 hours
Due: **4 May**
Weighting: **15%**

You are required to design and present a 3-minute scientific conference poster (design as a powerpoint slide with recorded presentation) on **a topic in genetics** that you find exciting, based on a peer-reviewed scientific paper. The grade of your poster assessment will be based on content and presentation and involves peer evaluation.

On successful completion you will be able to:

- Describe how genetic processes apply to agriculture, human health, society, and the environment
- Describe routine techniques used to assay genetic variation in populations
- Source, synthesise and critically evaluate information from the literature in written and oral formats

Test

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 10 hours
Due: **May 14**
Weighting: **10%**

Your progress during the unit will be assessed with a test that will focus on topics covered during the lectures and practical sessions. This test will require application of genetic principles to solve problems and an ability to describe genetic processes and techniques.

On successful completion you will be able to:

- Describe how genetic processes apply to agriculture, human health, society, and the environment
- Describe routine techniques used to assay genetic variation in populations
- Apply numeracy and basic principles of genetics to solve problems and draw conclusions from genetic data

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 25 hours
Due: **Exam Period**
Weighting: **45%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Students will be tested on their knowledge of course content. The exam will include information from lectures, practical classes and assessment tasks up to and including week 13. The date for your final exam will be available later in the semester.

On successful completion you will be able to:

- Describe how genetic processes apply to agriculture, human health, society, and the environment
- Describe routine techniques used to assay genetic variation in populations
- Apply numeracy and basic principles of genetics to solve problems and draw conclusions from genetic data

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[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment

- the Writing Centre for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

Unit Text Book

- **Peirce (2017). Genetics: A conceptual Approach (6th Edition). W.H. Freeman and Company, New York.**

Lecture Schedule

This unit has two online lectures per week. Lectures will be made available at the start of each week on iLearn (via Echo360).

Lecture	Week	Topic
1	1	Unit Introduction and Basic Revision
2	1	Basic Revision 2: Sex and Reproduction
3	2	Mendelian Genetics
4	2	Sex Determination Patterns of Inheritance
5	3	Allelic variation and gene function
6	3	Linkage and Crossing Over
7	4	Chromosome Number and Structure
8	4	DNA Replication and Synthesis
9	5	Transcription and Translation
10	5	Gene Expression, Mutation and DNA Repair
11	6	Molecular Techniques I
12	6	Molecular Techniques II
13	7	Population Genetics
14	7	Inbreeding and Inbreeding Depression
15	8	Epigenetics
16	8	Evolutionary Genetics
17	9	Quantitative Genetics
18	9	Conservation Genetics

19	10	Genetic Response to Change
20	10	Human Genetics
21	11	Technological Advances and Applications
22	11	Revision 1
23	12	Revision 2

On-Campus Session DAY 1

Saturday March 12, 9.00 am (Lab E8A 120/160 in the Biology Building)

This day covers internal pracs 1 and 2

DNA Extraction, Gel Electrophoresis

Problem Set tutorial

Polymerase Chain Reaction (PCR)

Finish ~ 4.00pm

On-Campus Session DAY 2

Sunday March 13, 9.00 am (Lab E8A 120/160 in the Biology Building)

This day covers internal pracs 3, 4, 5

HWE -single locus and problem solving tutorial

HWE – population analysis

DNA Sequence alignment and data analysis (*this part comprises part of your practical report methods and results!)*

Practical report guidance

Finish ~ 4.00-5:00pm

ONLINE Practical Content

The week 9 practical will have online recordings and materials provided, with a scheduled zoom session for Q&A on May 4th, 2-3pm. Zoom sessions will be recorded.

Week	Dates	Practical
9	Materials available **4th May**	Problem Solving and Test Preparation (Prac 7)
10	Saturday **14 May**	Online Test

On-Campus Session DAY 3

Saturday May 21, 9.00 am (Labs E8A 120/160 in the Biology Building)

This day covers internal pracs 5, 6, 8.

- Linkage Disequilibrium
- Data Quality in Genomics
- Test Answers and Exam Revision

Finish ~4.00-5:00pm

Unit Schedule

COVD information and On-Campus classes

On-campus teaching continues to be scheduled for Session 1, 2022. Masks are compulsory for all classes in indoor spaces and social distancing will be implemented wherever possible. Students will also be required to sanitise surfaces before and after use.

Students are requested to minimise the risk of spreading COVID to themselves and others in accordance with the university and NSW Health guidelines:https://www.mq.edu.au/about/coronavirus-faqs and https://www.nsw.gov.au/covid-19/stay-safe.

Any further requirements or changes to units in relation to COVID will be communicated to students via iLearn.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Assessment Procedure
- Complaints Resolution Procedure for Students and Members of the Public
- Special Consideration Policy

Students seeking more policy resources can visit Student Policies (https://students.mq.edu.au/su

pport/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing and maths support, academic skills development and wellbeing consultations.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

The Writing Centre

The Writing Centre provides resources to develop your English language proficiency, academic writing, and communication skills.

- Workshops
- Chat with a WriteWISE peer writing leader
- Access StudyWISE
- Upload an assignment to Studiosity
- Complete the Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

Student Services and Support

Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study
- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues

Student Enquiries

Got a question? Ask us via AskMQ, or contact Service Connect.

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Changes from Previous Offering

Genetics is now offered in three modes - as 1) fully online, 2) face to face (practicals weekly) and 3) infrequent/external (on-campus sessions for practicals).

Changes since First Published

Date	Description
01/03/2022	Changed general assessment information