



UOW  
COLLEGE  
AUSTRALIA

—  
PATHWAYS TO  
UNIVERSITY OF  
WOLLONGONG

# Undergraduate Certificate in Engineering

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## Course Outline

# Contents

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|    |  |    |
|----|--|----|
| 1  | Course Description.....                                    | 3  |
| 2  | Graduate Qualities.....                                    | 4  |
| 3  | Course Learning Outcomes.....                              | 4  |
| 4  | Course Learning Outcomes Mapped to Graduate Qualities..... | 5  |
| 5  | Course Structure and Subjects.....                         | 6  |
| 6  | Subjects Mapped to Course Learning Outcomes.....           | 7  |
| 7  | Progression Guidelines .....                               | 7  |
| 8  | Entry Requirements / Admissions Guidelines .....           | 8  |
| 9  | Assessment.....  | 8  |
| 10 | Quality Assurance .....                                    | 8  |
| 11 | Subject Descriptions.....                                  | 9  |
| 12 | Version Control Table .....                                | 11 |

# Undergraduate Certificate in Engineering Course Outline

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## 1 Course Description

The UOW College Australia (UOWCA) Undergraduate Certificate in Engineering provides a program of study involving students in first year engineering subjects, but with additional levels of support which enhance their opportunity to succeed. Students are provided a range of experiences and opportunities to engage with core engineering disciplines, including maths and physics, at the tertiary level. The course also provides students with a broad educational and skills base as preparation for a variety of entry level positions in industries and businesses requiring engineering knowledge and aptitudes.

Successful completion of the Undergraduate Certificate of Engineering provides students with entry into the UOWCA Diploma of Engineering with 24 points of credit.

Undergraduate Certificates are higher education qualifications of six months duration that may be used to articulate with existing qualifications at AQF levels 5, 6, or 7. They qualify individuals with knowledge and skills for further study, professional upskilling, employment and participation in lifelong learning.

## 2 Graduate Qualities

The Undergraduate Certificate of Engineering course is designed to assist students in developing the UOW College Graduate Qualities. It helps students become:

1. **Informed:** Have a basic knowledge of an area of study and understand its issues. Know how to apply this knowledge.
2. **Independent Learners:** Begin to engage with new ideas and ways of thinking and critically analyse issues. Seek to extend knowledge through ongoing enquiry and active learning. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.
3. **Problem Solvers:** Demonstrate introductory levels of creative, logical and critical thinking skills to respond effectively to problems. Be flexible and thorough.
4. **Effective Communicators:** Articulate and convey ideas effectively using a range of media. Work collaboratively and engage with people in different settings.
5. **Responsible:** Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity and act with integrity. Take responsibility for one's own learning and completion of assessment tasks.

## 3 Course Learning Outcomes

Graduates will be able to:

1. Demonstrate a broad and coherent body of knowledge required to upskill professionally.
2. Demonstrate knowledge and skills sufficient to sustain lifelong learning in higher education and vocational settings.
3. Apply knowledge in new or existing disciplines or professional areas.
4. Demonstrate an appropriate depth of integrated knowledge of the specialisation area.

## 4 Course Learning Outcomes Mapped to Graduate Qualities

The table below shows how the graduate qualities are integrated into the course learning outcomes:

| <b>Course Learning Outcomes/Graduate Qualities</b>   | <b>1. Informed</b> | <b>2. Independent Learners</b> | <b>3. Problem Solvers</b> | <b>4. Effective Communicators</b> | <b>5. Responsible</b> |
|--|--------------------|--------------------------------|---------------------------|-----------------------------------|-----------------------|
| 1. Demonstrate a broad and coherent body of knowledge required to upskill professionally.                                | ✓                  |                                |                           | ✓                                 |                       |
| 2. Demonstrate knowledge and skills sufficient to sustain lifelong learning in higher education and vocational settings. | ✓                  | ✓                              |                           |                                   | ✓                     |
| 3. Apply knowledge in new or existing disciplines or professional areas.   | ✓                  | ✓                              | ✓                         |                                   |                       |
| 4. Demonstrate an appropriate depth of integrated knowledge of the specialisation area.                                  | ✓                  |                                |                           | ✓                                 |                       |

## 5 Course Structure and Subjects

| <b>UNDERGRADUATE CERTIFICATE IN ENGINEERING (UOW Autumn and Spring Sessions)</b> |   |                      |                             |
|--|---|----------------------|-----------------------------|
| <b>UOW Autumn Session</b>  |   |                      |                             |
| <b>Subject Code</b>  | <b>Subject Name (UOW Equivalent Subject Code)</b> | <b>Credit Points</b> | <b>Contact Hours a Week</b> |
| DPEN102  | Fundamentals of Engineering Mechanics (ENGG102)   | 6                    | 6                           |
| DPEN103  | Materials in Design (ENGG103)                     | 6                    | 6                           |
| DPEN105  | Engineering Design for Sustainability (ENGG105)   | 6                    | 6                           |
| DPEN141*   | Foundations of Engineering Mathematics (MATH141)  | 6                    | 6                           |
| <b>Total Session 1</b>   |   | <b>24</b>            | <b>24</b>                   |
| <b>UOW Spring Session</b>  |   |                      |                             |
| <b>Subject Code</b>  | <b>Subject Name (UOW Equivalent Subject Code)</b> | <b>Credit Points</b> | <b>Contact Hours a Week</b> |
| DPEN100  | Engineering Computing and Analysis (ENGG100)      | 6                    | 6                           |
| DPEN104  | Electrical Systems (ENGG104)                      | 6                    | 6                           |
| DPEN142  | Essentials of Engineering Mathematics (MATH142)   | 6                    | 6                           |
| DPEN143  | Physics for Engineers (PHYS143)                   | 6                    | 6                           |
| <b>Total Session 2</b>   |   | <b>24</b>            | <b>24</b>                   |

\*DPEN141 Foundations of Engineering Mathematics is a pre-requisite for DPEN142 Essentials of Engineering Mathematics. Students cannot enrol in DPEN142 unless they pass DPEN141 with a minimum result of 50%.

## 6 Subjects Mapped to Course Learning Outcomes

| Subject/ Course Learning Outcomes              | 1. Demonstrate a broad and coherent body of knowledge required to upskill professionally. | 2. Demonstrate knowledge and skills sufficient to sustain lifelong learning in higher education and vocational settings. | 3. Apply knowledge in new or existing disciplines or professional areas. | 4. Demonstrate an appropriate depth of knowledge of the specialisation area. |
|--|---|--|--|--|
| DPEN141 Foundations of Engineering Mathematics | ✓   | ✓  | ✓  | ✓  |
| DPEN142 Essentials of Engineering Mathematics  | ✓   | ✓  | ✓  | ✓  |
| DPEN143 Physics for Engineers                  | ✓   | ✓  | ✓  | ✓  |
| DPEN100 Engineering Computing and Analysis     | ✓   | ✓  | ✓  | ✓  |
| DPEN105 Engineering Design for Sustainability  | ✓   | ✓  | ✓  | ✓  |
| DPEN102 Fundamentals of Engineering Mechanics  | ✓   | ✓  | ✓  | ✓  |
| DPEN103 Materials in Design                    | ✓   | ✓  | ✓  | ✓  |
| DPEN104 Electrical Systems                     | ✓   | ✓  | ✓  | ✓  |

## 7 Progression Guidelines

To qualify for the award of the Undergraduate Certificate in Engineering, students must achieve a minimum result of 50% in any four approved subjects.

1. Students who meet the requirements for the award of the Undergraduate Certificate can progress to the Diploma of Engineering with 24 points of credit.

## 8 Entry Requirements / Admissions Guidelines

Entry requirements for this course can be viewed online at:

<https://coursefinder.uow.edu.au/information/index.html?course=undergraduate-certificate-engineering-uow-college>

## 9 Assessment

Students are required to complete a number and variety of assessment tasks related to their streams of study.

Each subject has a subject outline that is issued to students. Subject outlines contain an overview of subject objectives, an assessment schedule, a list of learning resources and a weekly topic outline. Subject outlines also contain an explanation of assessment components.

All assessment tasks with a weighting of 10% or greater have marking criteria and an answer/marking guide.

All aspects of assessment are governed by the Assessment Guidelines, which can be viewed at: [Assessment & Examination Guidelines for Students](#) and [Assessment Guidelines](#).

## 10 Quality Assurance

The College applies formal quality assurance processes to its design of courses, subjects and their assessments. These processes include:

- Clear subject outlines that align with the objectives of the course and support consistent delivery of content;
- Mandatory inclusion of clear and appropriate marking criteria in assessment tasks;
- Moderation of marking of student assessment tasks, ensuring that the assessment criteria have been applied consistently and there is equity across individual markers;
- A regular schedule of audits on student assessment tasks using randomly-selected samples of student work; and
- The use of feedback from students and teachers to inform continuous improvement of curriculum, delivery, policies and procedures.

Details of the College's approach to quality assurance can be viewed at the following link: <https://www.uowcollege.edu.au/about/policies-procedures/index.html>.



## **11 Subject Descriptions**

### **DPEN141 Foundations of Engineering Mathematics**

This subject consists of two strands, Calculus and Linear Algebra. The Calculus strand covers differential calculus and provides an introduction to integral calculus. The Linear Algebra strand covers matrices, determinants and applications of these in the sub-topic of vector geometry. All of these are presented with accompanying examples from various engineering disciplines.

### **DPEN142 Essentials of Engineering Mathematics**

This subject consists of two strands, Integral Calculus with applications and Series. The Integral Calculus strand presents a number of analytical and numerical integration techniques plus applications of integration to find areas, volumes of revolution and solve differential equations. The Series strand covers techniques for finding limits, determining the convergence of series and leads into Taylor series. All of these are presented with accompanying examples from various Engineering disciplines.

### **DPEN143 Physics for Engineers**

This subject covers vectors and their applications, and an introduction to the physical laws of electricity and magnetism, leading to an explanation of the generation of electromagnetic waves and some basic ideas in communication theory. It addresses electric charge and Coulomb's law, electric fields, potential differences, capacitance, dielectrics and relative permittivity, electric current, resistance, Ohm's 'law', superconductivity, DC circuits and Kirchhoffs laws, magnetic fields and forces, electromagnetic waves and the EM spectrum, carrier waves, modulation and bandwidth. It covers waves; reflection and refraction; interference; diffraction; polarization; optical instruments; quantum physics; waves and particles; atomic physics; and the Bohr atom.

### **DPEN100 Engineering Computing and Analysis**

This subject teaches algorithm design and computer programming using MATLAB. Students will develop a systematic approach to analyse engineering problems and create algorithms that solve real-world problems. Topics include: problem-solving techniques; algorithm design; data types and operators; conditional and repetitive control flow; file access; functions; data visualisation; code optimisation; arrays/matrices; and vectorisation. Students will also focus on computational tools to solve engineering problems such as kinematics of rectilinear and curvilinear motion.

### **DPEN105 Engineering Design for Sustainability**

In this subject, students draw together engineering principles covered in other subjects to develop context-appropriate solutions to engineering challenges. Students will work in teams undertaking investigation, concept development, and detailed design that demonstrate innovative and creative thinking. Students must consider the technical, social, economic and environmental aspects of a design problem to produce solutions that are likely to be workable in the real world.

### **DPEN102 Fundamentals of Engineering Mechanics**

In this subject, students explore fundamental laws of motion and their application to the analysis and design of simple structures. Students will undertake a series of design and build projects to see the effects of concepts of mechanics in real structures. Working in design teams, students will also explore the professional responsibilities of engineers in terms of accountability, liability and sound design and analysis techniques.

### **DPEN103 Materials in Design**

In this subject, students explore the interrelationships between materials structure, properties, processing, application and lifecycle. Students will apply materials science and lifecycle analysis to develop solutions to engineering problem that are optimised for sustainability. Students must consider both economic and environmental impact in the identification and selection of appropriate materials in engineering design.

### **DPEN104 Electrical Systems**

This subject provides an introduction to real-world electrical systems. The subject teaches fundamental electrical concepts: charge, current, voltage, resistance, capacitance, inductance, energy and power. The subject introduces theorems to simplify AC and DC circuits through analysis and simulation. The subject also links the fundamental concepts to practical engineering applications such as motors and generators. The laboratory component covers measurements using electrical components and equipment, designing basic circuits, as well as report writing.

## 12 Version Control Table

| Version Control | Date Effective | Approved By           | Amendment   |
|-----------------|----------------|-----------------------|---|
| 1               | 18/12/2021     | Vice-Chancellor       | Initial release – 2021 delivery                                       |
| 2               | 09/09/2021     | UOWCA General Manager | Replace DENG subject codes with DPEN subject codes for 2022 delivery. |