

BIOL2050: Molecular Genetics

Callaghan

Semester 1 - 2024



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

OVERVIEW

Course Description	Molecular genetics is at the centre of contemporary biology with DNA technology of ever increasing social relevance. This course will provide the core information required to understand molecular genetics and will examine the central roles of nucleic acids and proteins in the storage and flow of genetic information. The central dogma of molecular genetics will be examined in detail as well as outlining the mechanisms of transferring genetic information from one generation to the next. The replication, reading and the expression of genetic information will also be discussed in detail in this course. Questions to be addressed include: What is a gene? What are genes made of and where are genes located? How does a gene exert its effect? How is a gene mutated? How is a gene inherited? How are different genes maintained within a population?
Academic Progress Requirements	Nil
Assumed Knowledge	BIOL1001 and BIOL1002.
Contact Hours	Callaghan Lecture Face to Face On Campus 3 hour(s) per week(s) for 13 week(s) starting Week 1 Tutorial Face to Face On Campus 1 hour(s) per week(s) for 13 week(s) starting Week 1
Unit Weighting Workload	10 Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

COURSE OUTLINE

CONTACTS

Course Coordinator **Callaghan**
Dr Joseph Pegler
Joseph.Pegler@newcastle.edu.au
(02) 4921 6129
Consultation: By Email. If urgent by phone or office (Callaghan campus, Biology Building B112)

Teaching Staff Prof. Brett Nixon
Brett.Nixon@newcastle.edu.au
(02) 4921 6977

School Office **School of Environmental and Life Sciences**
Room C228 Chemistry Building
Callaghan
Science-SELS@newcastle.edu.au
+61 2 4921 5080
9am-5pm (Mon-Fri)

SYLLABUS

Course Content

1. Gene structure: from single bases to whole genomes
2. The central dogma of molecular genetics
3. DNA replication
4. RNA transcription
5. Protein translation and modification
6. Gene expression regulation
7. Mutation and molecular evolution
8. Mendelian genetics
9. Population genetics
10. Cancer genetics.

Course Learning Outcomes **On successful completion of this course, students will be able to:**

1. Describe the structure of nucleic acids: from single nucleotides through to whole genomes;
2. Explain the differences between the core molecular processes of replication, transcription and translation;
3. Explain how gene expression is regulated at multiple levels;
4. Compare and contrast the principles of Mendelian and population genetics;
5. Describe the role that mutation plays both in cancer genetics and in evolution;
6. Critically review scientific papers and general media presentations on issues related to molecular genetics;
7. Identify, gather, retrieve and analyse appropriate molecular genetics information via the internet;
8. Use online resources to interpret molecular genetics data.

Course Materials **Recommended Text:**

- Concepts of Genetics 12th Global Edition, Klug, Cummings, Spencer, Palladino, Killian. Pearson's International Publishing.

SCHEDULE

Week	Week Begins	Topic	Learning Activity	Assessment Due
1	26 Feb	Central dogma of molecular genetics, DNA as the genetic material, Nucleotides through to whole genomes, Coding DNA and repetitive DNA	Lecture (x3) Tutorial (x1) Dr. Pegler	
2	4 Mar	Cytoplasmic genomes (chloroplasts and mitochondria), Nucleic acid hybridisation, DNA replication (DNA to DNA)	Lecture (x3) Tutorial (x1) Dr. Pegler	
3	11 Mar	Genetic recombination, The genetic code, RNA transcription (DNA to RNA)	Lecture (x3) Tutorial (x1) Dr. Pegler	
4	18 Mar	Amino acid translation (RNA to protein), Mutation, DNA repair mechanisms, DNA cloning	Lecture (x3) Tutorial (x1) Dr. Pegler	
5	25 Mar	Gene expression regulation	Lecture (x3) Tutorial (x1) Dr. Pegler	Online Quiz #1
6	1 Apr	Epigenetics, Gene expression regulation, Developmental genetics, Genetically Modified Organisms (GMOs)	Lecture (x3) Tutorial (x1) Dr. Pegler	
7	8 Apr	Genomics, Cancer genetics, Cancer and the cell cycle, Revision Lectures	Lecture (x3) Tutorial (x1) Dr. Pegler	Assignment #1
Mid-Semester Recess				
Mid-Semester Recess				
8	29 Apr	Mendelian genetics (including probabilities and statistics), Monohybrid and dihybrid crossing	Lecture (x3) Tutorial (x1) Prof. Brett Nixon	
9	6 May	Extension of Mendelian genetics	Lecture (x3) Tutorial (x1) Prof. Brett Nixon	
10	13 May	Linkage and chromosomal mapping Pedigree analysis and DNA markers	Lecture (x3) Tutorial (x1) Prof. Brett Nixon	
11	20 May	Population genetics The Human genome	Lecture (x3) Tutorial (x1) Prof. Brett Nixon	
12	27 May	PCR DNA sequencing	Lecture (x3) Tutorial (x1) Prof. Brett Nixon	Assignment #2
13	3 Jun	Protein modification, Protein stability, The proteasome Revision Lectures	Lecture (x3) Tutorial (x1) Prof. Brett Nixon	Online Quiz #2
Examination Period				Formal Exam
Examination Period				Formal Exam

ASSESSMENTS

This course has 3 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Exam	Formal Examination Period.	Individual	50%	1, 2, 3, 4, 5
2	Quizzes - On-line	Online Quiz #1 - Week 5 Online Quiz #2 - Week 13	Individual	10%	2, 3, 5
3	Tutorial contribution Assignments	Assignment #1 - Week 7 Assignment #2 - Week 12	Individual	40%	1, 4, 5, 6, 7, 8

Late Submissions

The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Exam

Assessment Type	Formal Examination
Purpose	Assessment of knowledge of the theoretical components of the course across the entire course.
Description	Formal Examination consisting of multiple choice and short written answer questions.
Weighting	50%
Length	2 hours
Due Date	Formal Examination Period.
Submission Method	Formal Exam
Assessment Criteria	Short answer questions will assess understanding of the field of molecular genetics. Full marks will be allocated for responses which provide comprehensive and correct information. Partial marks will be allocated for answers which incompletely address the question or display a lack of understanding of the topic.
Return Method	Not Returned
Feedback Provided	No Feedback

Assessment 2 - Quizzes - On-line

Assessment Type	Quiz
Purpose	Assess knowledge on specific topics presented as part of the course's lecture series.
Description	Multiple choice questions.
Weighting	10%
Length	1 hour.
Due Date	Online Quiz #1 - Week 5 Online Quiz #2 - Week 13
Submission Method	Online Online Quiz delivered via the course's CANVAS site.
Assessment Criteria	Multiple choice questions will assess understanding of the delivered molecular genetics content. Full marks will be allocated for the selection of the correct answer. No marks will be allocated for the selection of an incorrect answer.
Return Method	Online
Feedback Provided	Online - Correct answers will be provided after all students have completed the assessment item. Further explanation of the correct answers will be provided during the tutorial classes.

Assessment 3 - Tutorial contribution Assignments

Assessment Type	Written Assignment
Purpose	In depth study of a central and specific area of the greater field of molecular genetics.
Description	Written Assignment on central and specific course content.
Weighting	40%
Length	N/A
Due Date	Assignment #1 - Week 7 Assignment #2 - Week 12
Submission Method	Online
Assessment Criteria	Assignments are to be electronically submitted via the course's CANVAS site. Short answer questions will assess understanding of a highly specific area of the greater field of molecular genetics. Full marks will be allocated for responses which provide comprehensive and correct information. Partial marks will be allocated for answers which incompletely address the question or display a lack of understanding of the topic.
Return Method	Online
Feedback Provided	Online - After all students have completed the Assessment item. In depth written feedback will be provided to each student outlining how marks were allocated.

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Email: Students will receive communications via their student email account.
- Face to Face: Communication will be provided via face to face meetings or supervision.

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

- Oral Interviews (Vivas)** As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the [Oral Examination \(viva\) Procedure](#). In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the [Student Conduct Rule](#).
- Academic Misconduct** All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to <https://policies.newcastle.edu.au/document/view-current.php?id=35>.
- Adverse Circumstances** The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:
1. the assessment item is a major assessment item; or
 2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
 3. you are requesting a change of placement; or
 4. the course has a compulsory attendance requirement.
- Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at:
<https://policies.newcastle.edu.au/document/view-current.php?id=236>
- Important Policy Information** The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at <https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures> that support a safe and respectful environment at the University.
- Other Information** If you are registered with AccessAbility and have been provided with a Reasonable Adjustment Plan (RAP), please ensure that you provide your Course Coordinator with a copy as soon as you can, or let your Course Coordinator know that you are still waiting for your RAP.

This course outline was approved by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.

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