



Course Outline (Higher Education)

School:	School of Science, Engineering and Information Technology
Course Title:	SECRETS OF THE MATRIX
Course ID:	MATHS1005
Credit Points:	15.00
Prerequisite(s):	Nil
Co-requisite(s):	Nil
Exclusion(s):	(MA555)
ASCED:	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, etc.)

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 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.** proclaim the fundamental structure of matrices and matrix arithmetic;
- K2.** explain the nature of vectors;
- K3.** recognise the basic techniques used for problems in linear programming;
- K4.** demonstrate an understanding of the theoretical basis for such algorithms;

Skills:

- S1.** represent and solve systems of linear equations;
- S2.** perform the operations of addition, multiplication, and transposition of matrices;
- S3.** find the determinant and inverse of a matrix;
- S4.** prove simple algebraic statements about vector addition, scalar multiplication and inner products;
- S5.** use vectors and operations involving vectors to solve problems involving lines and planes in 3-space;
- S6.** find eigenvalues and eigenvectors of a 2x2 matrix;
- S7.** graphically represent linear programming problems in 2 dimensions;

Application of knowledge and skills:

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

Course Content:

Topics may include:

- matrix representations of systems 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;
- the setting of LP problems and the geometry of LP problems;
- the Simplex algorithm;
- duality;
- modern algorithms such as those based on interior point methods;
- transportation problems;
- 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 FedUni 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)	Code A. Direct B. Indirect N/A Not addressed	Assessment task (AT#)	Code A. Certain B. Likely C. Possible N/A Not likely
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, S1, S2, S3, S4, S5, S6, S7, A1, A2	A	1, 2, 3, 4, 5	A
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	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	B	4	C
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	A	4	B
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	Not applicable	Not applicable

Learning Task and Assessment:

Learning Outcomes Assessed	Learning Tasks	Assessment Type	Weighting
K1-4, S1-7, A1	Participate in class activities	Portfolio of completed work	0 - 20%
K1-4, S1-7, A1, A2	Self directed or group exploration	Projects	10 - 30%
K1-4, S1-7, A1, A2	Self directed or group exploration	Presentation	10 - 20%
K1-4, S1-7, A1	Review and skills practice	Tests/examination(s)	40 - 60%

Adopted Reference Style:

APA