SUBJECT OUTLINE: EN 124 INTRODUCTION TO ENGINEERING DESIGN

Course(s)	Common to all Bachelor of Engineering Courses
Subject Name	Introduction to Engineering Design
Subject Code	EN124
Duration	13 teaching weeks, 1 exam and 1 break week
Contact Hours	6 hours per week (2 Lect) + 1 Tut + 3 Proj/Lab)
Credit Points	15
Delivery Mode	On campus
Prerequisites	Nil
Co-requisites	Nil

Synopsis

The subject provides students with the opportunity to develop their engineering design skills, underpinned through the utilisation of a broad range of engineering drafting equipment, media, and reproduction methods including computer-aided design and drafting (CADD). Topics include design elements and components and the application of CADD in the design process. The importance of communication design through drawings, presentations and writing as key steps in solving most engineering problems is stressed. A team based design project is undertaken.

Subject Topics

1. Introduction to engineering design and design teams
2. Design elements and components including design drafting
3. Drafting and reproduction methodologies including sketching applications within engineering design
4. Introduction to Computer-Aided Design and Drafting (CADD) as part of the design process
5. Geometry, views, annotations, dimensioning and tolerancing
6. Producing working design drawing
7. Design specifications

Subject Learning Outcomes (SLOs)

On completion of this subject students will be able to:

1. Identify and apply the various elements and components within an engineering design process.
2. List and describe the key terminology and tools within engineering design drawing.
3. Apply their skills to solve technical problems, and to develop a systematic methodology in engineering design drawing.
4. Outline systematic methodologies within the engineering design process
5. Apply creativity, problem solving, and decision-making techniques in the design process.

6. Display communication, teamwork and leadership skills through active participation within an engineering design team.

Assessment Tasks and Weightings

To obtain a pass grade in this Unit 50% overall must be achieved plus at least 40% in the Final Design Report. There is no final examination in this subject. Unit Assessment consists of reports, assignments, test and a presentation as summarised below. Students must also refer to the Assignments and the Subject Assessment Guide for detailed information on each assignment.

Assessment Task 1: Project Concept Report. The first assessment task is a Team based report that outlines; team formation, the roles of team members, the process for design project selection, the team action plan and future schedule for meetings. A Gantt chart or its equivalent is required. It is worth 10% of the total marks for the subject.

Assessment Task 2: Two individual written assignments that are each worth 5% and contribute 10% overall to the final marks.

Assessment Task 3: Two class tests/quizzes that are each worth 5% and contribute 10% overall to the final marks.

Assessment Task 4: Design Progress Report. The Team based report outlines the team progress in achieving design outcomes. The report will outline the progress against the schedule provided in assessment task 1 and identify the issues that may have impacted on progress. It is worth 15% of the total marks for the subject.

Assessment Task 5: Final Design Report. The assessment task is comprised of a combination of individual and team-based reports outlining the design processes, issues that may have impact design, design outcomes and recommendations for future work. It is worth 40% of the total marks for the subject.

Assessment Task 6: Team Presentation. The task is a Team audio visual presentation of the Final Design Report, which focusses on design outcomes. Marks will be awarded for Team members and the overall Team. It is worth 15% of the total marks for the subject.

It is important that all students familiarise themselves with the University of Technology Assessment Guidelines including those on plagiarism in the Academic Integrity Policy at:

http://asix.unitech.ac.pg/apps/pnguot/?q=unitech/policies

Subject Mapping

Subject Learning Outcomes (SLO) are mapped to each of; PNG National Qualifications Framework (NQF), Course Learning Outcomes (CLO), Unitech Graduate Attributes (GA) and Engineers Australia Stage 1 Competencies.

The Subject Learning Outcomes for this Subject combine with those of all Subjects within your course to collectively deliver the Engineers Australia Stage 1 Competencies.

Subject Mapping Matrix

SLO	SLO to NQF	SLO to CLO*	SLO to GA	SLO to AT	SLO to EA Stage 1 Competencies
1	Application	3,4,5	Critical Thinker	1,2,3	1.5, 1.6, 2.3, 3.2, 3.6
2	Application	6,7,8	Effective Communicator	1,2,3,4	1.2, 1.3, 2.3
3	Knowledge & Skills	3,5,8	Critical thinker Technologically savvy	1,3	1.2, 1.3, 1.5
4	Application Skills	1,5,7	Critical thinker Technologically savvy	1,2,3	1.5, 1.6, 2.3, 2.4, 3.1, 3.6
5	Application Knowledge	1,2,5	Moral uprightness Technologically savvy	1,2,3	1.3, 1.5, 2.2, 2.3, 3.2, 3.6
6	Application	2,4,5,6,7, 8	Effective Communicator & Moral Uprightness Technologically savvy	4	1.5, 1.6, 2.3, 2.4, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6

Graduate Capability Statement

This subject is common to all Bachelor of Engineering courses. Student should refer to their own engineering discipline for the Graduate Capability Statement that applies to their course/discipline.

Engineering Courses Learning Outcomes - EA Stage 1 Competencies

This Subject is common to all engineering courses and its Learning Outcomes are mapped to the following broad engineering Course Learning Outcomes, which mesh with those of each engineering discipline.

The following table is included to demonstrate to students that overall, the Engineering CLOs address all Competencies. The combined mapping details for all SLOs to Engineers Australia Stage 1 Competencies for each course provides finer detail.

Course Learning Outcome	Engineers Australia Stage 1 Competencies
1. Possession of a deep understanding of the sciences, math, information systems and engineering fundamentals that underpin the engineering disciplines.	1.1, 1.2
2. An in-depth understanding of the body of knowledge that forms the engineering disciplines.	1.2, 1.3
3. Collection, synthesis and application of information within the engineering disciplines.	1.4, 1.5, 2.1, 2.3, 2.4, 3.4
4. Undertaking research, analysis & evaluation of ideas and concepts within engineering.	1.3, 1.4, 1.6, 2.1, 2.3, 2.4, 3.2, 3.4
5. Applying problem solving skills to complex engineering systems and processes.	1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3
6. Undertake engineering design and manage engineering projects.	1.6, 2.2, 2.4, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6
7. Communication via multiple media to diverse audiences, undertaking team roles, teamwork and providing team leadership.	2.4, 3.2, 3.3, 3.4, 3.5, 3.6
8. Behaving in an ethical and professional manner and respecting others.	1.6, 2.4, 3.1, 3.4, 3.5, 3.6
9. Being cognisant of the importance of sustainability and the environmental impact of engineering.	1.5, 1.6, 3.1, 3.3, 3.4

***Note:** While the course learning outcomes will have minor differences for each engineering course the above mapping remains valid for use in all courses.

Engineers Australia Stage 1 Competencies

1. KNOWLEDGE AND SKILL BASE	2.ENGINEERING APPLICATION ABILITY	3. PROFESSIONAL AND PERSONAL ATTRIBUTES
1.1 Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.	2.1 Application of established engineering methods to complex engineering problem solving.	3.1 Ethical conduct and professional accountability.
1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.	2.2 Fluent application of engineering techniques, tools and resources.	3.2 Effective oral and written communication in professional and lay domains.
1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline.	2.3 Application of systematic engineering synthesis and design processes.	3.3 Creative, innovative and pro-active demeanour.
1.4 Discernment of knowledge development and research directions within the engineering discipline.	2.4 Application of systematic approaches to the conduct and management of engineering projects.	3.4 Professional use and management of information.
1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline.		3.5 Orderly management of self, and professional conduct.
1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline		3.6 Effective team membership and team leadership.

Unitech Graduate Attributes

Attribute	Academic dimension	Personal Dimension	Transferable Dimension
1. Lifelong learner	Sustained intellectual curiosity and use of feedback to reflect on their own work.	Sets aspirational goals for personal improvement and career growth.	Takes responsibility for one's learning and development.
2. Critical thinker	Uses rules of inference to analyse complex issues and find solutions.	Calmly uses logic and critical thinking, and not emotion, in all situations.	Ability to find solutions to problems by using logical and imaginative thinking.
3. Effective communicator	Ability to discuss and debate issues articulately and confidently and convincingly.	Character of producing high quality written essays and oral presentations.	Ability to communicate and negotiate with others and to listen to them.
4. Cultural modernist	Familiarity with international standards and world cultures and human rights.	Tolerance of the religions and cultures of others.	Ability to work in a multicultural setting and comprehension and tolerance of religious and cultural differences.
5. Moral uprightness	Understand and act upon the ethical responsibilities of their actions.	Character of acting in a morally upright way in all situations.	Professional behaviour at all times.
6. Technologicall y savvy	Familiarity and use of technologies appropriately.	Keeping up to date with innovations.	Character of accepting new technology and quickly adapting to it.

Student Workload

The total workload for the subject is nominally 150 hours, based on a 15-week semester with 14 weeks of teaching as per the PNG National Qualification Framework.

Subject Text

Madsen D.A., Madsen D.P.-Engineering Drawing & Design, 5th Edition, Delmar, Cengage Learning, 2012.

References, Readings and Resources

Engineering Design Process, available at https://www.youtube.com/watch?v=ZQF8iU7ygoM

Introduction to Engineering Design Course, available at https://www.youtube.com/watch?v=sCgGW5XBnGI

Introduction to Engineering Design Process and Stages of Designing, available at

https://www.youtube.com/watch?v=1JQBkU-DtYY

Summer Institute for Engineering and Technology Education, 2001. Introduction to Engineering Design and Problem Solving, available at https://webpages.uncc.edu/~jmconrad/hsed/intr_0in.pdf

Other readings and resources for this subject will depend on the design project selected for students to undertake.

Relevant Unitech Policies

It is important that all students familiarise themselves with the PNGUOT Assessment Guidelines including those on plagiarism and other relevant policies. These policies are viewed by visiting the PNGUOT website:

http://asix.unitech.ac.pg/apps/pnguot/?q=unitech/policies