

MMAN4400

Engineering Management

Term 3, 2021



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Dr Erik van Voorthuysen	erikv@unsw.edu.au	During tutorial hours, on Moodle, Microsoft Teams and by appointment	ME507	9385 4147

Lecturers

Name	Email	Availability	Location	Phone
Dr Ron Chan	r.chan@unsw.edu.au	During tutorial hours, on Moodle, Microsoft Teams and by appointment	ME507	9385 1535

Tutors

Name	Email	Availability	Location	Phone
Mr Oscar Jones	o.boydjones@unsw.edu.au	During tutorial hours, on Moodle, Microsoft Teams and by appointment	ME507	9385 4147

School Contact Information

Location

UNSW Mechanical and Manufacturing Engineering

Ainsworth building J17, Level 1

Above Coffee on Campus

Hours

9:00–5:00pm, Monday–Friday*

*Closed on public holidays, School scheduled events and University Shutdown

Web

[School of Mechanical and Manufacturing Engineering](#)

[Engineering Student Support Services](#)

[Engineering Industrial Training](#)

[UNSW Study Abroad and Exchange](#) (for inbound students)

[UNSW Future Students](#)

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

(+61 2) 9385 4097 – School Office**

**Please note that the School Office will not know when/if your course convenor is on campus or available

Email

[Engineering Student Support Services](#) – current student enquiries

- e.g. enrolment, progression, clash requests, course issues or program-related queries

[Engineering Industrial Training](#) – Industrial training questions

[UNSW Study Abroad](#) – study abroad student enquiries (for inbound students)

[UNSW Exchange](#) – student exchange enquiries (for inbound students)

[UNSW Future Students](#) – potential student enquiries

- e.g. admissions, fees, programs, credit transfer

[School Office](#) – School general office administration enquiries

- NB: the relevant teams listed above must be contacted for all student enquiries. The School will only be able to refer students on to the relevant team if contacted

Important Links

- [Student Wellbeing](#)
- [Urgent Mental Health & Support](#)
- [Equitable Learning Services](#)
- [Faculty Transitional Arrangements for COVID-19](#)

- [Moodle](#)
- [Lab Access](#)
- [Computing Facilities](#)
- [Student Resources](#)
- [Course Outlines](#)
- [Makerspace](#)
- [UNSW Timetable](#)
- [UNSW Handbook](#)

Course Details

Units of Credit 6

Summary of the Course

MMAN4400 Engineering Management presents four subject areas, considered to be critical in terms of managing and leading engineering operations. They are:

- Issue analysis and decision making
- Investment analysis and engineering economy
- Costing and operations analysis
- Quality management, including design

Within each subject area the course will cover many conceptual and analytical techniques, all supporting fact- and data-based analysis and decision making with the aim of improved product and process performance, economy and sustainability. The course consists of lectures, demonstration sessions and assignment work. There will be three quizzes and a major case study. There will be no final exam.

Considering the diverse nature of subject areas, there really is no single, suitable textbook available that covers all these areas and therefore a custom textbook, consisting of a compilation of outstanding chapters from three different textbooks has been created with the assistance of the McGraw-Hill company. Our campus bookstore will have this book for you to purchase. It is important you do so, as this book will be an excellent reference for you for years to come. Additional lecture notes are also posted on Moodle.

Course Aims

This course is designed to help you to learn how to manage the operations in organizations and also to build a business or commercial case for making engineering related decisions, such as investment in plant, equipment and processes. Although the main emphasis will be on product and process, consideration will also be given to designing engineering services. The course offers a broad managerial perspective emphasizing the strategic impact of operations decisions and the interfaces between operations and the other functional areas of organizations, including of course, finance.

This course encompasses the key elements of operations management and investment analysis and pulls them together in a coherent format that allows you to understand the 'big picture' as well as 'the specific details'. It is aimed at integrating the knowledge gained from the different engineering subjects you have studied into a framework and process that allows you to implement your solutions and ideas in a commercial environment.

Specific topics include: Manufacturing operations and competitiveness, concurrent product and process design, manufacturing processes and technologies, global supply chain, E-manufacturing, Just-in-time and lean manufacturing, enterprise resource planning, production and materials planning, statistical process control techniques, quality and project management. Concept of engineering economy, time value of money, equivalence, nominal versus effective interest rates, present worth, annual worth, internal rate of return, pay back period calculations, inflation, depreciation and after-tax economic analysis.

Engineers have traditionally played an important role in management, largely because design and technology were the main key factors for success in product and process design, but also the fact that

our engineering degree gave us outstanding analytical skills to solve a multitude of problems. This really hasn't changed, but in an increasingly complex world, successful organizations – public, private or governmental – need managers with increasingly broad and diverse skills, especially in finance, law, risk and quality management, and customer relations. And more to the point, organizations need leaders at every level, with the ability to make carefully considered and innovative long-term strategic decisions. It is the purpose of MMAN4400 to equip you with enough knowledge and information to become a global manager, indeed a leader, with the ability to apply analytical methods and quality processes to create short and long-term value for your organization, your customers, and the community, in other words, all stakeholders.

Some of you will follow a 'traditional' engineering career, whereas others will branch out into very different fields, including consulting, banking, insurance, service industries, transport and so on. It is the aim of this course to prepare you for any of these and to train your mind to think strategically and systematically, integrating technical, commercial, financial and managerial concepts.

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. State what an organisation needs to do to remain competitive in today's environment.	PE3.1, PE3.2, PE3.3, PE1.5
2. Perform investment and feasibility analyses.	PE1.1, PE1.2, PE2.1
3. Be able to determine whether a process is capable of producing a product or service to specifications.	PE1.1, PE1.2, PE1.6
4. To be able to understand the role that the operations management function plays in international business and how the operations function can play a strategic role in improving the global competitiveness of the organisation.	PE3.1, PE3.4, PE3.6

Teaching Strategies

All lectures and tutorials for MMAN4400 will be online in T3, 2021. It will be a combination of synchronous as well as asynchronous lectures. Tutorials will be synchronous.

Lectures, demonstrations and assessments in the course are designed to cover the core knowledge areas in Engineering Management. They do not simply reiterate the texts, but build on the lecture topics using examples and cases taken directly from industry to show how the theory is applied in practice and the details of when, where and how it should be applied.

Lectures and demonstrations are designed to develop several graduate attributes by creating an environment where information sharing, discussions, teamwork, communication, task completions and project role playing will take place. Since each of you may have come from a different engineering stream, your experiences are drawn on to illustrate various aspects of cases covered, and this helps to increase motivation and engagement.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Quizzes	45%	Friday Week 3, 8 and 10 finishing at 05:00 PM	1, 2, 3, 4
2. Assignment Progress Evaluation	20%	By Tuesday 5pm in that week	1, 2, 3, 4
3. Group assignment	35%	Friday, Week 10 07:00 PM	1, 2, 3, 4

Assessment 1: Quizzes

Start date: Friday Week 3, 8 and 10 commencing at 04:00 PM

Assessment length: Each quiz will be 1 hour in duration

Due date: Friday Week 3, 8 and 10 finishing at 05:00 PM

Deadline for absolute fail: 5 minutes after the conclusion of the quiz

Marks returned: Within 1 week

3 quizzes at 15% each. The start and finish times and the day the quizzes will be held will be announced on Moodle.

Quiz 1 will be held in week 3 and cover material taught in weeks 1-2.

Quiz 2 will be held in week 8 and cover material taught in weeks 3-7.

Quiz 3 will be held in week 10 and cover material taught in weeks 8-9.

You must make yourself available during the set time for these quizzes.

This is not a Turnitin assignment

Assessment criteria

Quizzes will be online and a link will be provided on Moodle. Questions will consist of multiple choice as well as numeric answers.

Assessment 2: Assignment Progress Evaluation

Start date: Each week from week 3-9

Submission notes: Submit using the link provided in Moodle and make certain that the file name is unchanged from the Excel workbook provided to you.

Due date: By Tuesday 5pm in that week

Deadline for absolute fail: 5 minutes after the due time of 5pm in that week

Marks returned: Within two of weeks of submission

The group project consists of a realistic engineering business case scenario, where students make decisions in relation to the main responsibilities that they will be exposed to as a manager of engineering projects and business streams. Decisions include product mix, manufacturing infrastructure, capital

expenditure, operational improvements, human resources and training, health, safety and environmental policies. Teams compete against a limited number of other teams in a set of "worlds" that realistically mimic competitive behaviour amongst competing companies. Teams are assessed on financial performance but also, and importantly on customer satisfaction, staff morale, health and safety as well as sustainability. This is a group project, as it reflects common practice in industry.

From weeks 3-9, all teams will submit their strategic decisions via a link provided on Moodle and directly on the provided Excel workbook, in relation to the case study. Marks will be awarded for submitting on time, with the correct file name (please do not ever change the file name). Additional marks will be given for strategies that are Coherent, Consistent and Contingent. In other words for strategic decisions that are well thought through and that reflect the state of the market in which the team participates.

Assessment criteria

Marks will be awarded for submitting on time, with the correct file name (please do not ever change the file name). Additional marks will be given for strategies that are Coherent, Consistent and Contingent. In other words for strategic decisions that are well thought through and that reflect the state of the market in which the team participates.

Assessment 3: Group assignment

Assessment length: limit of 3000 words per team

Due date: Friday, Week 10 07:00 PM

Deadline for absolute fail: 5 calendar days after the due date

The group project consists of a realistic engineering business case scenario, where students make decisions in relation to the main responsibilities that they will be exposed to as a manager of engineering projects and business streams. Decisions include product mix, manufacturing infrastructure, capital expenditure, operational improvements, human resources and training, health, safety and environmental policies. Teams compete against a limited number of other teams in a set of "worlds" that realistically mimic competitive behaviour amongst competing companies. Teams are assessed on financial performance but also, and importantly on customer satisfaction, staff morale, health and safety as well as sustainability. This is a group project, as it reflects common practice in industry. Students are assessed individually as part of the quizzes component in this course. The final report will be written as a 'hand-over' report to the new and incoming management team. It will focus on a description of the market, the nature of the business, what has worked well in terms of your strategies and what has not worked well. What were the key drivers in your market. What would you have done differently. Each team member needs to write their own reflection as part of this report, describe their own approach to the strategies and decisions made and what they would do differently.

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Assessment criteria

The final report will be marked as follows:

- Understand the market drivers (5)
- Describe the overall strategy (5)
- Insight into price vs performance/style (2)
- role of quality in market (2)
- Relate to market segments (2)

- Use Michael Porter descriptions (2)
- More than financial outcomes identified (2)
- Handover Issues - what is your advice to the incoming team (3)
- Writing Style and Grammar (2)

And then each individual team member will write:

- Give reasons for each product strategy that you were responsible for (5)
- Identify what worked/what didn't (2)
- Identify Things to do differently (2)
- Reflections of how the team worked (2)
- Roles identified (1)
- Decision-making protocol (2)
- Conflict mechanism (1)
- Learnings and Pivots (5)

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Schedule

[View class timetable](#)

Timetable

Date	Type	Content
Week 1: 13 September - 17 September	Lecture	Issue analysis Part I – Issue Analysis Framework, Operations, Processes, Little’s law. Chapters 1, 2, 3, 4 of the textbook and Lecture notes and video on issue analysis.
	Workshop	Introduction to the Case Study and Engineering Business Simulation Assignment
Week 2: 20 September - 24 September	Lecture	Issue analysis Part II – Strategy, Cost Estimation, Capacity Analysis. Chapters 1, 2, 3, 4, 5 of the textbook and Lecture notes and video on issue analysis.
	Workshop	Workshop on Little's Law, Capacity Planning and Cost Estimation
Week 3: 27 September - 1 October	Lecture	Engineering economy Part I – Foundations of engineering economy. Introduction to Accounting. Chapter 9, 10 of the textbook and Lecture notes.
	Assessment	Quiz 1 will be held this week during the scheduled tutorial class. This quiz will cover material taught in Weeks 1-2.
Week 4: 4 October - 8 October	Lecture	Engineering economy Part II – Interest rates, present worth. Chapter 9, 10, 11, 12, 13 and Lecture notes.
	Workshop	Questions on interest rate, PW, AW, FW Case study discussion
Week 5: 11 October - 15 October	Lecture	Engineering economy Part III – Annual worth and future worth. Chapter 9, 10, 11, 12, 13 and Lecture notes
	Workshop	Questions on IRR, breakeven, sensitivity and payback Case study discussion
Week 6: 18 October - 22 October	Blended	Week 6 is a flexibility week
	Blended	Week 6 is a flexibility week

Week 7: 25 October - 29 October	Blended	Engineering economy Part IV – Rate of return analysis, breakeven, sensitivity and payback analysis. Chapter 14, 15, 16, 17, 18 and lecture notes.
	Workshop	Questions on ROR, breakeven, sensitivity and payback analysis. Quiz 2 preparation.
Week 8: 1 November - 5 November	Lecture	Quality management, Basic 7 tools. Chapter 8 and Lecture notes.
	Assessment	Quiz 2 will be held during the scheduled tutorial class. Material covered is weeks 3-7.
Week 9: 8 November - 12 November	Lecture	Statistical process control – process variables, process attributes, capability analysis. Chapter 8 and Lecture notes.
	Workshop	Statistical process control, capability analysis.
Week 10: 15 November - 19 November	Lecture	Six Sigma, Lean, Agile, JIT, Process Improvement and Reengineering. Linking Operations with Finance. Chapter 8, 19, 21 and Lecture notes
	Assessment	Quiz 3 will be held during the scheduled tutorial class. Material covered is from weeks 8-9.
Study Week: 20 November - 25 November	-- Select --	
	-- Select --	

Resources

Prescribed Resources

Lecture notes for all topics will be posted on Moodle. For all e-Books and reference books please visit the UNSW Library website: <https://www.library.unsw.edu.au/>

Textbooks:

The prescribed textbook for this course is:

MMAN4400 ENGINEERING MANAGEMENT – McGraw-Hill, 2013. ISBN-13: 978-1-12-179435-1.

You can purchase the textbook from UNSW bookshop. Alternatively, you can purchase the eBook version (at a lower price) directly from the publisher at:

<http://www.mheducation.com.au/9781307074352-aus-engineering-management> (link to be confirmed)

UNSW Library website: <https://www.library.unsw.edu.au/>

Moodle: <https://moodle.telt.unsw.edu.au/login/index.php>

Recommended Resources

Not available

Course Evaluation and Development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, informal discussion in the final class for the course, and the School's Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

In this course, recent improvements resulting from student feedback include a business simulation-based group project.

Submission of Assessment Tasks

Assessment submission and marking criteria

Should the course have any non-electronic assessment submission, these should have a standard School cover sheet.

All submissions are expected to be neat and clearly set out. Your results are the pinnacle of all your hard work and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

Late policy

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 percent (20%) of the maximum mark possible for that assessment item, per calendar day, for a minimum of zero marks.

The late penalty is applied per calendar day (or part thereof), including weekends and public holidays, that the assessment is overdue.

Work submitted after the 'deadline for absolute fail' is not accepted and a mark of zero will be awarded for that assessment item. For example:

- Your course has an assessment task worth a total of **30 marks (Max Possible Mark)**
- You submit the assessment **2 days after the due date**
- The assessment is marked as usual and achieves a score of **20 marks (Awarded Mark)**
- The late policy is applied using **Late Mark = Awarded Mark - (Days*Penalty per Day)*Max Possible Mark**. Your adjusted final score is **8 marks** ($20 - ((2*0.2)*30)$).

For some assessment items, a late penalty may not be appropriate. These are clearly indicated in the course outline, and such assessments receive a mark of zero if not completed by the specified date. Examples include:

1. Weekly online tests or laboratory work worth a small proportion of the subject mark, or
2. Online quizzes where answers are released to students on completion, or
3. Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or
4. Pass/Fail assessment tasks.

Examinations

You must be available for all quizzes, tests and examinations. For courses that have final examinations, these are held during the University examination periods: February for Summer Term, May for T1, August for T2, and November/December for T3.

Please visit myUNSW for Provisional Examination timetable publish dates. For further information on

exams, please see the [Exams](#) webpage.

Special Consideration

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to submitting an assessment or sitting an exam.

UNSW now has a [Fit to Sit / Submit rule](#), which means that if you attempt an exam or submit a piece of assessment, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's [Special Consideration page](#).

Please note that students will **not** be required to provide **any** documentary evidence to support absences from any classes missed **because of COVID-19 public health measures such as isolation**. UNSW will **not** be insisting on medical certificates from anyone deemed to be a positive case, or when they have recovered. Such certificates are difficult to obtain and put an unnecessary strain on students and medical staff.

Applications for special consideration **will** be required for assessment and participation absences – but no documentary evidence **for COVID-19 illness or isolation** will be required.

Special Consideration Outcomes

Assessments have default Special Consideration outcomes. The default outcome for the assessment will be advised when you apply for Special Consideration. Below is the list of possible outcomes:

Outcome	Explanation	Example
Time extension	Student provided more time to submit the assessment	e.g. 1 more week of time granted to submit a report
Supplementary assessment	Student provided an alternate assessment at a later date/time	e.g. a supplementary exam is scheduled during the supplementary exam period of the term
Substitute item	The mark for the missed assessment is substituted with the mark of another assessment	e.g. mark for Quiz 1 applied also applied as mark for Quiz 2, meaning if a student achieved a mark of 20/30 for Quiz 1 and was granted Special Consideration for Quiz 2, a mark of 20/30 would be applied for Quiz 2, etc
Exemption	All course marks are recalculated excluding this assessment and its weighting	e.g. The course has an assessment structure of: - Assignments 30%, - Lab report 30%, - Final Exam 40%. If the Lab report is missed and student is granted Special Consideration, then the assessment structure may be reweighted as follows: - Assignments 50% - Final Exam 50% as though the Lab report did not exist
Non-standard	Course Coordinator is contacted for the outcome when special consideration is granted as the outcome differs on a case-by-case basis	e.g. typical for group assessments where time extension supplementary assessment could be granted to the group member, time extension could be granted to the whole group, etc. Clarify with your Course Convenor for

Academic Honesty and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off 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. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

If plagiarism is found in your work when you are in first year, your lecturer will offer you assistance to improve your academic skills. They may ask you to look at some online resources, attend the Learning Centre, or sometimes resubmit your work with the problem fixed. However more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Academic Information

Credit points

Course credit is calculated in Units-Of-Credit (UOC). The normal workload expectation for one UOC is approximately 25 hours per term. This includes class contact hours, private study, other learning activities, preparation and time spent on all assessable work.

Most coursework courses at UNSW are 6 UOC and involve an estimated 150 hours to complete, for both regular and intensive terms. Each course includes a prescribed number of hours per week (h/w) of scheduled face-to-face and/or online contact. Any additional time beyond the prescribed contact hours should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

On-campus class attendance

****T3-2021 UPDATE****

Classes will be entirely ONLINE until at least Week 6, after which we will receive further advice from UNSW about the return of face-to-face classes. Students who are enrolled in face-to-face classes will have access to the course's online content but NO classes will be changed to reflect online delivery until Week 6 due to uncertainty regarding delivery mode for the rest of the term. Please go to your course's Moodle modules and MS Teams sites for further information about accessing course resources and content.

Public distancing conditions must be followed for all face-to-face classes. To ensure this, only students enrolled in those classes will be allowed in the room. No over-enrolment is allowed in face-to-face classes. Students enrolled in online classes can swap their enrolment from online to a **limited** number of on-campus classes by Sunday, Week 1. Please refer to your course's Microsoft Teams and Moodle sites for more information about class attendance for in-person and online class sections/activities.

Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by [NSW health](#) or government authorities. Current alerts and a list of hotspots can be found [here](#). **You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-isolate.** We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed. Further information is available on any course Moodle or Teams site.

In certain classroom and laboratory situations where physical distancing cannot be maintained or there is a high risk that it cannot be maintained, face masks will be considered **mandatory PPE** for students and staff.

For more information, please refer to the
FAQs: <https://www.covid-19.unsw.edu.au/safe-return-campus-faqs>

Guidelines

All students are expected to read and be familiar with UNSW guidelines and policies. In particular,

students should be familiar with the following:

- [Attendance](#)
- [UNSW Email Address](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)

Image Credit

Photo by Stephen Blake March 2017, Willis Annexe (J18) Thermofluids lab

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	✓
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	✓
PE2.2 Fluent application of engineering techniques, tools and resources	
PE2.3 Application of systematic engineering synthesis and design processes	
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	✓
PE3.2 Effective oral and written communication in professional and lay domains	✓
PE3.3 Creative, innovative and pro-active demeanour	✓
PE3.4 Professional use and management of information	✓
PE3.5 Orderly management of self, and professional conduct	
PE3.6 Effective team membership and team leadership	✓