# BIOX2110

## Genetics

Session 1, In person-scheduled-infrequent, North Ryde 2023

*School of Natural Sciences*

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# General Information

Unit convenor and teaching staff
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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
BIOL2110, BIOL6110

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

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

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

**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

### Late Assessment Submission Penalty

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written report or presentation assessment is not submitted, up until the 7$^{th}$ day (including weekends). After the 7$^{th}$ day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all uploaded assessments is **11:55 pm**. A 1-hour grace period will be provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, please apply for Special Consideration.

**Assessments where Late Submissions will be accepted or not accepted for Genetics:**

- Practical Report – YES, Standard Late Penalty applies
- Poster Presentation - YES, Standard Late Penalty applies
- Problem Sets - NO, unless special consideration is granted. Each problem set is worth 1% (5 in total) and there is 14 days to complete each one.
- Online Test - NO, unless special consideration is granted - this is a timed test assessment
- Exam - NO, unless special consideration is granted for a supplementary exam - this is a timed test assessment

**Special Consideration**

The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through ask.mq.edu.au.

Special Consideration Policy: https://policies.mq.edu.au/document/view.php?id=136

**Hurdle Assessment**

**Final Exam (45%)**

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 - the exam will be online multiple choice format. This is a hurdle assessment meaning that failure to achieve 45% in the final exam may result in a fail grade for the unit. Students who obtain between 35-44% in the final exam will be invited resit a supplementary exam at a designated time after the exam period.

### Requirements to Pass this Unit

To pass this unit you must:

- Achieve at least 45% in the final examination (hurdle assessment)
- Achieve a total mark equal to or greater than 50%, including 45% in the final exam.

**Further, it is considered essential that you attempt every assessment in this unit to pass. It is very difficult to pass this unit without attempting all of the assessments.**

# Assessment Tasks

| Name | Weighting | Hurdle | Due | Groupwork/Individual | Short Extension | AI Approach |
|---|---|---|---|---|---|---|
| Problem Sets | 5% | No | Weeks 3,5,7,9,11 | | No | |
| Practical Report | 25% | No | April 13th | | No | |
| Seminar Poster | 15% | No | May 3rd | | No | |
| Test | 10% | No | May 13th (Saturday online - timed) | | No | |
| Final Exam | 45% | Yes | Exam period | | No | |

## Problem Sets

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 10 hours
Due: **Weeks 3,5,7,9,11**
Weighting: **5%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

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

## Practical Report

Assessment Type [1]: Report
Indicative Time on Task [2]: 20 hours
Due: **April 13th**
Weighting: **25%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

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

## Seminar Poster

Assessment Type [1]: Presentation
Indicative Time on Task [2]: 10 hours
Due: **May 3rd**
Weighting: **15%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

You are required to design and present a 3-minute scientific conference poster (design as a powerpoint slide with recorded oral 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 13th (Saturday online - timed)**
Weighting: **10%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

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
- Apply numeracy and basic principles of genetics to solve problems and draw conclusions from genetic data
- Describe routine techniques used to assay genetic variation in populations

## Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 25 hours
Due: **Exam period**
Weighting: **45%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:
**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
- Apply numeracy and basic principles of genetics to solve problems and draw conclusions from genetic data
- Describe routine techniques used to assay genetic variation in populations

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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
- Academic Success 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.

[3] An automatic short extension is available for some assessments. Apply through the Service Connect Portal.

# Delivery and Resources

**Methods of Communication**

We will communicate with you via your university email address or through announcements on iLearn. Queries to convenors can either be placed on the iLearn discussion board or sent to genetics.biol2110@mq.edu.au from your university email address.

## LECTURE SCHEDULE

This unit has two online lectures per week.

Lectures will also be available each week online under the Echo360 link. Lecture notes will be made available each week under the corresponding week tabs below.

| 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 |
| **Mid-Semester Recess (April 7-23)** (Good Friday April 7th) | | |
| 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 |

# Practical Schedule

**This unit has THREE mandatory on-campus days of practical sessions for infrequent/OUA  students. There are also two online practical slots.**

## On-Campus Session DAY 1

Saturday March 11, 9.00 am (Lab E8A 120/160 in the Biology Building)

We will be extracting shark tissue DNA, running PCRs and gels - all of which make up the methods of your practical report (25%).

DNA Extraction

Problem Set tutorial

Polymerase Chain Reaction (PCR), Gel Electrophoresis

Finish ~ 4.00pm

## On-Campus Session DAY 2

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

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 10 practical will have online recordings and materials provided, with a scheduled zoom session for Q&A on May 9th, 11am-12 pm to answer any questions/revision. Zoom sessions will be recorded.

| Week | Dates | Practical |
|---|---|---|
| 9 | Materials available on ILearn | Problem Solving and Test Preparation (online recordings) |
| 10 | Saturday **13 May** | Online Test (available 9am-1pm) - if alternative time required, email unit address or submit Special Consideration |

## On-Campus Session DAY 3

Saturday May 20, 9.00 am (Labs E8A 120/160 in the Biology Building)

Genetic Linkage and Independent Assortment

Data Quality in Genomics

Test Answers and Exam Revision

Finish ~5:00pm

## COVID Information

For the latest information on the University's response to COVID-19, please refer to the Coronavirus infection page on the Macquarie website: https://www.mq.edu.au/about/coronavirus-faqs. Remember to check this page regularly in case the information and requirements change during semester. If there are any changes to this unit in relation to COVID, these will be communicated 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/support/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 Advocacy provides independent advice on MQ policies, procedures, and processes

## 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

There is no longer an online only offering for this unit.

# Changes since First Published

| Date | Description |
| --- | --- |
| 07/02/2023 | The lecture schedule was corrected to indicate the time of mid-semester recess |

Unit information based on version 2023.03 of the Handbook