Unit Outline (Higher Education)

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

Description of the Unit:

This unit 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)

Work Experience:

No work experience: Student is not undertaking work experience in industry.

Placement Component: No

Supplementary Assessment: Yes

Where supplementary assessment is available a student must have failed overall in the Unit but gained a final mark of 45 per cent or above, has completed all major assessment tasks (including all sub-components where a task has multiple parts) as specified in the Unit Description and is not eligible for any other form of supplementary assessment

Course Level:

Level of Unit in Course	AQF Level of Course					
	5	6	7	8	9	10
Introductory			✔			
Intermediate						
Advanced						

Learning Outcomes:

This unit introduces students to the fundamentals of linear algebra and linear programming that underlie applications in operations research. After successfully completing this unit, 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;

Unit Content:

Topics may include:

Topics may include:

- matrix representations of systems of linear equations;
- methods for solving the sytem 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.

Learning Task and Assessment:

Learning Outcomes Assessed	Assessment 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](#)