



UNSW
SYDNEY

FACULTY OF ENGINEERING

**School of Mineral and Energy
Resources Engineering**

**Petroleum Geophysics
PTRL2114/5014/6014**

T2, 2020 COURSE OUTLINE



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1 COURSE INFORMATION

COURSE NAME	COURSE CODE	TERM:	LEVEL:	UNITS OF CREDIT (UoC)	MODE
PETROLEUM GEOPHYSICS	PTRL2114	T2, 2020	UG	6	SYNCHRONOUS ONLINE
	PTRL5014	T2, 2020	PG	6	SYNCHRONOUS ONLINE
	PTRL6014	T2, 2020	PG	6	ASYNCHRONOUS ONLINE

Course Convenor	Dr Stuart Clark
Preferred Contact Method	Microsoft Teams Class Forums (tag with @Stuart Clark)
Contact Email	Stuart.clark@unsw.edu.au
Consultation	By Appointment
Consultation types	Microsoft Teams



1.1 COURSE DESCRIPTION

In this course, you will engage in activities that align with what would be expected of petroleum geophysicist in industry. The topics covered take students from introductory seismology and potential field geophysics to advanced concepts in seismic attributes and inversion. A number of the concepts are taught using a programming language without requiring prerequisite knowledge: as a result you will also gain programming skills, which are of growing demand in industry. Finally, the course will focus on communicating geophysical methods and results to an interdisciplinary audience.

1.2 COURSE COMPLETION

Course completion requires submission of all assessment items; failure to submit all assessment items can result in the award of an Unsatisfactory Failure (UF) grade for the Course.

1.3 ATTENDANCE

For PTRL2114 and PTRL5014 students, attendance at lectures and tutorials is compulsory and important to contribute to class activities, a number of which will be assessed during class time. It is important that you make sure you have the right hardware and software ready and tested before the class starts. Failing to attend marked class activities will lead to a zero for that mark and will also likely lead to a negative mark applied to your overall team mark in the course.

1.4 COURSE TIMETABLE

All lectures and tutorials will be conducted through Microsoft Teams according to the following schedule:

Class Type	Channel	Group	Weeks	Time
Lectures	General	PTRL2114/5014	1-5, 7-10	Wed 9am-11am
Tutorials	UG Tutorials	PTRL2114		Fri 12pm – 2pm
	PG Tutorials	PTRL5014		Fri 9am – 11am
		PTRL6014		Fri 9am – 11am

Note: no lectures or tutorials in week 6, the mid-week break.

1.5 WHERE DO I GO IF...

<i>I need help with finance, housing, study skills support, time management or personal issues such as stress and anxiety</i>	Student Support and Success https://student.unsw.edu.au/advisors +61 2 93854734
<i>I need practical educational adjustments to assist me to manage my studies and my disability, medical condition and / or mental health condition</i>	Equitable Learning Service (ELS) https://student.unsw.edu.au/els +61 2 93854734
<i>I need psychological and counselling support to manage my mental health and wellbeing</i>	University Counselling and Psychological Services (CAPS) https://student.unsw.edu.au/counselling +61 2 9385 5418
I need to apply for late enrolment, program changes or other enrolment issues	Log a request online.

2 AIMS, LEARNING OUTCOMES AND GRADUATE ATTRIBUTES

2.1 COURSE AIMS

In this course, you will engage in activities that align with what would be expected of exploration geophysicists in industry. You will learn seismic processing techniques through coding and learn seismic 3D and 4D acquisition, processing and interpretation as well as study various inversion strategies. Finally, you will study the application of seismic methods to finding subsurface resources, such as petroleum reservoirs and mineral deposits. The course will also focus on communicating geophysical results to an interdisciplinary audience.

2.2 COURSE LEARNING OUTCOMES (CLOs)

By successfully completing this course, you should be able:

- CLO1. Explain seismic wave propagation and image processing using wave theory
- CLO2. Interpret and analyse geological features in seismic images
- CLO3. Enhance seismic images with computer algorithms and industry software
- CLO4. Demonstrate strong oral and written communication skills through clear explanations of geophysical concepts appropriate for an interdisciplinary industry audience

2.3 HARDWARE AND SOFTWARE REQUIREMENTS

It is essential that you have access to a reasonable computer, webcam and microphone and an internet connection.

2.3.1 Hardware

The course requires the following minimum hardware configurations:

- Regular internet access to participate in forum discussion and group work.
- Broadband connection (256 kbit/s or better) for streaming video
- Microphone and Camera (webcam or smartphone selfie camera)

The course requires you run and install DUG Insight 4.0 (a software key will be given to you). The minimum requirements for this are:

- **Operating System:**
Windows (64-bit Vista, 7, 8, 10), Mac OS X 10.6+, or modern Linux variant
- **Memory and CPU:**
(Minimum Requirements for the Course) - For basic visualisation and interpretation
 - Minimum memory: 4GB RAM
 - CPU: 2+ GHz, dual-core(Recommended for the Course) - For smooth visualisation, interpretation and attributes
 - Minimum Memory: 8-16GB RAM
 - CPU: 2+ GHz, quad-core

2.3.2 Software

a. *Microsoft Teams*: Lectures, labs, course outlines, lecture notes and preparation quizzes and links to assessments will be placed in Microsoft Teams. You can access Teams via mobile or desktop – I recommend you download both - from:

<https://www.microsoft.com/en-au/microsoft-365/microsoft-teams/download-app>

Mobile device: will allow for notifications through the term and quick chats with myself

Desktop: for more detailed interaction with the course and uploading assignments.

Each module will be represented in Microsoft Teams as channels and communication about the topic can be done in the channel. All enrolled students are automatically included in the Microsoft Team. Microsoft Teams can be also be downloaded on your smartphone or tablet. The course requires that you have regular internet access to participate in the course via Microsoft Teams, Moodle and other systems.

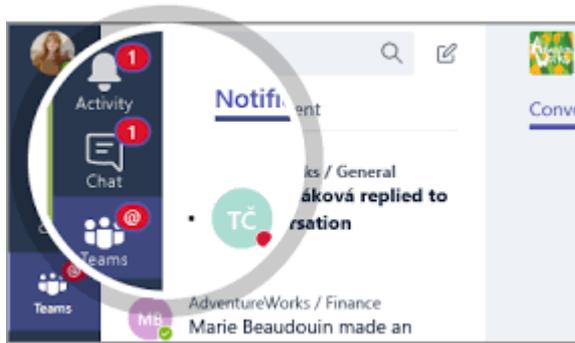
b. *DUG Insight*: You will receive a licence for this software from the course convenor but you should download DUG Insight from here first:

<https://dug.com/dug-insight/download-resources/>

c. *Zotero*: Students are expected to use a referencing software for their assignments, I recommend Zotero (<https://Zotero.org/download>). You will need to download the standalone program for storing your citations and a browser plugin/connector (firefox, chrome and safari). This plugin allows you to immediately add references to your library from a web search, the library or google scholar. I recommend also downloading the Zotero style for the Journal of Geodynamics.

2.4 HOW WE CONTACT YOU: TEAMS ANNOUNCEMENTS

Course announcements will be placed via Microsoft Teams.



See <https://www.youtube.com/watch?v=7DSbBr7Xwfs> for details about channels.

2.5 HOW YOU CAN CONTACT US

Please ask the majority of your questions using the online forums for each topic or the general course one. You may get your answers faster that way than email and my answers will inform the whole class. If you really need to discuss something one-on-one with me, then please organise an appointment via Teams.

3 COURSE ASSESSMENT

The course has four types of assessment:

Assessment Item	Weight	Learning Outcomes			
		CLO1. Explain seismic wave propagation and image processing	CLO2. Interpret and analyse geological features	CLO3 Enhance seismic images	CLO4. Demonstrate strong oral and written communication skills
Topic Quizzes (Individual)	10%	✓	✓		
Application Exercises and Team Quizzes (includes a participation bonus mark)	30%	✓	✓	✓	✓
Take-Home Assignments	40%		✓	✓	✓
Final Exam	20%	✓	✓		

3.1 TOPIC QUIZZES (INDIVIDUAL)

Students must complete an individual online quiz for each module of the course. These quizzes are very similar to preparation quizzes provided as part of the learning activities for that module. The quiz format may vary but will generally consist of multiple-choice questions. Note that:

- only one attempt is allowed
- failure to submit the quiz by the deadline will result in zero marks
- Quiz questions may be shuffled and drawn randomly from a bank of questions.

3.2 APPLICATION EXERCISES AND TEAM QUIZZES

For each module, there will be in-depth activities that build upon the previous work called Application Exercises. These application exercises are designed to apply the knowledge learned in the topic to industry-like cases and real-world problems. These assessments will feature more open-ended questions, are open book and involve more thinking and calculation than the quizzes, although some of the responses will be multiple choice. Participation will be assessed and a bonus mark or deduction of $\pm 5\%$ will be applied (to a minimum mark of 0% and a maximum mark of 30% for this assessment component). These assessments and participation marks will be conducted differently depending on the course you are enrolled in.



3.2.1 PTRL2114/5014

If you are enrolled in PTRL2114/5014, then you will be divided into teams at the start of term. During each class, you will move into break-out rooms online via Microsoft Teams channels. The team component will begin with a Team Quiz that is the same as the Topic Quiz. You will be given slightly longer to complete this compared with the Topic Quiz to allow for discussion in the Team. This discussion will be conducted during the Lectures. You will also complete the application exercise as a team. At the end of term, your team-mates will assess your contribution to the team and some bonus marks of up to 5% will be added to this component (capped to a maximum 30%). Your course convenor, instructor or tutor may also deduct up to 5% of your marks in this component (minimum 0%) for poor team participation.

3.2.2 PTRL6014

Students in PTRL6014 will instead conduct work online and participate in forum discussions asynchronously over the course of the module. Students in PTRL6014 will undertake the Application Exercises individually and will not take team quizzes. At the end of term, your contribution to the online channels for each topic will be assessed and bonus marks of up to 5% may be added to this component (capped to a maximum 30%). Your course convenor, instructor or tutor may also decide to deduct up to 5% of your marks in this component (minimum 0%) for poor participation online.

4 COURSE MODULES, PHASES AND ASSESSMENTS

This course is organised around 5 major modules.

1. Introduction to Petroleum Geophysics
2. Seismic Fundamentals
3. Fundamentals of Seismic Interpretation
4. Seismic Processing
5. Well-ties and Depth Conversion

Each module has several phases:

- A Preparation Phase

- Readiness Assurance Test (RAT)
- Application Exercise
- Take-home Assignment

4.1 PREPARATION PHASE

This is a self-study phase. Prior to coming to the first class of a module (**even the first lecture!**), you will need to have completed a number of online learning activities, including:

- An online lecture
- Course readings (via Leganto)
- A preparation quiz (via Microsoft Teams) – a multiple choice quiz (MCQ)

These are intended to make the class time as effective as possible and to focus class time on feedback.

4.2 READINESS ASSURANCE TESTS (RATs)

The RAT phase is designed to test your readings and learnings from the preparation phase and identify any gaps. We will discuss the results in the weekly lectures and I will use the opportunity to give you feedback on the material that you might have problems with. The RAT phase will be conducted during the Course Lectures (PTRL2114/5014) or asynchronously (PTRL6014). For both, the RAT typically consists of 10 unique multiple-choice questions with 3-5 possible answers taken in ~10 minutes. These marks contribute to your overall quiz mark and similar questions will reappear in the final online quiz.

4.2.1 RATs in PTRL2114/5014

For students in these classes, the same multiple-choice quiz is completed synchronously in the first lecture for the module, as specified in **Section 3.5**:

- A Topic Quiz (Individual) or an individual Readiness Assurance Test (iRAT) – a closed-book quiz, attempted individually, taken synchronously during lectures – the Topic Quiz for the module
- A Team Quiz or a team Readiness Assurance Test (tRAT) – a closed-book quiz, attempted as a team, additional discussion time allowed, conducted synchronously immediately after the iRAT

4.2.2 RATs in PTRL6014

For PTRL6014 students, the RAT phase is assessed only by the Topic Quiz – an individual Readiness Assurance Test (iRAT) – closed book, attempted individually. Students must complete the quiz by Sunday of the first week of that module, as specified in **Section 5**.



4.3 APPLICATION EXERCISE (AE) PHASE

In this phase, you will start doing some more applied work on the module. These have been designed to facilitate engagement and discussion and provide you with some industry-like problems that you will solve. For PTRL2114/5014 students, you will conduct this phase during class time as per **Section 5**. This

phase is conducted in teams except for PTRL6014 who will complete it individually although they are encouraged to discuss it online in the forums.

4.4 TAKE-HOME ASSIGNMENT (THA) PHASE

Each module is completed by an individual take-home assignment. There are two types of Take-Home assignments:

- Minor (for Modules 1-3): these assignments are summative assessments for the module and include work that is contained in that module only
- Major: The final take-home assignment is a summative assignment for the entire course.

4.5 ASSESSMENT WEIGHTING

Each of the four major assessment types for this course is divided into the following sub-assessments with the following weightings:

Assessment	Assessment Type	Assessment Code	Assessment Weighting	Total
Topic Quizzes (Individual)	Multiple Choice Quiz (MCQ)	iRAT1-5	2% each	10%
Team Quizzes and Application Exercises	PTRL2114/5014	Multiple Choice Quiz (MCQ) In Teams	tRAT1-5 2% each (10% total)	30%
		Application Exercises (MCQ & Long-Answer) In Teams	AE1-5 4% each (20% total)	
		Team Participation Mark (Bonus/Penalty)	BONUS ± 5% to total Team Mark	
	PTRL6014	Application Exercises Individual	AE1-5 6% each (30% total)	
		Online Participation Mark (Bonus/Penalty)	BONUS ± 5% to total mark for this section	
Take-home Assignments	Minor Take-home Assignments	THA1-4	5% each	40%
	Major Take-home Assignment	THA5	20%	
Final Exam	Multiple Choice Quiz	FINAL		20%

4.6 ACADEMIC INTEGRITY

Note that I will fail students who do not abide by [UNSW's policy on Academic Integrity and Plagiarism](#) when submitting take-home exams or other material for assessment. Major mistakes include:

- Your references need to be cited twice! Once when you mention it in the text and once with a full citation at the end of the document.

- Not using quotation marks when using someone else’s words.
- Paraphrasing by simply changing a few words from the original text.
- Using another student’s assignment and submitting as your own with only minor modifications (excludes team-based assignments)

Over reliance on a single source to answer a question – for most cases you will need to compare multiple sources and evaluate them in your own words. Using a reference manager like Zotero will help you obey these rules.

5 COURSE SCHEDULE AND ASSESSMENTS

Time for assessments will be provided in class. RATs will be conducted synchronously in class for PTRL2114/5014 and asynchronously for PTRL6014. Assessments for each module will be due on the Saturday of each week according to the following schedule:

UNSW Week	Module	Wednesdays		Fridays	Sundays
		PTRL6014	PTRL2114/5014		
		Online Activities + iRATs	Lectures + iRATs/tRATs conducted in class	Laboratory Work in Assignments	Assignments Due
Week 1	1. Introduction to Petroleum Geophysics	iRAT1 due	iRAT/tRAT1 in class + Lecture	Work on AE1	AE1 due
Week 2	2. Seismic Fundamentals	iRAT2 due	iRAT2/tRAT2 in class + Lecture	Work on AE2	
Week 3		Work on AE2		Work on THA2	AE2 due
Week 4	3. Fundamentals of Seismic Interpretation	iRAT3 due	iRAT/tRAT1 in class + Lecture	Work on AE3	THA2 due
Week 5		Work on AE3		Work on THA3	AE3 due
Week 6	No Classes (Mid-term Break)				
Week 7	4. Seismic Processing	iRAT4 due	iRAT/tRAT4 in class + Lecture	Work on AE4	THA3 due
Week 8		Work on AE4		Work on THA4	AE4 due
Week 9	5. Well-ties and Depth Conversion	iRAT5 due	iRAT/tRAT5 in class + Lecture	Work on AE5	THA4 due
Week 10	Revision	Course Revision		Course Revision	AE5 due
Exam Week	Major THA5 due and Course Exam				

5.1 TEACHING STRATEGIES

The course uses the following main strategies:

- Just-in-time teaching based on real-time feedback from students
- Active learning - via online activities and quizzes
- Problem- and Team-based learning with case-studies encouraging industry-related thinking.
- Assignments over exams – I prefer students get time to digest and think about a topic and provide detailed answers with the flexibility that take-home assignments offer. This matches more closely what would be expected of you in an industry setting.

The teaching approach is a fully online learning environment, with lectures, reading material, assignments and quizzes to be completed online. In online classes, we will employ a flipped classroom strategy, where problem and team-based learning take the bulk of the teaching time, aimed at reinforcing the online theoretical material through practical discussions and work.



5.2 SUGGESTED APPROACHES TO LEARNING

As a guide, 1 UOC equates to approximately 25 hours of work per semester, including lectures, tutorials and private study. This course is worth 6 UOC, corresponding to 150 hours of work or about 12 hours per week. You should take the required workload into account when planning how to balance study with employment and other activities.

5.3 WEEKLY TASKS

See the Microsoft Team page for deadlines as well as the assessment schedule above. As a guide, each week, you will need to spend 2-3 hours outside of class completing one or more of the following tasks:

- Weekly readings and watching course videos
- Practice online quizzes
- Minor take-home assignments (THA1-4)

In addition, you will complete 3-4 hours of the following activities each week, either in class (PTRL2114/5014) or during your own time (PTRL6014):

- Readiness Assurance Tests (RAT1-5)
- Application exercises (AE1-6)

Finally, each week you should dedicate 1-2 hours each week progressing with the following tasks:

- Major take-home assignment (THA5)
- Study and revision of course material and quiz results for the Final Exam.

5.4 ATTENDANCE

For in-person students, attendance of all classes is mandatory because team-based learning exercises are graded each week. Failure to attend will result in a mark of 0. Normally, there is no make-up work for poor attendance. If you have misadventure or ill-health, please speak with me as soon as possible. Online contributions are also graded, with students needed to post a minimum of one relevant entry to the weekly glossary.

5.5 WEEKLY ONLINE PARTICIPATION

Each module begins with a series of preparation activities, including a practice quiz. For in-person students, these reading must be completed prior to the lecture that week. For online students, the material should be completed by Friday of the first week the module runs.

You should also check or subscribe to the announcements, so you receive any important course information, like change of venue, cancelled lectures or changes to the quizzes or due dates.

In summary, online each week it is expected that you:

- Do the online learning activities for that week
- Post or respond to questions in the forum
- Post a well referenced definition to the glossary section

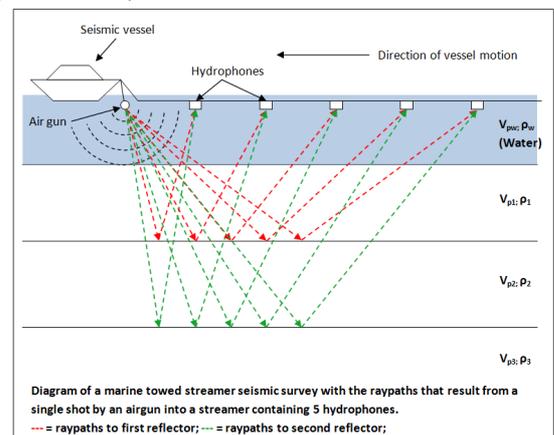
5.6 ACADEMIC INTEGRITY AND PLAGIARISM

5.7 SPECIAL CONSIDERATION

Applying for special consideration does not mean that you will be granted additional assessment or that you will be awarded an amended result. The latter will be granted at the discretion of teaching staff and will be considered only in exceptional circumstances. The timing of any additional assessment is entirely at the discretion of teaching staff.

5.8 EQUITY AND DIVERSITY

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (9385 4734 or <http://www.studentequity.unsw.edu.au/>). Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.



6 RESOURCES AND SUPPORTS FOR STUDENTS

The following materials are a few sources you can use for gathering the latest research evidence and theoretical propositions to help you in this course:

6.1 TEXTS AND COURSE READINGS

The readings for each module are provided via [Leganto Online System](#)

Recommended texts for this course include (all available via UNSW library online):

[Introduction to Petroleum Seismology, Ikelle, Luc T and Amundsen, Lasse, Society of Exploration Geophysicists, 2005](#)

There are numerous articles, wiki-pages on seismology on the web. Many of them are sound, but many are either very lightweight or contain errors.

Your best source is going to be scholar.google.com or library.unsw.edu.au and conduct academic searches of material. I encourage the use of journal articles but discourage the use of wikipages for answering questions.

Also, if you are citing any material from the web you must openly acknowledge even when you present the points in your own words. If you are unsure how to do this see:

<http://www.lc.unsw.edu.au/plagiarism/pintro.html>.

6.2 OTHER RESOURCES AND SUPPORTS

The University and the Faculty provide a wide range of support services for students, including:

- UNSW Learning Centre - <http://www.lc.unsw.edu.au>
- Counselling support - <http://www.counselling.unsw.edu.au>
- Library training and support services – <http://www.library.unsw.edu.au>

7 STUDYING A UG COURSE IN UNSW MINERALS AND ENERGY RESOURCES ENGINEERING

7.1 ASSIGNMENT SUBMISSIONS

The School has developed a guideline to help you when submitting a course assignment. We encourage you to retain a copy of every assignment submitted for assessment for your own record either in hardcopy or electronic form.

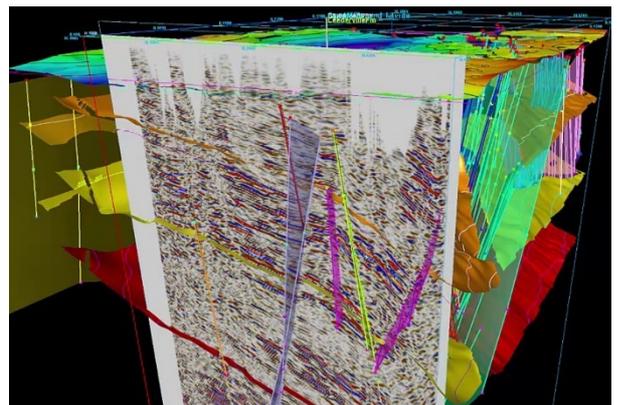
7.2 LATE SUBMISSION OF AN ASSIGNMENT

Full marks for an assignment are only possible when an assignment is received by the due date. We understand that at times you may not be able to submit an assignment on time, and the School will accommodate any fair and reasonable extension. We would recommend you review the UNSW Special Consideration guidelines – see following section. Late assignments will be penalised at a rate of 5% per day up to and including 7 days. After 7 days, the assignment will receive a mark of 0.

7.3 SPECIAL CONSIDERATION

You can apply for special consideration through UNSW Student Central when illness or other circumstances interfere with your assessment performance. Sickness, misadventure or other circumstances beyond your control may:

- Prevent you from completing a course requirement,
- Keep you from attending an assessable activity,



- Stop you submitting assessable work for a course,
- Significantly affect your performance in assessable work, be it a formal end-of-semester examination, a class test, a laboratory test, a seminar presentation or any other form of assessment. We ask that you please contact the Course Convenor immediately once you have completed the special consideration application, no later than one week from submission. More details on special consideration can be found at: www.student.unsw.edu.au/special-consideration

7.4 COURSE RESULTS

For details on UNSW assessment policy, please visit: www.student.unsw.edu.au/assessment. In some instances, your final course result may be withheld and not released on the UNSW planned date. This is indicated by a course grade result of either:

- WD – which usually indicates you have not completed one or more items of assessment or there is an issue with one or more assignment; or
- WC – which indicates you have applied for Special Consideration due to illness or misadventure and the course results have not been finalised.

In either event it would be your responsibility to contact the Course Convener as soon as practicable but no later than five (5) days after release of the course result. If you don't contact the convener on time, you may be required to re-submit an assignment or re-sit the final exam and may result in you failing the course. You would also have a NC (course not completed) mark on your transcript and would need to re-enroll in the course.

7.5 ACADEMIC HONESTY AND PLAGIARISM

Your lecturer and the University will expect your submitted assignments are truly your own work. UNSW has very clear guidelines on what plagiarism is and how to avoid it. Plagiarism is using the words or ideas of others and presenting them as your own. Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. The University has adopted an educative approach to plagiarism and has developed a range of resources to support students. All the details on plagiarism, including some useful resources, can be found at www.student.unsw.edu.au/plagiarism.

If you need some additional support with your writing skills, please contact the Learning Centre or view some of the resources on their website: www.lc.unsw.edu.au/. The Learning Centre is designed to help you improve your academic writing and communication skills. Some students use the Centre services because they are finding their assignments a challenge, others because they want to improve an already successful academic performance.

7.6 CONTINUAL COURSE IMPROVEMENT

As students and instructor - we are partners in this course and in your learning. I encourage all students to share any questions or feedback they have at any time during the course – come see me after a lecture or organise to meet with me. You can help me learn how to be a better teacher.



Good luck with the course, I sincerely hope you enjoy it and learn from it.

Stuart Clark

Sydney, May, 2020