



# Course Outline (Higher Education)

<b>Institute:</b>	Institute of Innovation, Science & Sustainability
<b>Course Title:</b>	LINEAR ALGEBRA AND APPLICATIONS
<b>Course ID:</b>	MATHS1102
<b>Credit Points:</b>	15.00
<b>Prerequisite(s):</b>	Nil
<b>Co-requisite(s):</b>	Nil
<b>Exclusion(s):</b>	(MATHS1005)
<b>ASCED:</b>	010101

## Description of the Course:

This course aims to offer students from diverse backgrounds an introduction to the use of mathematical methods in finding optimal choices in business, industry, economics, and social, behavioural and biological sciences. It introduces students to linear algebra and linear programming that underlie applications in operations research.

**Grade Scheme:** Graded (HD, D, C, P, MF, F, XF)

**Placement Component:** No

**Supplementary Assessment:** Yes

Where supplementary assessment is available a student must have failed overall in the course but gained a final mark of 45 per cent or above and submitted all major assessment tasks.

## Program Level:

Level of course in Program	AQF Level of Program					
	5	6	7	8	9	10
Introductory	<input type="checkbox"/>	<input type="checkbox"/>	✓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Intermediate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Advanced	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Learning Outcomes:

This course introduces students to the fundamentals of linear algebra and linear programming that underlie applications in operations research. After successfully completing this course, students should be able to:

**Knowledge:**

- K1.** Classify the system of linear equations and demonstrate an understanding of methods for solving such systems.
- K2.** Explain and classify the fundamental structure of matrices and matrix arithmetic
- K3.** Demonstrate an understanding of inverses, determinants, eigenvalues and eigenvectors of matrices.
- K4.** Explain the nature of vectors.
- K5.** Recognise the basic techniques used for problems in linear programming

**Skills:**

- S1.** Express and solve systems of linear equations;
- S2.** Apply the operations of addition, multiplication, and transposition of matrices;
- S3.** Calculate the determinant and inverse of a matrix;
- S4.** Evaluate simple algebraic statements about vector addition, scalar multiplication and inner products;
- S5.** Apply vectors and operations involving vectors to solve problems involving lines and planes in 3-space;
- S6.** Calculate eigenvalues and eigenvectors of a matrix;
- S7.** Graphically explain linear programming problems in 2 dimensions;

**Application of knowledge and skills:**

- A1.** Apply appropriate algorithms to solve linear programming problems;
- A2.** Apply appropriate software packages to solve elementary problems of linear programming;

**Course Content:**

Topics may include:

Topics may include:

- matrix representations of systems of linear equations;
- methods for solving the system of linear equations
- vectors and matrices and their algebraic properties;
- determinants and inverses of matrices;
- dot products and cross products of vectors;
- lines and planes in 3-space;
- vector spaces, linear independence, basis, dimension and rank of matrices;
- inner products, orthonormal bases, orthogonal matrices;
- diagonalization of matrices, eigenvalues and eigenvectors;
- Linear Programming (LP) problems and the geometry of LP problems
- the Simplex algorithm;
- duality;
- network flow problems;
- applications of LP;
- software packages for solving LP problems.

**Values:**

- V1.** appreciate the use of matrices and linear programming to solve real-world problems.

**Graduate Attributes**

The Federation University Federation graduate attributes (GA) are entrenched in the [Higher Education Graduate Attributes Policy](#) (LT1228). FedUni graduates develop these graduate attributes through their engagement in explicit learning and teaching and assessment tasks that are embedded in all FedUni programs. Graduate attribute attainment typically follows an incremental development process mapped through program progression. **One or more graduate attributes must be evident in the specified learning outcomes and assessment for each FedUni course, and all attributes must be directly assessed in each program**

Graduate attribute and descriptor		Development and acquisition of GAs in the course	
		Learning Outcomes (KSA)	Assessment task (AT#)
GA 1 Thinkers	Our graduates are curious, reflective and critical. Able to analyse the world in a way that generates valued insights, they are change makers seeking and creating new solutions.	K1, K3, K5, S1, S2, S3, S4, S5, S6, S7, A1, A2	1,2,3,4
GA 2 Innovators	Our graduates have ideas and are able to realise their dreams. They think and act creatively to achieve and inspire positive change.	Not applicable	Not applicable
GA 3 Citizens	Our graduates engage in socially and culturally appropriate ways to advance individual, community and global well-being. They are socially and environmentally aware, acting ethically, equitably and compassionately.	A1, K4	4
GA 4 Communicators	Our graduates create, exchange, impart and convey information, ideas, and concepts effectively. They are respectful, inclusive and empathetic towards their audience, and express thoughts, feelings and information in ways that help others to understand.	K2, S4	4
GA 5 Leaders	Our graduates display and promote positive behaviours, and aspire to make a difference. They act with integrity, are receptive to alternatives and foster sustainable and resilient practices.	Not applicable	Not applicable

### Learning Task and Assessment:

Learning Outcomes Assessed	Learning Tasks	Assessment Type	Weighting
K1-2, S1-7, A1	Participate in class activities	Portfolio of completed work	10 - 20%
K1-5, S1-7, A1, A2	Self directed or group exploration	Projects	10 - 30%
K1-5, S1-7, A1, A2	Self directed or group exploration	Presentation	10 - 20%
K1-5, S1-7, A1	Review and skills practice	Tests/examination(s)	40 - 60%

### Adopted Reference Style:

APA

Refer to the [library website](#) for more information

Fed Cite - [referencing tool](#)