



# Elective Pathways

## MATHEMATICS

These pathways have been created to provide guidance for **Bachelor of Engineering (Honours)** students wishing to specialise in a study area with their elective courses. Each course has been selected to complement the content of the Bachelor of Engineering (Honours) degrees with consideration of pre-requisites.

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](#).

### Discrete Modelling

Concepts from logic, algebra and graph theory are embodied in digital computers through the design of their hardware and software. The Discrete Mathematics pathway provides an understanding of these foundations of computer science and computer engineering that enables more flexible and powerful use of computers. This pathway is suitable for students of engineering who will be working with computers. Graduating students will have enhanced understanding of the subjects of their engineering major and be more productive in future industrial or academic settings. Emphasis is on the development of skills in formal reasoning and the conceptual understanding that facilitates ongoing learning of new developments.

#### Compulsory courses:

- [MATH2320](#) Linear Algebra
- [MATH3510](#) Combinatorics and Graph Theory
- [MATH3120](#) Algebra

#### 10 units from:

- [MATH3170](#) Number Theory
- [MATH3010](#) Logic and Set Theory
- [MATH1510](#) Discrete Mathematics *if not completed as part of engineering degree*

#### Assumed knowledge:

- *MATH3510 requires MATH1510*

#### Pathway available in the following degrees:

- ✓ Chemical
- ✓ Civil
- ✓ Computer Systems
- ✓ Electrical and Electronic
- ✓ Environmental
- ✓ Mechanical
- ✓ Mechatronics
- ✓ Software
- ✓ Surveying

## Foundations of Signal Processing

Modern signal processing is core to the new information economy. The data deluge of the new century provides new and exciting challenges for practitioners in industry and academia. The Foundations of Signal Processing pathway provides engineering students with the essential mathematical and analytical tools required for meaningful work in this booming area of research and development.

This pathway is suitable for students of engineering who wish to work at the cutting-edge of signal processing research and the development of algorithms for signal processing applications. Graduating students will have enhanced understanding of the subjects of their engineering major and be more productive in future industrial or academic settings. Emphasis is on the development of foundational mathematical skills in the area.

### Compulsory courses:

<a href="#">MATH2320</a>	Linear Algebra
<a href="#">MATH2330</a>	Analysis
<a href="#">MATH3205</a>	Fourier Analysis
<a href="#">MATH3242</a>	Complex Analysis

### Assumed knowledge:

- *MATH2310 Calculus of Science and Engineering*

### Pathway available in the following degrees:

- ✓ Chemical
- ✓ Computer Systems
- ✓ Electrical and Electronic
- ✓ Mechanical
- ✓ Mechatronics

## Modelling with Differential Equations

Differential equations provide flexible models of real-world phenomena and are ubiquitous in scientific and engineering applications. Modelling with differential equations provides one of the most effective methods of developing an understanding of the way the natural world works and provides a means of making sensible predictions of the behaviour of systems, as well as a reliable tool for design of systems.

This pathway is suitable for students of engineering who wish to benefit from the insights that modelling with differential equations provides. Graduating students will have an enhanced understanding of the subjects of their engineering major and be more productive in future industrial or academic settings. Emphasis is on the development of strong modelling, analytical and interpretive skills.

### Compulsory courses:

<a href="#">MATH2320</a>	Linear Algebra
<a href="#">MATH2330</a>	Analysis
<a href="#">MATH2800</a>	Differential Equations
<a href="#">MATH3700</a>	Advanced Differential Equations

### Assumed knowledge:

- *MATH2310 Calculus of Science and Engineering*

### Pathway available in the following degrees:

- ✓ Chemical
- ✓ Civil
- ✓ Computer Systems
- ✓ Electrical and Electronic
- ✓ Mechanical
- ✓ Mechatronics

# Operations Research

Often known as the “science of better”, Operations Research (OR) is the cornerstone of effective decision making. OR provides the basis for decision support in strategic and operational planning, resulting in more productive systems in many key sectors. OR improves efficiency and effectiveness and has enhanced organisations and experiences all around us, from more cost effective scheduling of airline crews to the design of less intrusive cancer radiation therapy treatments, from two-person start-ups to Fortune 500 companies, from global resource planning to optimising local postal delivery routes.

## Compulsory courses:

[STAT2010](#) Fundamentals of Statistics

[MATH2730](#) Operations Research 1

[MATH3830](#) Operations Research 2

## 10 units from:

[MATH3840](#) Optimisation in Business and Industry

[STAT3100](#) Total Quality Management

## Assumed knowledge:

- *MATH1110 Mathematics 1*
- *MATH1120 Mathematics 2*

## Pathway available in the following degrees:

- ✓ Chemical
- ✓ Civil
- ✓ Computer Systems
- ✓ Electrical and Electronic
- ✓ Environmental
- ✓ Mechanical
- ✓ Mechatronics
- ✓ Software
- ✓ Surveying