



### Course information for

Associate Degree of Applied Engineering  
(Renewable Energy Technologies)

### Course Number

HE20502

### Locations

Newcastle

Ultimo

Go higher

## Course Structure

The structure below is the typical study pattern for a full time student. Availability of electives and study pattern is determined by the campus. All subjects are worth 10 credit points (CP). 160 credit points are required to complete this course.

### Year 1 Level 100 – Foundation Engineering

#### Semester 1

ENEGY101A	Foundation studies in renewable energy and sustainability (10CP)
ENEMP101A	Introductory engineering maths and physics (10CP)
ENMAT101A	Engineering materials and processes (10CP)
ENMCC101A	Foundation mechanical and civil engineering principles (10CP)

#### Semester 2

ENELE101A	Principles of electrical engineering 1 (10CP)
ENEMP102A	Foundation engineering maths and physics (10CP)
ENPRA101A	Engineering Practices (10CP)
AEEGY201A	Energy storage systems (10CP)

### Year 2 Level 200 – Engineering Development

#### Semester 3

ENEMP201A	Intermediate engineering maths and physics (10CP)
ENMGT201A	Engineering management (10CP)

*Plus two electives from elective bank*

#### Semester 4

ENEMP202A	Advanced engineering maths and physics (10CP)
AEEGY202A	Renewable energy resource analysis (10CP)

*Plus two electives from elective bank*

#### Elective Bank

AEEGY101A	Grid connected photovoltaic power systems (10CP)
AEEGY102A	Solar and thermal energy systems (10CP)
AEEGY203A	Wind energy conversion systems (10CP)
AEEGY204A	Energy system efficiency (10CP)
ENELE201A	Advanced electrical engineering (10CP)
ENELE202A	Principles of electrical machines (10CP)
ENELE203A	Electronics and power control (10CP)
ENMCC201A	Advanced mechanical and civil engineering principles (10CP)

## Overview of subject requirements

The information on the following pages provides an overview and an indicative assessment schedule for each subject in the course. It is provided for information purposes only. The Subject Guide distributed to enrolled students will detail full learning and assessment requirements for each subject.

**SUBJECT:** Grid connected photovoltaic systems

**CODE:** AEEGY101A      **CREDIT POINTS:** 10      **CONTACT HRS:** 4 hpw

**PREREQUISITES:** ENEMP101A & ENELE101A & ENEGY101A

### Subject overview

In this subject you will learn the principles of grid connect photovoltaic power systems. You will develop knowledge and applied skills relating to solar geometry and radiation, principles of photovoltaic modules and grid connected inverters. You will develop the knowledge and skills to perform design calculations to match photovoltaic modules and inverters for a proposed site given appropriate site data, and to calculate energy output and monetary payback. You will learn the requirements for installing, commissioning and maintaining grid connected photovoltaic power systems. You will also learn the underlying principles of smart metering, smart grids, basic energy efficiency and large scale grid connected photovoltaic power systems.

### Indicative assessment schedule

Design project	50%
Written examination	50%

**SUBJECT:** Solar and thermal energy systems

**CODE:** AEEGY102A      **CREDIT POINTS:** 10      **CONTACT HRS:** 4 hpw      **PREREQUISITES:** ENEGY101A+ ENEMP101A

### Subject overview

In this subject you will learn about thermal energy (heat). Mechanical Engineering, more so than any other engineering discipline, involves the design and/or specification of equipment for the control and use of heat. Typical tasks include heating, cooling, drying, as well as various energy conversions involving heat and the conversion of heat to mechanical power. In a renewable energy context, the sun is a major source of thermal energy – solar heat is therefore a major topic in this subject, but other heat sources including waste heat and geothermal energy will also be considered.

In this Mechanical core subject students will develop a foundation understanding of thermal engineering practice. This understanding will include theory, knowledge of equipment, sizing calculations, and considerations of economic viability.

### Indicative assessment schedule

Individual written report	10%
Short answer test	20%
Portfolio	20%
Written examination	50%

**SUBJECT:** Energy storage systems

**CODE:** AEEGY201A      **CREDIT POINTS:** 10      **CONTACT HRS:** 4 hpw

**PREREQUISITES:** ENEMP101A & ENELE101A & ENEGY101A

### Subject overview

In this subject you will learn about energy storage systems. You will develop specialised knowledge and skills relating to the design and application of Energy Storage Systems in both Renewable and non-Renewable energy supply systems. You will develop the ability to critically examine current and future energy storage technologies to determine their applicability to a range of energy storage applications and be able to advise on appropriate technology options.

### Indicative assessment schedule

Individual written report	25%
Group design project	25%
Group presentation	10%
Written examination	40%

**SUBJECT:** Renewable energy resource analysis

**CODE:** AEEGY202A      **CREDIT POINTS:** 10      **CONTACT HRS:** 4 hpw      **PREREQUISITES:** ENEGY101A

### Subject overview

In this subject you will learn about our society's current dependence on fossil fuels and relevant behavioural trends. You will investigate how a coal fuelled thermal power station works, and learn about alternative renewable energy technologies that might potentially replace our dependence on fossil fuels. You will learn about constraints impacting on the implementation of renewable energy technologies. You will explore physical characteristics, political beliefs and regional practices that underpin the limited implementation of renewable energy technologies to date. You will develop numeric awareness with regard to scope of size, pertaining firstly to your own environment, the fossil energy giants and then related to the renewable energy sector.

### Indicative assessment schedule

Individual written report	20%
Individual written report	20%
Portfolio and/or written report	20%

Associate Degree of Applied Engineering (Renewable Energy Technologies)

Written examination

40%

## Associate Degree of Applied Engineering (Renewable Energy Technologies)

**SUBJECT:** Wind energy conversion systems

**CODE:** AEEGY203A

**CREDIT POINTS:** 10

**CONTACT HRS:** 4 hpw

**PREREQUISITES:** ENEGY101A & AEEGY101A

### Subject overview

In this subject you will learn how to interpret local and global environmental wind data and select equipment to harness its freely available energy. You will develop an understanding of wind characteristics, work with equipment used in the industry, and enhance your ability to be analytical of terrain and seasonal movement of wind energy. The engineering knowledge and skills gained through this subject will enable you to review prospective sites and make decisions about their potential along with the wind energy conversion equipment needed.

### Indicative assessment schedule

Individual written report	10%
Group project & written report	25%
Portfolio and/or written report	15%
Written examination	50%

**SUBJECT:** Energy system efficiency

**CODE:** AEEGY204A

**CREDIT POINTS:** 10

**CONTACT HRS:** 4 hpw

**PREREQUISITES:** ENEMP102A+ ENMCC101A

### Subject overview

In this subject you will learn how to perform calculations related to energy conversion and energy auditing. You will also learn how to outline the economic and environmental benefits of energy efficiency, and how explain methods employed to improve energy efficiency in all areas of the energy supply sector.

### Indicative assessment schedule

Major individual written report	50%
Written examination	50%

**SUBJECT:** Foundation studies in renewable energy and sustainability

**CODE:** ENEGY101A

**CREDIT POINTS:** 10

**CONTACT HRS:** 4 hpw

**PREREQUISITES:** Nil

### Subject overview

In this subject you will develop the skills and knowledge to critically assess issues in Renewable Energy and Sustainability. You will gain a broad understanding of current and emerging Renewable Energy Technologies, and the principles underlying movements toward a sustainable economy in a post-carbon world.

### Indicative assessment schedule

Individual written report	10%
Written report on field trip	10%
Collaborative written report	25%
Presentation	10%
Written examination	45%

**SUBJECT:** Principles of electrical engineering 1

**CODE:** ENELE101A

**CREDIT POINTS:** 10

**CONTACT HRS:** 4 hpw

**PREREQUISITES:** Nil

### Subject overview

In this subject you will learn about the principles of electrical engineering as a foundation for later study and employment. The subject will include both AC and DC theory and the analysis of basic circuits using a variety of techniques. You will be introduced to a number of theorems and laws that will be expanded on in other subjects. Students will participate in tutorials and laboratory classes to practically apply theory learnt in lectures. The laboratory classes will introduce you to analysis equipment and circuit components that will be used in later subjects.

### Indicative assessment schedule

Written examination	25%
Portfolio and/or written report	25%
Written examination	50%

**SUBJECT:** Advanced electrical engineering

**CODE:** ENELE201A

**CREDIT POINTS:** 10

**CONTACT HRS:** 4 hpw

**PREREQUISITES:** ENELE101A

### Subject overview

In this subject you will learn more about the principles and applications of electrical engineering. You will develop the knowledge and skills to solve a variety of practical problems in selected areas of electric circuits, electronics and communication systems.

### Indicative assessment schedule

Written short answer test	20%
Individual project report	20%
Individual project Presentation	20%
Written examination	40%

## Associate Degree of Applied Engineering (Renewable Energy Technologies)

**SUBJECT:** Principles of electrical machines

**CODE:** ENELE202A      **CREDIT POINTS:** 10      **CONTACT HRS:** 4 hpw      **PREREQUISITES:** ENEMP101A & ENELE101A

### Subject overview

Students will learn about the construction, operating principles, performance characteristics, control and applications of transformers and major types of electric machines. The subject will emphasise the basic principles and construction of transformers and rotating machinery and develop methods of constructing equivalent circuits to analyse performance and predict operational parameters.

### Indicative assessment schedule

Written examination	35%
Portfolio and/or written report	30%
Written examination	35%

**SUBJECT:** Electronics and power control

**CODE:** ENELE203A      **CREDIT POINTS:** 10      **CONTACT HRS:** 4 hpw      **PREREQUISITES:** Nil

### Subject overview

In this subject you will learn about the basic concepts of analogue and digital electronics and the electronic means of controlling power in a variety of applications including renewable energy. You will explore and analyse a range of electronic components, circuits and systems used to electronically control power. You will construct and test various circuits to aid your understanding of concepts.

### Indicative assessment schedule

Individual written report	20%
Group project and presentation	30%
Portfolio and/or written report	10%
Written examination	40%

**SUBJECT:** Introductory engineering maths and physics

**CODE:** ENEMP101A      **CREDIT POINTS:** 10      **CONTACT HRS:** 4 hpw      **PREREQUISITES:** Nil

### Subject overview

This is the first of a series of four subjects covering various topics in mathematics and physics. In this subject, you will learn about some introductory principles in both subjects. You will learn how to apply those basic principles in many engineering applications. In the mathematics part of the subject, you will learn how to use programming software like Microsoft Excel to solve mathematical or physical problems. Functions, algebraic equations and differential calculus are also introduced. In the physics part of the subject, you will learn about the SI systems of units, vectors and their use, statics and dynamics including the Laws of Motion and foundations of mechanical waves.

### Indicative assessment schedule

Test	10%
Written examination	20%
Portfolio and/or written report	20%
Written examination	50%

**SUBJECT:** Foundation engineering maths and physics

**CODE:** ENEMP102A      **CREDIT POINTS:** 10      **CONTACT HRS:** 4 hpw      **PREREQUISITES:** ENEMP101A

### Subject overview

This subject is the second in a series of four subjects covering topics in both mathematics and physics. In this subject, the study of calculus will proceed to cover some techniques of integration and the applications of integral calculus in the solution of mathematical and engineering problems. An introduction to the techniques of optimisation and approximation together with the use of Riemann integrals will be discussed. The physics part of the subject introduces the fundamentals of some physical phenomena and the laws governing them. Those topics are: static force and equilibrium, thermal physics, fluid mechanics, electrostatics, electromagnetism and current electricity. Applications of those phenomena are widely recognised in the field of renewable energy.

### Indicative assessment schedule

Short answer test	10%
Written examination	20%
Portfolio and/or written report	20%
Written examination	50%

## Associate Degree of Applied Engineering (Renewable Energy Technologies)

**SUBJECT:** Intermediate engineering maths and physics

**CODE:** ENEMP201A

**CREDIT POINTS:** 10

**CONTACT HRS:** 4 hpw

**PREREQUISITES:** ENEMP102A

### Subject overview

This subject is the third in a series of four subjects covering topics in both mathematics as well as physics. In this subject, the study of calculus will proceed to cover ordinary and partial differential equations. A closer look at function continuity and limits will be made, together with the mathematics of statistics and probability, including regression analysis and types of distributions. The physics part of this subject introduces the fundamentals of some physical phenomena and the laws governing them. These topics are: particle theory, Einstein's theories of Relativity, the nature and applications of electromagnetic waves, in particular light.

### Indicative assessment schedule

Short answer test	10%
Written examination	20%
Portfolio and/or written report	20%
Written examination	50%

**SUBJECT:** Advanced engineering maths and physics

**CODE:** ENEMP202A

**CREDIT POINTS:** 10

**CONTACT HRS:** 4 hpw

**PREREQUISITES:** ENEMP201A

### Subject overview

This subject is the fourth in a series of four subjects covering topics in both mathematics and physics. In this subject, the study of series, matrices, eigenvectors and the use of simulation software is discussed. Matlab will continue to be taught as a programming tool for engineering applications. The physics part of this subject continues to introduce some more fundamentals of physical phenomena and the laws governing them.

### Indicative assessment schedule

Short answer test	10%
Written examination	20%
Portfolio and/or written report	20%
Written examination	50%

**SUBJECT:** Engineering materials and processes

**CODE:** ENMAT101A

**CREDIT POINTS:** 10

**CONTACT HRS:** 4 hpw

**PREREQUISITES:** Nil

### Subject overview

The selection of a material in an engineering application entails an extensive range of attributes. Material properties, manufacturing processes, product performance, life cycle measurements, environmental costs, safety and economic concerns compete in the choice of a particular material, a component or system. In this core subject, students will form a foundation understanding of engineering materials based on their microstructures and behaviour, and develop familiarity with general classes of engineering materials in theory, in the laboratory, and in practice. Students will examine the modifications and processes that are used to produce successful components and products. This understanding will be used to evaluate selected renewable energy hardware and critique the choices of materials and processes made by the original engineering design team.

### Indicative assessment schedule

Short answer test	15%
Quizzes	10%
Portfolio and/or written report	30%
Collaborative report	15%
Written examination	30%

**SUBJECT:** Foundation mechanical and civil engineering principles

**CODE:** ENMCC101A

**CREDIT POINTS:** 10

**CONTACT HRS:** 4 hpw

**PREREQUISITES:** Nil

### Subject overview

In this subject you will learn fundamental mechanical and civil engineering principles, practices and methods relevant to particular renewable energy technology applications. Specifically, you will learn how to determine the resultant and equilibrant within systems of coplanar forces, calculate nominal sizes for simple beams subject to a combination of uniform and point loading, and determine stresses in structures and mechanical components.

### Indicative assessment schedule

Written examination	30%
Portfolio and/or written report	20%
Written examination	50%

## Associate Degree of Applied Engineering (Renewable Energy Technologies)

**SUBJECT:** Advanced mechanical and civil engineering principles

**CODE:** ENMCC201A      **CREDIT POINTS:** 10      **CONTACT HRS:** 4 hpw

**PREREQUISITES:** AEEGY101A & ENEMP102A & ENMCC101A

### Subject overview

In this subject you will learn about advanced mechanical and civil engineering principles, practices and methods relevant to particular renewable energy technology applications. Specifically you will learn how to determine energy, power and displacement in simple dynamic mechanical systems; stress, strain and deflection in beams and columns; and energy balances within fluid systems. You will develop an understanding of advanced mechanical and civil engineering principles, practices and methods that go into designing renewable energy facilities.

### Indicative assessment schedule

Written examination	30%
Portfolio and/or written report	20%
Written examination	50%

**SUBJECT:** Engineering management

**CODE:** ENMGT201A      **CREDIT POINTS:** 10      **CONTACT HRS:** 4 hpw      **PREREQUISITES:** ENPRA101A

### Subject overview

In this subject you will learn about the practice of engineering, what it means to be an engineer and the role of the engineer in society. You will explore and analyse real-life case studies of engineering practice, project delivery and the engineering challenges that were overcome to achieve successful project outcomes. You will develop an understanding of the engineering practice related to the electrical and electronics disciplines. You will also develop and practice engineering skills in a compulsory Professional Experience component of this subject.

### Indicative assessment schedule

Short answer test	10%
Capstone project & Presentation	35%
Individual work-based research report	10%
Reflective journal	10%
Written examination	30%
Host Company Report	5%

**SUBJECT:** Engineering practices

**CODE:** ENPRA101A      **CREDIT POINTS:** 10      **CONTACT HRS:** 4 hpw      **PREREQUISITES:** ENEMP101A & ENELE101A

### Subject overview

In this subject you will learn about the practices of an engineering professional within a multidisciplinary framework. You will develop basic knowledge and skills relating to electrical and other engineering specialisations, including introduction to the regulatory system, drawings and specifications, generation and distribution, fasteners and fastening methods, wiring systems, control and protection, illumination and emergency systems.

### Indicative assessment schedule

Essay	10%
Individual project	10%
Individual project	40%
Written examination	40%