Faculty of Engineering

DESN1000
ENGINEERING DESIGN AND INNOVATION

Course Outline
2022 Term 1

Course Convenor
Ilpo Koskinen

This outline informs you how this course will be run.

If you need more help…

Before the course starts, ask at the Nucleus.

Once you are enrolled, the Moodle Learning Management site has more specific information for this course

Quick-start To-Do List

Week 0 *(O-Week)*

- Read this course outline
- Check you can access the course site on Moodle
- Prepare to attend the first lecture on Monday 14/02 from 2:00 – 5:00 pm.
- Research availability of reference text: Dym et al. *Engineering Design.*
- Install Office 365 using your free UNSW license
- Familiarise yourself with Microsoft Teams

Week 1	
Monday, 14/02	
2:00 – 5:00 pm	Attend the first lecture online via Teams: introducing this course and the available projects. After the lecture, select your project for the term using the tool on Moodle.
Thursday, 17/02	
2:00 – 5:00 pm	Participate in the *Impromptu Design Day*. After the session, complete the *Reflective Writing Assessment Task*, worth 5% of your final grade. More information on Moodle.

Weeks 2 to 10	
Monday and Thursday	
2:00 – 5:00 pm	From week 2 your class activities will be determined by your selected project. Please refer to your project-specific section on Moodle for more information. Your selected project will determine class activities.

1. Course Staff

This course is coordinated jointly by the Faculty of Engineering and Design Next. Academic staff from various Engineering Schools coordinate specific Projects and Technical streams within the course.

Faculty	Convenor contacts
Design Next	Prof Ilpo Koskinen Dr Nicholas Gilmore Dr Arianna Vignati designnext@unsw.edu.au

Projects	Coordinator contacts
Autonomous Container Delivery	Matthew Priestley - m.priestley@unsw.edu.au
Bionic Hand	Michael Stevens - michael.stevens@unsw.edu.au
Bridge to Share	Darson Li - darson.li@unsw.edu.au
Mars Rover	Binghao Li - binghao.li@unsw.edu.au
Project EV	Peter Neal - peter.neal@unsw.edu.au
Renewable Energy from Waves	Mitch Harley - m.harley@unsw.edu.au Ian Turner - ian.turner@unsw.edu.au
Soccer Droids	Michael Schofield - michael.schofield@unsw.edu.au
Shock-proof Buildings	Wei Gao - w.gao@unsw.edu.au
Solar Raceway	Ziv Hameiri - z.hameiri@unsw.edu.au
Surveying with Triangles	Yi Liu - yi.liu@unsw.edu.au
The Purple House	Lucy Marshall - lucy.marshall@unsw.edu.au

2. Course Information

Units of credit: 6 UOC
Prerequisite(s): None

2.1 Course summary

In this course, you will experience first-hand one of the major things that engineers do: designing and building creative solutions to problems. You will learn to think the way that engineers think, coming up with good solutions to problems despite being limited by budget, time and resources, the requirement to also meet environmental and social objectives and, of course, the limitations of the laws of physics. This will help you appreciate engineering design's central ideas as an on-time, on-budget and fit for purpose solution to a poorly specified, open-ended problem.

You will start to build critical skills for engineers that will be called upon repeatedly in your academic and professional lives, including concept development, critical thinking and evaluation skills, clear communication, research and information literacy skills and the skills involved in successfully functioning within a team environment to complete a given task.

A key part of the course is a design project. You will select one project from the ones offered in the Faculty of Engineering. Once you've joined a project, you will be assigned to a team of around 5-6 students. With this team, you will work to practically solve your design problem.

Your team must also ensure that it has enough technical skills to complete the project. Some projects will offer a selection of Technical Streams to select from week 2 onwards.

Common Faculty-wide activities and assessments will complement this project-specific work. Further, the Faculty ensures that all project-specific work achieves the same learning outcomes. Any differences in assessments and learning activities between projects are reviewed to ensure equivalence.

2.2 Course aims

This course aims to make you familiar with the process of engineering design and the use of design methods for: (1) defining an open-ended design problem; (2) generating alternative conceptual solutions; (3) evaluating these solutions and implementing them. We also want to give you opportunities to develop your professional skills, such as technical writing, public speaking, teamwork and project management.

2.3 Relationship with the rest of your program and the discipline

This course looks at what it means to be a design engineer. You will see the big picture and how all your studies, such as mathematics and science, fit together. It will also look at some of the non-technical issues which are just as vital to a successful engineering career.

You will study and experience Engineering Design as a multi-faceted activity, which requires considerable creativity, as well as judgement, decision making and problem-solving skills. You will see the need to take context into account and be able to complete design projects on time and within budget. The problem solving and project management skills that you learn in this course will be invaluable for later courses in your degree, in your career and for life in general.

The following table explains how DESN1000 is designed to align with Engineers Australia's Stage 1 Competencies. These are the Program Learning Outcomes for the Bachelor of Engineering (Honours).

Course Learning Outcome (CLO)	At the successful completion of this course, you should be able to:	Engineers Australia Stage 1 Competencies
CLO1	Demonstrate a systematic approach to design in response to a specified set of project requirements.	1.5, 2.1, 2.2, 2.3, 2.4, 3.3
CLO2	Test the suitability of designs using analytical and practical validation methods pertinent to the project.	1.5, 2.1, 2.2, 2.3, 3.3
CLO3	Apply foundational technical theory and skills to a design project.	1.1, 1.3, 2.1, 2.2, 2.3
CLO4	Demonstrate the attributes of an effective team member, including the use of basic organisational and interpersonal tools.	2.4, 3.3, 3.4, 3.5, 3.6
CLO5	Use foundational project management techniques to plan, execute and complete a design project.	2.4, 3.3, 3.4, 3.5, 3.6
CLO6	Explain designs using oral, written and visual forms of professional communication within the project context.	2.5, 3.4, 3.5, 3.6

2.4 Course evaluation and development

Engineering Design is a team effort, and we are particularly interested in your feedback. We want your suggestions of what is good and should be retained, and what is not so good and should be improved (with ideas on how to do it).

In addition to the standard UNSW Course and Teaching Evaluation and Improvement (myExperience) surveys, we will be asking for your feedback in other ways during the course. Do make attempts to communicate constructive feedback to your lecturers. Feedback on individual tasks is often requested during the course.

3.Strategies and Approaches to Learning

3.1 Learning philosophy

This course is, first and foremost, an exercise in experiential learning, with emphasis on reflection on the design process. You will work together in teams to design a solution to a specified but open-ended problem. This project will be supported with a variety of additional student experiences to help you acquire individual and group skills in areas needed for communicating the design, including graphical representation, collaboration, report writing and any necessary discipline-specific knowledge.

3.2 Learning and teaching activities

Teaching in this course is centred on the project. For example, you will develop communication skills by communicating about the project; you will develop teamwork and project management skills in the context of your project team, and you will experience the kinds of technical problems resolved by engineers in your selected project area. How this will work out in detail will depend upon the project. You will receive a separate handout describing this once you have finalised your choice. If you want to see details earlier, refer to the Moodle site for this course.

3.2 Expectations of students

Integrity and Respect

The UNSW Student Code of Conduct among other things, expects all students to demonstrate integrity in all the academic work and to treat all staff, students and visitors to the University with courtesy, tolerance and respect.

Time commitment

UNSW expects students to spend approximately 150 hours to successfully complete a 6 UOC course like DESN1000. Since there is no final exam, this translates to approximately 12-15 hours per week of work for this course. We expect 60 hours to be spent participating in face-to-face classes, with the remaining 90 hours spent collaborating with your teammates outside of class time and in private study.

Participation

When you attend classes (whether those are delivered face-to-face or online), we expect you to actively participate in the activities organised. This may mean listening, taking notes, asking questions or engaging in peer discussions. It may also mean working by yourself or in groups on tutorial exercises.

To complete the design project, you are required to work in a team. We expect all team members to agree on how they will manage the team (e.g. making and documenting decisions), to assign the project work equitably and contribute to the delivery of project outputs to the best of their ability. If this is not feasible, discuss this with your mentor as soon as possible. Low or no participation in your team may lead to some or all of your team marks to be removed.

Students are expected to contribute to online discussions through the course forum on Moodle and your project's Microsoft Teams instance. You may wish to discuss challenges faced through this course, ask questions about course content, and discuss solutions to project challenges.

Attendance and punctuality

We expect students to be punctual and attend all lectures, mentor meetings and classes. While exceptions may be made for special circumstances, we do expect University commitments to take precedence over regular work activities, holidays etc. If you miss a class, you should catch up in your time. Lectures will be recorded and made available through Teams and/or Moodle.

4. Course Schedule and Structure

4.1 Teaching times and locations

In general, you will have DESN1000 classes on Mondays and Thursdays from 2 to 5 pm.

At 3 pm on Monday of Week 2, you will attend your first project-specific class. The details of this class will be available via your project-specific section in Moodle and a project-specific Microsoft Team. Make sure to check these details before the end of Week 1. Most of your classes will be online, although some projects may allow for some workshop time in UNSW Makerspaces.

4.2 Course Schedule

Blue items are faculty-wide activities completed by every DESN1000 student. They consist of common lectures and the Impromptu Design Day. **Yellow items** are activities determined by your selected Project or Technical Stream. Your Project Coordinator (see 1. Course Staff) will provide additional details and a schedule once you have selected your project during week 1. Importantly, this generic schedule is superseded by the schedule provided by your Project Coordinator.

Week	Monday 2 – 5pm	Thursday 2- 5pm
1	**Common lecture** An overview of the course and introduction to projects offered, followed by a briefing for the Impromptu Design Day	**Impromptu Design Day** A team-based rapid prototyping design challenge, followed by a reflective writing assessment task.
2	**Common lecture** – Teamwork and project management Project activities	**Common lecture** – Problem definition and requirements Project or technical stream activities
3	**Common lecture** Conceptulisation and oral presentation skills Project activities	Project or technical stream activities
4	**Common lecture** – *Report writing* Project activities	Project or technical stream activities
5	**Common lecture** – Testing and verification Project activities	Project or technical stream activities
6	*Revision week*	
7	Project activities	Project or technical stream activities
8	Project activities	Project activities
9	Project activities	Project activities
10	*Public holiday*	Project activities

5. Design Projects

5.1 Introduction

We want you to experience the engineering design process as well as hear about it and reflect upon it. So, in this course, you will learn by doing; by working on tasks connected with a project.

Performance of your design will be a critical part of the assessment; the other marks will be awarded for the process (what you do) and your reflection (thinking about and showing that you have understood what you do).

5.2 Range of Projects and Project Selection

After the Week 1 Monday lecture, the next step is to review the 1-page project descriptions available on Moodle. This information complements the project pitches provided in the common lecture on the Monday of Week 1.

Projects fall within the topic areas listed below. Some areas have more than one project. You may select any of the projects independently of your preferred field of study.

Project title(s)	Engineering topic areas
Autonomous Container Delivery	Computing, Electrical, Mechanical
Bionic Hand	Biomedical, Mechanical
Bridge to Share	Mechanical
Mars Rover	Computing, Electrical, Mechanical
Project EV	Chemical, Renewable Energy, Mechanical, Electrical
Renewable Energy from Waves	Environmental, Renewable Energy, Civil
Soccer Droids	Computing, Electrical, Mechanical
Shock-proof Buildings	Civil, Mechanical
Solar Raceway	Photovoltaic, Renewable Energy, Mechanical, Electrical, Computing
Surveying with Triangles	Civil, Environmental
Purple House	Environmental, Humanitarian, Chemical, Mechanical, Electrical

All projects are subject to quotas, so complete your project selection as soon as the tool opens to secure your preferred project. Be sure of your preferred project before committing to it, as selections cannot be changed after the deadline.

The project selection tool opens: Monday Week 1, 14/02 at 9pm.
The project selection tool closes: Wednesday Week 1, 16/09 at 6pm.

For exceptional circumstances, you may contact the course convenor.

6. Assessments

6.1 Assessment tasks

DESN1000 has been designed to ensure equivalence and alignment between the various projects offered in this course. Each project operates within an agreed framework of assessments, as indicated in the following table. Full details of each project's specific assessment activities and their weightings are provided in the project outlines available on the Moodle site after the project has been selected. You are encouraged to preview these and download them for future reference.

Task	Weight	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6
Impromptu Design - Reflective Writing Due Week 2, Thursday at 5:00 pm	5 %	+			+		+
Engineering Design Process (EDP) Due Week 4, Sunday at 11:59 pm	15 %	++	++	++	+	++	++
Project assessments Consult your project outline and coordinator for a detailed breakdown.	60 %	++	++	++	++	++	++
Technical stream assessments* Consult technical stream guide and coordinator for a detailed breakdown.	20 %	+	+	++		+	+

**Some projects will not include a technical stream, and instead have 80% project assessments.*

6.2 Assessment criteria and standards

The marking rubrics used in DESN1000 will be provided separately on Moodle. Students should familiarise themselves with these rubrics well before the assessment due date. Because of differences between each Project's specific learning and assessment activities, it may be necessary to moderate/adjust marks (up or down) to ensure fairness. This will be undertaken after all the results are available at the end of the semester and done by a representative panel of the Faculty.

Note that for team submissions, marks for individual team members may be adjusted to account for their level of contribution towards the submission. For this purpose, project coordinators may use team evaluations and mentor insights to gauge individual students' level of participation.

6.3 Submission of assessment tasks

Most assessments will be submitted through Moodle. Presentations are generally given in front of other groups in class, a live virtual meeting, or are submitted as a video. Submission of testing assessments is dependent on your project, and not all projects will facilitate online delivery modes. Specific submission details for each assessment will be provided separately on Moodle.

6.3 Requests for special consideration

There are no formal examinations in this course. However, if you find that your performance in an assessable component has been significantly affected by illness or other unexpected circumstance, then you should make an application for special consideration as soon as possible by visiting the Nucleus Student Hub. Talk to the project/course coordinator too. Note that consideration is not granted automatically and often requires an application to be lodged ahead of an assessment due date.

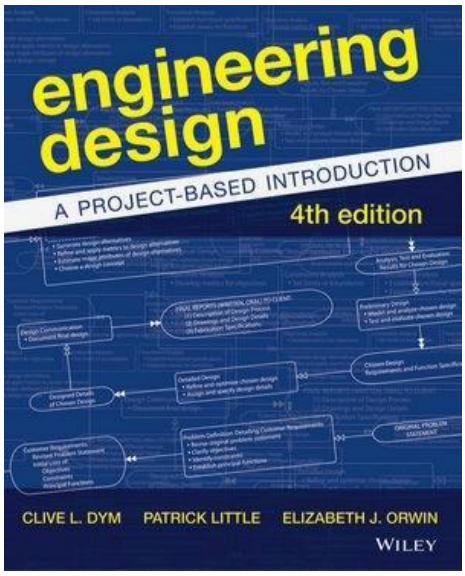
6.4. Feedback on assessment

You will receive feedback on you and your team's performance in many ways throughout this course. Sometimes it may be written, other times verbal comments. The use of rubrics also provides students with guidance on how they well they are performing in the course. In addition to feedback from the teaching staff, from time to time, you will also receive feedback from your peers – particularly your teammates.

7. Additional information

RESOURCES

The recommended text for this course is:



Dym, Clive L., Little, Patrick., Orwin, Elizabeth J.
Engineering Design: A Project Based Introduction.

You should have access to a copy as it provides a useful reading on several relevant topics throughout your degree. It is available as a text and as an accompanying eBook from the UNSW Bookshop. There are copies available for purchase from the University Book Store and available in the University Library Reserved Collection. The coordinator of your selected project will tell you if alternative or additional textbooks are recommended. References specific to a particular project are given in the School outlines that will be supplied after you have finalised your decision and may be previewed on the Moodle site for this course.

Online resources:
Moodle and Microsoft Teams will be used to disseminate teaching materials. Assessment marks will also be made available via Moodle: https://moodle.telt.unsw.edu.au/login/index.php.

ASSESSMENT SUBMISSION AND MARKING CRITERIA

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.

PENALTIES

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.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day.

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

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.

SPECIAL CONSIDERATION & SUPPLEMENTARY EXAMINATION

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.

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

DATES TO NOTE

Refer to MyUNSW for Important Dates available at: https://student.unsw.edu.au/dates

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.

GENERAL CONDUCT & BEHAVIOUR

Consideration and respect for the needs of your fellow students and teaching staff is an expectation. Conduct which unduly disrupts or interferes with a class is not acceptable and students may be asked to leave the class.

HEALTH, SAFETY & ON-CAMPUS CLASS ATTENDANCE

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, if available. 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. 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

COURSE IMPROVEMENT

This course is under constant revision in order to improve the learning outcomes for all students. Please forward any feedback (positive or negative) on the course to the course convener or via the online student survey myExperience.

You can also provide feedback to your student society who will raise your concerns at student focus group meetings. As a result of previous feedback obtained for this course and in our efforts to provide a rich and meaningful learning experience, we have continued to evaluate and modify our delivery and assessment methods including updated lecture notes, workshops, blended learning resources, in-class demonstrations, and industry guest lectures.

ADMINISTRATIVE MATTERS AND LINKS

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams

- Approved Calculators
- Academic Honesty and Plagiarism
- Moodle
- Faculty Transitional Arrangements for COVID-19
- UNSW Timetable
- UNSW Handbook
- Equitable Learning Services

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 Equitable Learning Services. 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.

CRICOS

CRICOS Provider Code: 00098G

ACKNOWLEGEMENT OF COUNTRY

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

Appendix A: UNSW Graduate Capabilities

The course delivery methods and course content directly or indirectly addresses a number of core UNSW graduate capabilities, as follows:

- Developing scholars who have a deep understanding of their discipline, through lectures and solution of analytical problems in tutorials and assessed by assignments and written examinations.
- Developing rigorous analysis, critique, and reflection, and ability to apply knowledge and skills to solving problems. These will be achieved by the laboratory experiments and interactive checkpoint assessments and lab exams during the labs.
- Developing capable independent and collaborative enquiry, through a series of tutorials spanning the duration of the course.
- Developing digital and information literacy and lifelong learning skills through assignment work.

Appendix B: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of Knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex 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
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (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