

# Elective Pathways

## SCIENCE

These pathways have been created to provide guidance for **Bachelor of Engineering (Honours)** and **Bachelor of Surveying (Honours)** students wishing to specialise in a study area with their elective courses. **Please note** that these pathways are suggestions only and will not be noted formally on the final degree certificate.

Students are welcome to enrol in any elective provided that they satisfy the pre-requisites. For a full list of UON courses, [visit the course handbook](#).

### Aquatic Environments

85% of the population in NSW live on or near the water and 80% of Australians live within 50km of the coast. Students completing the Aquatic Environments pathway would be well placed for employment opportunities as water is a key social and economic component of our everyday lives. This pathway equips students with knowledge of this important ecosystem and the services it provides (clean water, aesthetic value, harvesting, nutrient recycling, recreational activities). B Engineering (Hons) (Environmental) is the key program for the Aquatic Environments, however, the pathway is relevant to all programs based on the importance of aquatic environments.

#### *Suggested courses:*

<a href="#">ENVS1001</a>	Environmental Science: Concepts and Methods
<a href="#">MARI1000</a>	Our Oceans
<a href="#">MARI2410</a>	Coral Reef Experiences
<a href="#">ENVS3002</a>	Applied Environmental Science

#### *Pre-requisites/Assumed knowledge:*

- *Prior to enrolment, students should ensure that they meet course requirements in relation to pre-requisites and assumed knowledge by referring to the [course handbook](#).*

#### Pathway available in the following degrees:

- ✓ Environmental

## Biochemistry

Cellular processes are increasingly being harnessed for manufacturing biomaterials.

### Suggested courses:

<a href="#">BIOL1001</a>	Molecules, Cells and Organisms
<a href="#">BIOL1002</a>	Organisms to Ecosystems
<a href="#">BIOL2010</a>	Biochemistry
<a href="#">BIOL2050</a>	Molecular Genetics

### Pre-requisites/Assumed knowledge:

- Prior to enrolment, students should ensure that they meet course requirements in relation to pre-requisites and assumed knowledge by referring to the [course handbook](#).

### Pathway available in the following degrees:

- ✓ Chemical
- ✓ Civil

## Earth Science/Geology

An understanding and knowledge of Earth Sciences and more specifically geology would greatly benefit students and is relevant to the chosen programs.

### Suggested courses:

<a href="#">GEOS1040</a>	Earth's Dynamic Systems
<a href="#">GEOS1050</a>	Earth Processes and Products
<a href="#">GEOS2080</a>	Earth Science Field Course
<a href="#">GEOS3220</a>	Coastal Environments and Processes

### Pre-requisites/Assumed knowledge:

- Prior to enrolment, students should ensure that they meet course requirements in relation to pre-requisites and assumed knowledge by referring to the [course handbook](#).

### Pathway available in the following degrees:

- ✓ Civil
- ✓ Environmental

## Environmental Chemistry

Chemistry underpins all of the science and technology associated with the environment. Designed to complement the Environmental Engineering program, with the Environmental Chemistry pathway the student has the opportunity to gain a greater understanding of Chemistry to enhance their understanding of environmental processes. The focus of the pathway is to build knowledge and skills in chemical analysis, chemistry of metals and colloidal materials. These will add value to a range of environmental engineering topics including sampling, remediation and water treatment.

### Suggested courses:

<a href="#">CHEM2110</a>	Analytical Chemistry
<a href="#">CHEM2210</a>	Inorganic Chemistry
<a href="#">CHEM3110</a>	Instrumental Chemical Analysis

Plus, one from the following courses:

<a href="#">CHEM2201</a>	Analytical and Medicinal Chemistry
<a href="#">CHEM2310</a>	Organic Chemistry
<a href="#">CHEM3210</a>	Chemistry of Nanostructured Materials

### Pre-requisites/Assumed knowledge:

- Prior to enrolment, students should ensure that they meet course requirements in relation to pre-requisites and assumed knowledge by referring to the [course handbook](#).

Pathway available in the following degrees:

- ✓ Environmental

## Inorganic Chemistry

Chemistry is the science underpinning many of the industrial operations in which Chemical Engineers will ultimately find employment. As such, with the Chemistry pathway the student has the opportunity to gain additional chemical experience with examples of reactions, systems and processes that may be found in a broad range of industrial operations. The four streams (Physical, Inorganic, Organic and Pharmaceutical Chemistry), provide context and applications for students interested in the following areas: coal or minerals processing, fine chemicals, petrochemicals, pharmaceuticals, polymers, consumer products or formulation science.

### Suggested courses:

<a href="#">CHEM2210</a>	Inorganic Chemistry
<a href="#">CHEM2410</a>	Physical Chemistry
<a href="#">CHEM3410</a>	Energy and Structure
<a href="#">CHEM3560</a>	Materials Chemistry: Solids and Semiconductors

### Pre-requisites/Assumed knowledge:

- Prior to enrolment, students should ensure that they meet course requirements in relation to pre-requisites and assumed knowledge by referring to the [course handbook](#).

Pathway available in the following degrees:

- ✓ Chemical

## Materials Chemistry

Chemistry underpins all of the science and technology associated with developing, optimising and deploying new materials. Designed to complement the Mechanical Engineering program, particularly the Materials Science and Engineering courses MECH2250 and 3400, with the Materials Chemistry pathway the student has the opportunity to gain a greater understanding of Chemistry to enhance their understanding of materials science and engineering. The focus of the pathway is to build knowledge and skills in materials chemistry, inorganic chemistry, physical chemistry, soft matter and the computational modelling of material structure. These will add value to a range of materials and mechanical engineering topics including energy storage technologies, corrosion, advanced manufacturing, tribology and engineering materials.

### *Suggested courses:*

<a href="#">CHEM1010</a>	Introductory Chemistry I
<a href="#">CHEM1020</a>	Introductory Chemistry II
<a href="#">CHEM2210</a>	Inorganic Chemistry
<a href="#">CHEM2410</a>	Physical Chemistry
<a href="#">CHEM3560</a>	Materials Chemistry: Solids and Semiconductors
<a href="#">CHEM2410</a>	Physical Chemistry
<a href="#">CHEM3410</a>	Energy and Structure
<a href="#">CHEM2310</a>	Organic Chemistry
<a href="#">CHEM3580</a>	Polymers and Colloids

### **Pathway available in the following degrees:**

✓ Mechanical

### *Pre-requisites/Assumed knowledge:*

- *Prior to enrolment, students should ensure that they meet course requirements in relation to pre-requisites and assumed knowledge by referring to the [course handbook](#).*

## Microbiology

Fermentation technology requires an understanding of microbes and how they grow in different systems (e.g. closed vs continuous). Microbes can also protect structures from erosion which has ramifications for some Civil and Environmental engineering projects.

### Suggested courses:

<a href="#">BIOL1001</a>	Molecules, Cells and Organisms
<a href="#">BIOL1002</a>	Organisms to Ecosystems
<a href="#">BIOL2090</a>	Microbial Biology
<a href="#">BIOL3100</a>	Microbiology

### Pre-requisites/Assumed knowledge:

- Prior to enrolment, students should ensure that they meet course requirements in relation to pre-requisites and assumed knowledge by referring to the [course handbook](#).

### Pathway available in the following degrees:

- ✓ Chemical
- ✓ Civil
- ✓ Environmental
- ✓ Mechanical
- ✓ Surveying

## Molecular Biology

Gene technology is a tool of increasing use and is combined with large-scale fermentation in the biotechnology industry. The big data generated by molecular biology is best handled by bioinformatics.

### Suggested courses:

<a href="#">BIOL1001</a>	Molecules, Cells and Organisms
<a href="#">BIOL1002</a>	Organisms to Ecosystems
<a href="#">BIOL2050</a>	Molecular Genetics
<a href="#">BIOL3090</a>	Molecular Biology

### Pre-requisites/Assumed knowledge:

- Prior to enrolment, students should ensure that they meet course requirements in relation to pre-requisites and assumed knowledge by referring to the [course handbook](#).

### Pathway available in the following degrees:

- ✓ Chemical
- ✓ Computer Systems
- ✓ Environmental

## Organic Chemistry

Chemistry is the science underpinning many of the industrial operations in which Chemical Engineers will ultimately find employment. As such, with the Chemistry pathway the student has the opportunity to gain additional chemical experience with examples of reactions, systems and processes that may be found in a broad range of industrial operations. The four streams (Physical, Inorganic, Organic and Pharmaceutical Chemistry), provide context and applications for students interested in the following areas: coal or minerals processing, fine chemicals, petrochemicals, pharmaceuticals, polymers, consumer products or formulation science.

### Suggested courses:

<a href="#">CHEM2310</a>	Organic Chemistry
<a href="#">CHEM2210</a>	Inorganic Chemistry
<a href="#">CHEM3310</a>	Molecular Organic Synthesis
<a href="#">CHEM3580</a>	Polymers and Colloids

### Pathway available in the following degrees:

✓ Chemical

### Pre-requisites/Assumed knowledge:

- Prior to enrolment, students should ensure that they meet course requirements in relation to pre-requisites and assumed knowledge by referring to the [course handbook](#).

## Pharmaceutical Chemistry

Chemistry is the science underpinning many of the industrial operations in which Chemical Engineers will ultimately find employment. As such, with the Chemistry pathway the student has the opportunity to gain additional chemical experience with examples of reactions, systems and processes that may be found in a broad range of industrial operations. The four streams (Physical, Inorganic, Organic and Pharmaceutical Chemistry), provide context and applications for students interested in the following areas: coal or minerals processing, fine chemicals, petrochemicals, pharmaceuticals, polymers, consumer products or formulation science.

### Suggested courses:

<a href="#">CHEM2201</a>	Analytical and Medicinal Chemistry
<a href="#">CHEM2310</a>	Organic Chemistry
<a href="#">CHEM3550</a>	Medicinal and Biological Chemistry
<a href="#">CHEM3110</a>	Instrumental Chemical Analysis

### Pathway available in the following degrees:

✓ Chemical

### Pre-requisites/Assumed knowledge:

- Prior to enrolment, students should ensure that they meet course requirements in relation to pre-requisites and assumed knowledge by referring to the [course handbook](#).

## Physical Chemistry

Chemistry is the science underpinning many of the industrial operations in which Chemical Engineers will ultimately find employment. As such, with the Chemistry pathway the student has the opportunity to gain additional chemical experience with examples of reactions, systems and processes that may be found in a broad range of industrial operations. The four streams (Physical, Inorganic, Organic and Pharmaceutical Chemistry), provide context and applications for students interested in the following areas: coal or minerals processing, fine chemicals, petrochemicals, pharmaceuticals, polymers, consumer products or formulation science.

### Suggested courses:

<a href="#">CHEM2410</a>	Physical Chemistry
<a href="#">CHEM3410</a>	Energy and Structure
<a href="#">CHEM3560</a>	Materials Chemistry: Solids and Semiconductors
<a href="#">CHEM3580</a>	Polymers and Colloids

### Pathway available in the following degrees:

✓ Chemical

### Pre-requisites/Assumed knowledge:

- Prior to enrolment, students should ensure that they meet course requirements in relation to pre-requisites and assumed knowledge by referring to the [course handbook](#).

## Plant Biology

Plants provide the entry point of all energy and nutrients into terrestrial ecosystems. A comprehensive investigation of coordinated plant development is critical for broad scale environmental understanding.

### Suggested courses:

<a href="#">BIOL1001</a>	Molecules, Cells and Organisms
<a href="#">BIOL1002</a>	Organisms to Ecosystems
<a href="#">BIOL2220</a>	Plant Cell Development
<a href="#">BIOL3330</a>	Plant Development and Physiology

### Pathway available in the following degrees:

✓ Environmental

### Pre-requisites/Assumed knowledge:

- Prior to enrolment, students should ensure that they meet course requirements in relation to pre-requisites and assumed knowledge by referring to the [course handbook](#).

## Sustainability

Finding sustainable solutions for complex environmental issues is more than a technological matter. The best solutions consider the social, political and economic context in which the responses are deployed. This pathway introduces students to this context and deepens their understanding of how environmental engineering solutions are interlinked with the social, political and economic world. The sustainability pathway is designed for those students who want their solutions to have maximum effect and public benefit.

### *Suggested courses:*

<a href="#">ENVS1003</a>	Environmental Values and Ethics
<a href="#">ENVS1004</a>	Social Development and the Environment
<a href="#">ENVS2008</a>	The Sustainable Society
<a href="#">ENVS3006</a>	Sustainability: Theory and Practice

### **Pathway available in the following degrees:**

✓ Chemical

### *Pre-requisites/Assumed knowledge:*

- *Prior to enrolment, students should ensure that they meet course requirements in relation to pre-requisites and assumed knowledge by referring to the [course handbook](#).*