BIOL206

Genetics

S1 Day 2015

Dept of Biological Sciences

Contents

General Information	2
Learning Outcomes	2
Assessment Tasks	3
Delivery and Resources	9
Unit Schedule	10
Policies and Procedures	13
Graduate Capabilities	15

General Information

Unit convenor and teaching staff
Other Staff
Sanscha Aberg
sanscha.regtop@mq.edu.au
Contact via sanscha.regtop@mq.edu.au
E8A105
Mon - Wed

Unit Convenor
Adam Stow
adam.stow@mq.edu.au
Contact via adam.stow@mq.edu.au

Credit points
3

Prerequisites
6cp from (BIOL114 or BIOL115 or BIOL108)

Corequisites
STAT170 or STAT171

Co-badged status
BIOL604

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:

Describe how genetic processes apply to agriculture, human health, social and environmental matters

Apply basic principles of genetics to solve problems

Describe routine techniques used to assay genetic variation and a capacity to use fundamental tools of genetic research (pipettes, gel electrophoresis, sequence analysis).

Use some common population genetic softwares and bioinformatic tools to analyse genetic data

Source, synthesise and critically evaluate appropriate primary scientific literature

Assessment Tasks

Name	Weighting	Due
Problem Sets	5%	Weeks 2, 3,7 & 8
Test	10%	18 May
Seminar Poster	10%	20 April
Practical Report	20%	20 April
Final Exam	55%	Exam Period

Problem Sets

Due: **Weeks 2, 3,7 & 8**
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 do complete the problem sets as the two tests and the final examination will cover similar topics to the problems. We will go through the problem sets during the practicals. Answers to the problem sets will be found on the unit's web page one week after the problem sets due date.

Problem sets are to be brought to your practical/tutorial classes.

Students doing their practicals externally should hand in problem sets according to the external assessment schedule. If a good attempt is made at each of the problem sets (that are to be handed in) then 1 mark will be awarded for each. This will make up 5% of the final assessment. We also recommend that you attempt the problems at the end of the relevant chapters in your textbook. It contains solved problems and answers to selected problems.

On successful completion you will be able to:

- Apply basic principles of genetics to solve problems

Test

Due: **18 May**
Weighting: **10%**

Your progress during the unit will also be assessed a test during **week 11**. Each test is worth 10% of the unit's assessment. The tests will focus mostly on topics covered during the lectures and are based on 35 multiple choice questions and 7 short answers. Students have up to one hour and 20 minutes for conclusion of each test. 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, social and environmental matters
- Apply basic principles of genetics to solve problems
- Describe routine techniques used to assay genetic variation and a capacity to use fundamental tools of genetic research (pipettes, gel electrophoresis, sequence analysis).

Seminar Poster

Due: **20 April**
Weighting: **10%**

You are required to design and present a conference poster (design as a powerpoint slide) to your tutorial group on almost any aspect of genetics that you find exciting. Don't panic. Being able to talk is essential in almost any job and it is far better to learn the art in front of a group of friendly biologists than anywhere else. You will have 3 minutes to present your poster and 2 minutes for questions.

You must email your PowerPoint presentation as an attachment to Sanscha by **9am, Thursday the 2nd of April (internal students) or Thursday 7th May (external students).** Make sure your presentation is saved with your surname and practical session day and time, e.g. "Smith_monam" (also make this the subject line of the email). Please use PowerPoint 2003 format (avoid tif. files for images) and also bring your presentation on a USB key as back up. It is your responsibility to ensure the presentation is emailed to Sanscha by the due date – we will not be chasing you up for it!

Useful places to begin searching for information on your topic are the following.

(i) Trends in Ecology and Evolution

(ii) Science

(iii) Nature

(iv) New Scientist

(v) Scientific American

Content: Choose an interesting topic and try to convey as much enthusiasm to your audience as possible. State the main points of the topic in a clear and concise manner and attempt to construct your own tables and figures, rather than taking from internet or using unreadable photocopies from papers. Make sure that there is a simple take home message.

Presentation: Write clearly and don't put too much information, illustrations may be a more effective way to impart information and be as creative as you like with the design.. You will need a heading and for text, write few lines with large print in point form rather than in sentences. Address your audience and stand back from the projector making sure that the audience has a clear view of the screen. Do not read from a transcript and use the poster as a reminder for the major points you wish to get across.

Assessment (10% of unit's assessment): It will be based on content and presentation. The overall mark will be based on a mean of the students' marks in the class out of 3 plus the tutor's mark out of 7.

We need two practical sessions to include everyone's posters and you are expected to attend, participate in discussions and mark both poster sessions.

On successful completion you will be able to:

- Describe how genetic processes apply to agriculture, human health, social and environmental matters
- Describe routine techniques used to assay genetic variation and a capacity to use fundamental tools of genetic research (pipettes, gel electrophoresis, sequence analysis).
- Source, synthesise and critically evaluate appropriate primary scientific literature

Practical Report

Due: **20 April**

Weighting: **20%**

A major component of *BIOL206 Genetics* is the preparation of a practical report. This practical report, titled *"From tissue to Species Identification"*, should be presented in the style of a scientific publication and describe the procedures and results of a series of three week practicals.

The report has a forensics type focus in that you will receive an unknown tissue sample and you need to identify the species from which it came. In the process of identifying your sample, you will learn essential skills in modern genetics, including: how to isolate DNA, visualize DNA using gel electrophoresis, perform PCR amplification, and sequence a mitochondrial gene. Students will then identify their mysterious sample by comparing their sequences with those available in the DNA sequence databases. After this is done, we will align all the DNA sequences collected and build a phylogenetic tree to determine how the species are related.

It is highly recommended that you go across to the library and browse through relevant journals online in order to familiarize yourself with setting out and general structure of scientific papers before you commence writing your report. Please do not underestimate the time requirement for this exercise. It is recommended that you start drafting your paper at the commencement of the '*from tissue to species identification*' DNA practical series.

Specific guidelines about preparing your practical report will be posted on iLearn.

The practical report is worth 20% of your total unit assessment and should be between 2,000 and 3,000 words (text only, do not include references and tables in your word count).

Submission of Report:

Assignments must be submitted both electronically **and** as a hardcopy.

1. *Hardcopy submission*

Your assignment (= report) must be submitted to the Biol206 assignment box. This box is located in the reception area of the Faculty of Science student assignment office on the first floor of E7A (at the western end of the building). Consult a campus map for directions http://mq.edu.au/on_campus/maps/. The Centre opens from 9.00am to 5.00pm, Monday to Friday.

Assignments are to be submitted strictly **before 10.00 am on the date specified** and must include a completed and signed coversheet stapled to the front cover (which includes your Turnitin submission number, see below). The Assignment Cover Sheet can be downloaded from the web at

http://web.science.mq.edu.au/intranet/lt/barcode/coversheet.php .

External students only should submit their assignments to the Centre for Open Education following the COE instructions provided at the start of semester. Assignments should be received at the Centre by the due date, so if you choose to mail your assignments please make allowances for postage time. Remember that work handed in at weekends is marked with Monday's date!

1. *Electronic submission*

All assignments must also be submitted online through Turnitin and you must write your Turnitin submission number onto your assignment cover-sheet (see above). Turnitin will check your assignment for plagiarism. It works by comparing the text of a submitted document (i.e., your assignment) with the work of your current classmates, past students in BIOL206 and other courses at Macquarie, as well as published material in books, journals and on the web.

To submit via Turnitin, you will need to follow the link provided in iLearn available via the "Assessments at a glance" folder or through the "Activities" block on the right hand side. Your assignment will not be marked if you have not submitted it to Turnitin and supplied the submission number.

1. To submit an assignment, click the 'submit' button to open the paper submission page and then follow the instructions on screen to submit your assignment. Note that to upload your assignment to Turnitin it must be either in MS Word, WordPerfect, RTF, PDF, PostScript, HTML, or plain text (.txt) format.

2. Click the 'yes, submit' button to upload your assignment. Once your assignment is uploaded, a digital receipt will be provided or emailed to you. You must retain a copy of this receipt.

3. Don't forget to submit a hard copy of your assignment in the usual way (outlined above) including a signed cover sheet.

If you need assistance, please contact Student IT Help (02 9850 4357). If you have any questions about privacy, security or these procedures, please contact the Coordinator, Copyright

and Digital Asset Management (02 9850 7578)

Please note:

MARKS (10% per day) WILL BE DEDUCTED FOR LATE ASSIGNMENTS

PLAGIARISM: THE REPORT MUST BE YOUR OWN WORK AND PLAGIARISM WILL NOT BE TOLERATED

Please follow this link for further information on plagiarism

Extensions and penalties

10% of the mark allocated for the assignment may be deducted per day that any work is submitted late.

The deadlines for assignments are not negotiable. Only a medical certificate or a letter with appropriate supporting documents outlining other serious, extenuating circumstances can be used to submit an assignment after the due date without penalty. All applications for special consideration or extension must be sought *before the due date* unless this is absolutely impossible. **All applications for extensions of deadlines must be submitted to the unit convenor.**

Reports will be returned to you via the Faculty of Science student assignment office on the first floor of E7A, or via mail if you are an external student.

On successful completion you will be able to:

- Describe routine techniques used to assay genetic variation and a capacity to use fundamental tools of genetic research (pipettes, gel electrophoresis, sequence analysis).
- Use some common population genetic softwares and bioinformatic tools to analyse genetic data
- Source, synthesise and critically evaluate appropriate primary scientific literature

Final Exam

Due: **Exam Period**
Weighting: **55%**

Students will be tested on their knowledge of course content. The exam will include information from lectures, prac classes and assessment tasks up to and including week 13. Exam conditions will be as for the mid-semester test. 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, social and environmental matters
- Apply basic principles of genetics to solve problems
- Describe routine techniques used to assay genetic variation and a capacity to use fundamental tools of genetic research (pipettes, gel electrophoresis, sequence analysis).

Delivery and Resources

REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

Text Book

- Peirce (2008). Genetics: A conceptual Approach (4th Edition). W.H. Freeman and Company, New York.

Other Major References

General Genetics

- Griffiths, A. J. F., Wessler, S. R., Lewontin R. C., Gelbart W. M., Suzuki, D. T., Miller, J.H. (2008). An Introduction to Genetic Analysis (9th Edition) W. H. Freeman, New York.

Population and Molecular Evolutionary Genetics

- Avise, J. C. (2004). Molecular Markers, Natural History and Evolution. Sinauer, New York.
- Frankham, R., Ballou, J. D. and Briscoe D. A. (2002) Introduction to Conservation Genetics. Cambridge University Press, Cambridge, UK.
- Hartl, D. L. and Clark, A. G. (1997) Principles of Population Genetics (3rd Edition) Sinauer Assoc. Massachusetts.

Problems

- Price H.J. (2000) Study Guide and Problems Workbook for Principles of Genetics (2nd

Edition). John Wiley & Sons, New York.

- Thompson, J. N., Hellack, J. J., Braver, G. and Durica, D. S. (1997). Primer of genetic analysis. A problems approach. Cambridge University Press, Cambridge.

UNIT WEBPAGE AND TECHNOLOGY USED AND REQUIRED

BIOL 206 on iLearn

Access Web Address: https://ilearn.mq.edu.au/login/MQ/

More information on this system can be found at the following site: http://www.mq.edu.au/iLearn/student_info/

iLearn provides **essential** information on various aspects of the unit, including practical guides, various notes, material required for practical reports, and general information about the unit. Students should visit our web site on a weekly basis. Lecture notes and audio are available via Echo360.

If you are having trouble accessing your online unit due to a disability or health condition, please go to the Student Services Website at http://sss.mq.edu.au/equity/about for information on how to get assistance.

If you are having problems logging on, If you cannot log in after ensuring you have entered your username and password correctly, you should contact Student IT Help, Phone: (02) 9850 4357 (in Sydney) or 1 800 063 191 (outside Sydney).

Unit Schedule

Lecture Schedule – 2015

(Wednesday 14:00-15:00, E7B T3 & Thursday 12:00-13:00pm, E7B T4)

Lecture	Month	Day	Topic	
1	February	25	Introduction	
2	February	26	Basic Revision 1: Genetics and the Organism	
3	March	4	Basic Revision 2: Sex and Reproduction	
4	March	5	Mendelian Genetics	
5	March	11	Sex determination and Patterns of Inheritance	

6	March	12	Allelic variation and gene function	
7	March	18	Chromosome Number and Structure	
8	March	19	Linkage and Crossing Over	
9	March	25	Central Dogma 1	
10	March	26	Central Dogma 2	
11	April	1	Mutation and DNA repair	
12	April	2	Genetics of Human Behavior	

Easter vacation

13	April	22	Molecular Techniques 1
14	April	23	Molecular Techniques 2
15	April	29	Population Genetics I
16	April	30	Population Genetics II
17	May	6	Inbreeding and Inbreeding Depression
18	May	7	Conservation Genetics
19	May	13	Evolutionary Genetics
20	May	14	Quantitative Genetics (Guest Lecturer Dr Kemp)
21	May	20	Human Genetics (Guest Lecturer Dr Donald))
22	May	21	Reflecting on a successful career in Science (Prof. Frankham)

23	May	27	Technological Advances
24	May	28	Revision
25	June	3	No lecture
26	June	4	No lecture

Practical Schedule - 2015

Internals

Week	Date	Practical
1	23 & 24/2	Introduction to Practical Components / Lab and Chemical Safety
2	2 & 3/3	Hardy-Weinberg Equilibrium single locus
3	9 & 10/3	Hardy-Weinberg Equilibrium and population genetics
4	16 & 17/3	DNA – Extraction of DNA
5	23 & 24/3	DNA – PCR
6	30 & 31/3	DNA – Sequence Alignment and Data Analysis

Mid Semester Break

7	20 & 21/4	Poster session I
8	27 & 28/4	Poster session II
9	4 & 5/5	Revision questions
10	11 & 12/5	No practical
11	18 & 19/5	Test
12	25 & 26/5	Revision of Test
13	1 & 2/6	No practical

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special*

Consideration Policy.

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Results

Results shown in *iLearn*, 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.

Student Support

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

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://informatics.mq.edu.au/help/.

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

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Describe how genetic processes apply to agriculture, human health, social and environmental matters
- Apply basic principles of genetics to solve problems
- Use some common population genetic softwares and bioinformatic tools to analyse genetic data
- Source, synthesise and critically evaluate appropriate primary scientific literature

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- Describe routine techniques used to assay genetic variation and a capacity to use fundamental tools of genetic research (pipettes, gel electrophoresis, sequence analysis).
- Source, synthesise and critically evaluate appropriate primary scientific literature

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

- Describe routine techniques used to assay genetic variation and a capacity to use

fundamental tools of genetic research (pipettes, gel electrophoresis, sequence analysis).
- Use some common population genetic softwares and bioinformatic tools to analyse genetic data

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Describe how genetic processes apply to agriculture, human health, social and environmental matters
- Apply basic principles of genetics to solve problems
- Describe routine techniques used to assay genetic variation and a capacity to use fundamental tools of genetic research (pipettes, gel electrophoresis, sequence analysis).
- Use some common population genetic softwares and bioinformatic tools to analyse genetic data
- Source, synthesise and critically evaluate appropriate primary scientific literature

Assessment tasks

- Problem Sets
- Test
- Seminar Poster
- Practical Report
- Final Exam

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Describe how genetic processes apply to agriculture, human health, social and environmental matters
- Apply basic principles of genetics to solve problems
- Use some common population genetic softwares and bioinformatic tools to analyse genetic data
- Source, synthesise and critically evaluate appropriate primary scientific literature

Assessment tasks

- Test
- Seminar Poster
- Practical Report
- Final Exam

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Describe how genetic processes apply to agriculture, human health, social and environmental matters
- Apply basic principles of genetics to solve problems
- Describe routine techniques used to assay genetic variation and a capacity to use fundamental tools of genetic research (pipettes, gel electrophoresis, sequence analysis).
- Use some common population genetic softwares and bioinformatic tools to analyse genetic data
- Source, synthesise and critically evaluate appropriate primary scientific literature

Assessment tasks

- Problem Sets
- Test
- Final Exam

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcome

- Source, synthesise and critically evaluate appropriate primary scientific literature

Assessment tasks

- Seminar Poster
- Practical Report

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcome

- Describe how genetic processes apply to agriculture, human health, social and environmental matters

Assessment tasks

- Seminar Poster
- Practical Report

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- Describe how genetic processes apply to agriculture, human health, social and environmental matters
- Source, synthesise and critically evaluate appropriate primary scientific literature