



LMED29004 Genomic Pathology 2

Term 1 - 2024

Profile information current as at 17/05/2024 12:02 pm

All details in this unit profile for LMED29004 have been officially approved by CQUUniversity and represent a learning partnership between the University and you (our student). The information will not be changed unless absolutely necessary and any change will be clearly indicated by an approved correction included in the profile.

General Information

Overview

Molecular and cellular pathology involves the study of disease processes at the molecular level and allows diagnosis of disease through the detection of genetic mutations, dysregulated gene expression and non functional or cytotoxic proteins. In this unit, you will study the role of cellular genetic material and associated genetic rearrangements and mutations at an advanced level. You will explore the application of advanced molecular techniques and their impact on diagnostic testing and provide guidance on appropriate investigation strategies.

Details

Career Level: *Postgraduate*

Unit Level: *Level 9*

Credit Points: 6

Student Contribution Band: 8

Fraction of Full-Time Student Load: 0.125

Pre-requisites or Co-requisites

Prerequisites: LMED29001 Genomic Pathology 1

Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the [Assessment Policy and Procedure \(Higher Education Coursework\)](#).

Offerings For Term 1 - 2024

- Melbourne
- Online
- Rockhampton

Attendance Requirements

All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

Website

[This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.](#)

Class and Assessment Overview

Recommended Student Time Commitment

Each 6-credit Postgraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

Class Timetable

[Regional Campuses](#)

Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

[Metropolitan Campuses](#)

Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. **Written Assessment**

Weighting: 20%

2. **Case Study**

Weighting: 30%

3. **Examination**

Weighting: 50%

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the [University's Grades and Results Policy](#) for more details of interim results and final grades.

CQUniversity Policies

All University policies are available on the [CQUniversity Policy site](#).

You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the [CQUniversity Policy site](#).

Unit Learning Outcomes

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

1. Explain the role of gene mutations or rearrangements in the multifactorial etiology of complex diseases
2. Critically discuss how epigenetic modification influences the transcriptome in disease onset and progression
3. Critique the existing and emerging technologies used in the detection of genetic variants in molecular pathology
4. Determine the appropriate selection and implementation of genetic techniques in the detection of pathogenic molecular variants of the genome
5. Research and critique literature related to the use of molecular pathology in disease diagnosis, prevention and treatment, including the development of personalised medicines.

Alignment of Learning Outcomes, Assessment and Graduate Attributes

 N/A Level	 Introductory Level	 Intermediate Level	 Graduate Level	 Professional Level	 Advanced Level
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Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes				
	1	2	3	4	5
1 - Written Assessment - 20%	•		•		•
2 - Case Study - 30%				•	•
3 - Examination - 50%	•	•	•		

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes				
	1	2	3	4	5
1 - Knowledge	◦	◦	◦	◦	◦
2 - Communication	◦	◦	◦	◦	◦
3 - Cognitive, technical and creative skills	◦	◦	◦	◦	◦
4 - Research		◦		◦	◦
5 - Self-management					
6 - Ethical and Professional Responsibility					
7 - Leadership					
8 - Aboriginal and Torres Strait Islander Cultures					

Textbooks and Resources

Textbooks

There are no required textbooks.

Additional Textbook Information

No textbook is prescribed, instead students will be provided with references to the appropriate published journal articles in the field of study.

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)

Referencing Style

All submissions for this unit must use the referencing style: [Vancouver](#)
For further information, see the Assessment Tasks.

Teaching Contacts

Jalal Jazayeri Unit Coordinator
j.jazayeri@cqu.edu.au

Schedule

Week 1- Molecular Diagnostics I - 04 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Molecular diagnostics 1: Sanger sequencing and Next-Generation Sequencing (NGS), as well as various PCR technologies, including Digital, multiplex, Nested and Methylation-Specific PCR (MSP),	No prescribed textbook is assigned for this unit. Please review the lecture materials and recordings available for Week 1 on Moodle before your tutorial/lectorial.	Welcome and introduction to the molecular diagnostics.

Week 2 - Molecular Diagnostics II - 11 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Molecular diagnostics II: Loop-Mediated Isothermal Amplification (LAMP), Nucleic Acid Hybridization Techniques, and various blotting methods such as Northern, Southern, and Western blots.	No prescribed textbook is assigned for this unit. Please review the lecture materials and recordings available for Week 2 on Moodle before your tutorial/lectorial.	A review of molecular diagnostic tools

Week 3 - Genomic Data Analysis - 18 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
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Genomic Data Analysis: Application of National Centre for Biotechnology Information (NCBI) software tools.

No prescribed textbook is assigned for this unit. Please review the lecture materials and recordings available for Week 3 on Moodle before your tutorial/lectorial.

Watch the video on how to use NCBI molecular biology tools and how to prepare for your assessment 2.

Please note that you are required to visit the subject Moodle site and select a topic from a list of proteins provided (under assessment 2) by the end of this week (Friday, March 22nd, 5:00 PM).

There are 17 available topics, and each topic can accommodate a maximum of two students. The selection process operates on a first-come, first-served basis. Once a topic is chosen by two students, it will no longer be available for selection. In that case, please choose another topic from the remaining options.

Week 4 - Therapies for genetic diseases - 25 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Therapies for Genetic Diseases	No prescribed textbook is assigned for this unit. Please review the lecture materials and recordings available for Week 4 on Moodle before your tutorial/lectorial.	Welcome to our guest lecturer on this topic, to be delivered by Dr. Igor Gonda, a pharmaceutical scientist of international reputation.

Week 5 - Pharmacogenomics - 01 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Pharmacogenomics: Understanding how individual's genetic makeup influences their responses to drugs.	No prescribed textbook is assigned for this unit. Please review the lecture materials and recordings available for Week 5 on Moodle before your tutorial/lectorial.	Discuss and explore articles that delve into how pharmacogenomics aims to optimize drug therapy by tailoring treatments to individual patients based on their genetic makeup.

Vacation Week - 08 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
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Week 6 - Cytokines and Anti cytokine Therapies - 15 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Cytokines and Anti cytokine Therapies. Methods to block the pro-inflammatory actions of cytokines in autoimmune diseases and cancer.	No prescribed textbook is assigned for this unit. Please review the lecture materials and recordings available for Week 6 on Moodle before your tutorial/lectorial.	Assessment 1 is due this week. It will be accessible online for completion starting at 9:00 AM on Sunday, April 14th, and will remain open for 24 hours and 30 minutes once started. Please ensure submission by 9:30 AM on Monday, April 15th.

Mid-term Written Assessment Due:
Week 6 Monday (15 Apr 2024) 9:30 am AEST

Week 7 - Hybridoma Technology and Antibody Engineering - 22 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Hybridoma Technology and Antibody Engineering	No prescribed textbook is assigned for this unit. Please review the lecture materials and recordings available for Week 7 on Moodle before your tutorial/lectorial.	Explore the concepts of polyclonal and monoclonal antibodies (mAbs) and delve into the methods for mAb production along with their diverse therapeutic applications, supported by illustrative examples.

Week 8 - Forensic Genomics - 29 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Forensic Genomics: Application of DNA fingerprinting techniques in medicine, forensic science and genetic disease diagnosis, parental testing, and cancer research.	No prescribed textbook is assigned for this unit. Please review the lecture materials and recordings available for Week 8 on Moodle before your tutorial/lectorial.	Explore and delve into human genome tandem repeat sequences such as mini- and microsatellites, including Variable Number Tandem Repeats (VNTR) and Short Tandem Repeats (STR). Investigate their diverse applications in forensics and medicine.

Week 9 - Autoimmune Diseases - 06 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Autoimmune Diseases: Gain insight into the nature of autoimmune diseases, focusing on the conceptual basis underlying these disorders. Conditions such as SLE, rheumatoid arthritis, and Grave's disease will be examined.	No prescribed textbook is assigned for this unit. Please review the lecture materials and recordings available for Week 9 on Moodle before your tutorial/lectorial.	Welcome to our guest lecturer on this topic, to be delivered by Dr. Graeme Carroll, a clinical rheumatologist of international reputation. Assessment 2 is due this week on Monday, May 6th, by 11:59 PM. Assessment 2 Genome Database Analysis Due: Week 9 Monday (6 May 2024) 10:59 pm AEST

Week 10 - Neurogenomics - 13 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Neurogenomics: Explore the genetics and pathogenesis of diseases such as Alzheimer's Disease, Parkinson's Disease, Huntington's Disease, Multiple Sclerosis (MS), and Schizophrenia.	No prescribed textbook is assigned for this unit. Please review the lecture materials and recordings available for Week 10 on Moodle before your tutorial/lectorial.	Discuss the genetic factors, etiology, risk factors, and prevention strategies associated with various neurogenetic diseases.

Week 11 - Genetic Disorders and Genetic Counselling - 20 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Genetic Disorders and Genetic Counselling	No prescribed textbook is assigned for this unit. Please review the lecture materials and recordings available for Week 11 on Moodle before your tutorial/lectorial.	Welcome to our guest lecturer on this topic, to be delivered by Dr. Matthew Burgess, a genetic counselor with many years of experience in clinical genetic counseling.

Week 12 - Revisions- All Topics - 27 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
All topics will be covered in the tutorial session, with the emphasis on topics 6-11		Attend the tutorial session dedicated to revise all topics.

Review/Exam Week - 03 Jun 2024

Module/Topic	Chapter	Events and Submissions/Topic
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Exam Week - 10 Jun 2024

Module/Topic	Chapter	Events and Submissions/Topic
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Term Specific Information

Your unit coordinators for LMED29004, Genomic Pathology 2, is Dr Jalal Jazayeri. Your primary contact point is Jalal and you can contact him using the following means:

- Via the Discussion forum on the unit's Moodle site. The forum for this unit is continuously monitored and you can expect a response within one-two (1-2) business day/s of posting your question.
- Through email (j.jazayeri@cqu.edu.au) or
- Via Microsoft Teams

Your secondary contact point is A/prof Genia Burchall and you can contact her using the following means:

- Via the forum on the unit's Moodle site.
- Through email (g.burchall@cqu.edu.au) or
- Via Teams

CM18 - Master of Laboratory Medicine

Tutorials/Lectorials will be delivered each week at the Rockhampton and Melbourne campuses, and students who are enrolled in mixed mode will be able to join these classes via Zoom. These tutorials/lectorials will also be recorded for the benefit of those students who are unable to attend the live classes. During the sessions, you will have the opportunity to ask questions or discuss uncertainties in relation to the lecture materials and recordings for each week. There will be some active learning exercises undertaken to assess your understating of the weekly lecture material including group and individual activities, short answer questions, kahoot quizzes, cases studies etc. We will also run through a set of questions and discuss in greater depth the peer-reviewed article or other pre-tutorial/lectorial learning for the week. These active learning activities will help you apply the knowledge learned during the weekly lectures and other pre-class learning material and prepare you for the assessments. You will gain the most benefit from the tutorials/lectorial if you watch the weekly lectures beforehand and read the peer-reviewed article and/or other pre-class learning material. You are also strongly encouraged to participate in tutorials, as studies have shown that students who attend the tutorials and participate in discussions have higher rates of success (Karnik et al., 2020*). Regular quizzes (ie kahoot) are also provided during some of the lectorial/tutorial classes to reinforce the knowledge you have gained from the lectures and to enhance your learning experience in this unit.

As per Australian educational standards, you are expected to commit 150 hours of engagement to your study of this unit. This is broken down as:

- 2 - 3 hours per week watching recorded lectures and revising the content through study notes
- 2 - 3 hours per week reviewing the peer-reviewed article provided in Moodle and other relevant resources available for each week
- 1.5 - 2.5 hours per week attending the weekly tutorial/lectorial classes and reflecting on your answers to the activities undertaken during class, identifies areas of uncertainty that still remain and discussing this/these with other fellow students or the teaching staff.
- 3 - 4 hours per week preparing your assessments or studying for your exams

*Karnik, A., Kishore, P., & Meraj, M. (2020). Examining the linkage between class attendance at university and academic performance in an International Branch Campus setting. *Research in Comparative and International Education*, 15(4), 371-390. <https://doi.org/10.1177/1745499920958855>

Assessment Tasks

1 Mid-term Written Assessment

Assessment Type

Written Assessment

Task Description

This assessment evaluates your understanding of the learning objectives and activities covered from weeks 1 to 5, inclusive, in the unit. This includes pre-tutorial materials such as weekly lecture notes, videos, and other relevant resources provided with the unit content, as well as topics covered during scheduled classes. The assessment will consist of various question formats, such as short answer questions, extended response questions, terminology questions, process and arrangement questions. The assessment will be conducted online and will have a duration of 2 hours and 15 minutes for writing, with an additional 15 minutes allocated for reading, downloading, and uploading materials.

This assessment is worth 20% of your final grade. It is designed to gauge your progress approximately halfway through

the term and to help you identify areas of strength and areas for improvement within the unit. Additionally, it aims to familiarize you with the structure and types of questions you can expect on the final exam.

Please note that this written assessment will be accessible online from 9 am, on Sunday 14th April, and it will remain open for 24h and 30 min to complete this assessment once commenced.

Mode: Online submission

Format: The assessment may include (but not be limited to) some short answer questions & some with a more extended type of response, terminology questions, process and arrangement questions & case study/ies. Marks will range from 1-2 marks for short answer questions and 4-5 marks where more detailed information will be required.

Assessment Due Date

Week 6 Monday (15 Apr 2024) 9:30 am AEST

Return Date to Students

Week 8 Tuesday (30 Apr 2024)

Weighting

20%

Assessment Criteria

A detailed marking criteria and marks allocated for each question will be provided with this assessment. You will be provided with support and examples of the types of questions you are likely to encounter in this assessment during your scheduled classes; this will assist you in learning and understanding the expectations of this assessment. You are therefore strongly encouraged to regularly attend and actively participate in the weekly scheduled classes, engage and ask

questions where you are uncertain and make sure you come prepared for each class by having reviewed any pre-class learning material. *If you still have questions or areas you do not understand following each weekly tutorial class you will be encouraged to address these promptly by posting your questions on the Discussion forum and engaging in discussion on this/these topics with fellow students and academics, and the Unit coordinators. Doing this will ensure you 'arrive' to this.*

Referencing Style

- [Vancouver](#)

Submission

Online

Submission Instructions

online submission

Learning Outcomes Assessed

- Explain the role of gene mutations or rearrangements in the multifactorial etiology of complex diseases
- Critique the existing and emerging technologies used in the detection of genetic variants in molecular pathology
- Research and critique literature related to the use of molecular pathology in disease diagnosis, prevention and treatment, including the development of personalised medicines.

2 Assessment 2 Genome Database Analysis

Assessment Type

Case Study

Task Description

Task: As a senior scientist in a pharmaceutical company, you have been assigned to a project involving the virtual mass production of a protein implicated in several diseases. All you have been given is the name and the molecular weight of the protein in kilo Dalton (kDa). To achieve this, you need to use the protein and nucleotides sequences, obtained from NCBI, to clone the gene encoding the protein of interest into an expression plasmid DNA vector and mass produce it in a host. You have been assigned to write a report in which you must outline the strategies and methodologies that you recommend.

Before you go any further, please go to the subject Moodle site and watch an instructions video provided for Assessment 2. In addition, an example of a report is provided in the subject Moodle site to help you with the format of the assignment. Watch this video: <https://www.youtube.com/watch?v=QLcmEqBayr0&t=143s> and this one:

<https://www.ncbi.nlm.nih.gov/>

Project Overview and Guidelines:

Topic Selection: Choose a protein from a list of proteins provided in the subject Moodle site, under assessment 2.

There are 17 available topics, and each topic can accommodate a maximum of two students. The selection process operates on a first-come, first-served basis. Once a topic is chosen by two students, it will no longer be available for selection. In that case, please choose another topic from the remaining options. **Please note that you are required**

to visit the subject Moodle site and select a topic from a list of proteins provided (under assessment 2) by

the end Friday, March 22nd, 5:00 PM. Prepare your report according to the following sub-headings and order:

1. **Aims and Objectives:** The goal is to virtually mass-produce the target protein using efficient strategies and methodologies. Prepare your task in accordance with the following subheadings.
2. **Introduction** (Literature Review): Use PubMed to conduct a literature review on your target protein. Write an introduction focusing on various aspects, including the protein's structure, molecular weight (in kDa), function, disease associations, amino acid and nucleotides sequences, production methodologies etc. limit the introduction to a maximum of 500 words.
3. **Go to NCBI** to determine the protein and the nucleotides sequence of your protein in **FASTA format**.
4. **Identify the open reading frame (ORF)** of your gene (start codon is ATG and the stop codon could be any of these three codons: TAG, TAA, or TGA).
5. **Select PCR primers** either independently or through NCBI's primer design tool. These primers aim to amplify and clone the gene responsible for encoding the protein of interest. Upon determining the forward and reverse primer sets, include them in your report.
6. **Restriction Enzyme analysis:** Construct a restriction enzyme map of your nucleotides sequence so that we can design a cloning strategy: (<https://www.neb.com/en-au/tools-and-resources/interactive-tools>).
7. **Results:** Present the amino acid sequence of the protein, the nucleotide sequence of the gene encoding it, restriction enzyme map of the gene to be cloned, and the forward and reverse PCR primers you have designed.
8. **Cloning Strategy:** Outline your cloning strategy based on the chosen expression system, ensuring the efficient insertion of the target gene into the expression plasmid DNA vector. Optimize the vector for high-yield protein expression.
9. **Outline the Expression System:** Based on the literature review and bioinformatic analysis, choose an appropriate expression system for virtual mass production. Consider factors such as protein solubility, post-translational modifications, and scalability.
10. **Host selection:** Select a suitable host, either a prokaryotic system such as a bacterium or a eucaryotic system such as cell lines, and optimize conditions for protein expression. Evaluate and modify growth media, induction conditions, and harvest timing for maximum yield.
11. **Describe the Purification Protocols:** Develop robust purification protocols. Prioritize purity, yield, and scalability in the purification process.
12. **Outline Quality Control Measures:** Implement quality control measures at each stage of the production process. Employ techniques like SDS-PAGE, Western blotting, and mass spectrometry to verify protein identity and purity. Conduct in vitro assays to determine the biological activity of the produced protein. Conduct in vivo studies to determine the protein's serum half-life and toxicity. Conduct pharmacokinetics (PK) and pharmacodynamics (PD) studies.
13. **Documentation and Reporting:** Document each step of the process, including protocols, results, and any deviations encountered. Provide clear and concise instructions for junior scientists and technical staff to follow. Have your draft read by a peer and check for inconsistencies, typographical errors, and grammar errors, etc. Submit your final draft on the subject Moodle site.
14. **Submit online.**

Assessment Due Date

Week 9 Monday (6 May 2024) 10:59 pm AEST

Return Date to Students

Week 9 Monday (6 May 2024)

Via Subject Moodle site

Weighting

30%

Assessment Criteria

Please refer to assessment 2 table of Rubrics in the subject Moodle site.

Referencing Style

- [Vancouver](#)

Submission

Online

Learning Outcomes Assessed

- Determine the appropriate selection and implementation of genetic techniques in the detection of pathogenic molecular variants of the genome
- Research and critique literature related to the use of molecular pathology in disease diagnosis, prevention and treatment, including the development of personalised medicines.

Examination

Outline

Complete an invigilated examination.

Date

During the examination period at a CQUniversity examination centre.

Weighting

50%

Length

120 minutes

Minimum mark or grade

50%

Exam Conditions

Closed Book.

Materials

Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments).

Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the [Student Academic Integrity Policy and Procedure](#). This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

What is a breach of academic integrity?

A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

Why is academic integrity important?

A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

Where can I get assistance?

For academic advice and guidance, the [Academic Learning Centre \(ALC\)](#) can support you in becoming confident in completing assessments with integrity and of high standard.

What can you do to act with integrity?

**Be Honest**

If your assessment task is done by someone else, it would be dishonest of you to claim it as your own

**Seek Help**

If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)

**Produce Original Work**

Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem