

MATH1014: Introduction to Linear Algebra

Semester 2, 2019 | 3 Credit points | Mode of delivery: Normal (lecture/lab/tutorial) day | Unit type: Standard

Coordinator: Sharon Stephen

Faculty of Science (SCIE), Mathematics and Statistics Academic Operations

Unit description

This unit is an introduction to Linear Algebra. Topics covered include vectors, systems of linear equations, matrices, eigenvalues and eigenvectors. Applications in life and technological sciences are emphasised.

Prohibitions: MATH1012 or MATH1002 or MATH1902

Pre-requisites : None

Co-requisites : None

Assumed knowledge: HSC Mathematics or MATH1111. Students who have not completed HSC Mathematics (or equivalent) are strongly advised to take the Mathematics Bridging Course (offered in February). Please note: this unit does not normally lead to a major in Mathematics or Statistics or Financial Mathematics and Statistics.

Unit aims

The unit aims are to: introduce the concept of a vector; illustrate how vectors are used in real-life applications; introduce the basic concepts of linear algebra - systems of linear equations, matrices, determinants, eigenvalues and eigenvectors; apply these concepts to some real world phenomena; improve your ability to think logically, analytically, and abstractly; enhance your problem-solving skills.

Learning outcomes

At the completion of this unit, you should be able to:

- LO1. represent vectors both algebraically and geometrically in R^2 and R^3
- LO2. perform operations on vectors (addition, scalar multiplication, dot and cross products)
- LO3. find equations of lines and planes in R^3
- LO4. perform arithmetic operations in Z_n
- LO5. understand how to use a check digit code vector
- LO6. solve systems of linear equations using Gaussian elimination
- LO7. set up systems of linear equations to model real-world situations
- LO8. add and multiply matrices, and be able to find inverses
- LO9. find a steady-state vector for a Markov process
- LO10. understand how Leslie matrices are used to model population growth
- LO11. calculate eigenvalues and eigenvectors of 2×2 and 3×3 matrices.

Graduate qualities

The Graduate Qualities are the qualities and skills that all University of Sydney graduates must demonstrate on successful completion of an award course. As a future Sydney graduate, the set of qualities have been designed to equip you for the contemporary world. Please see <https://sydney.edu.au/students/graduate-qualities.html>

Study commitment

- Typically, there is a minimum expectation of 1.5-2 hours of student effort per week per credit point for units of study offered over a full semester. For a 3 credit point unit, this equates to roughly 60-75 hours of student effort in total.

Teaching staff and contact details

Coordinator : Sharon Stephen, sharon.stephen@sydney.edu.au

Teaching staff :

Administrative and professional staff: MATH1014@sydney.edu.au

Learning activities schedule

Week	Topic	Learning activity type	Learning outcomes
Week 1	Geometry and algebra of vectors	Lecture and tutorial	LO1
Week 2	Length, dot product, cross product	Lecture and tutorial	LO2
Week 3	Lines and planes	Lecture and tutorial	LO3
Week 4	Modular arithmetic	Lecture and tutorial	LO4
Week 5	Code Vectors. Systems of linear equations	Lecture and tutorial	LO5
Week 6	Gaussian and Gauss-Jordan Elimination and applications	Lecture and tutorial	LO6, LO7
Week 7	Matrices	Lecture and tutorial	LO8
Week 8	The inverse of a matrix	Lecture and tutorial	LO8
Week 9	Markov chains	Lecture and tutorial	LO9
Week 10	Leslie population models. Introduction to eigenvalues and eigenvectors	Lecture and tutorial	LO10, LO11
Week 11	Determinants	Lecture and tutorial	LO11
Week 12	Eigenvalues and eigenvectors	Lecture and tutorial	LO11
Week 13	Revision	Lecture	LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8, LO9, LO10, LO11

Assessments

Assessment title	Assessment category	Assessment type	Assessment type description	Individual or group	Weight	Due date & time	Closing date	Length/duration	Learning outcomes
Assignment 1	Submitted work	Assignment	n/a	Individual	2.5%	Week 3 23 August 2019 11.59pm	02/09/19 23:59	n/a	LO1, LO2, LO3
Quiz 1	In-class assessment	Tutorial quiz, small test or online task	n/a	Individual	15%	Week 5		40 minutes	LO1, LO2, LO3, LO4
Assignment 2	Submitted work	Assignment	n/a	Individual	2.5%	Week 8 27 September 2019 11.59pm	08/10/19 23:59	n/a	LO6, LO7, LO8
Quiz 2	In-class assessment	Tutorial quiz, small test or online task	n/a	Individual	15%	Week 11		40 minutes	LO5, LO6, LO7, LO8, LO9, LO10
Exam	Exam	Final exam	n/a	Individual	65%	Formal exam period		1.5 hours	LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8, LO9, LO10, LO11

Assessment summary

- **Examination:** There is one examination of 1.5 hours' duration during the examination period at the end of Semester 2. Further information about the exam will be made available at a later date on the website.
- **Quizzes:** Quizzes will be held during tutorials. You must sit for the quiz during the tutorial in which you are enrolled, unless you have permission from the Student Services Office, issued only for verifiable reasons. Otherwise, your quiz mark may not be recorded. Quizzes will only be returned in the tutorial you sat the quiz and must be collected by week 13. The better mark principle will be used for the quizzes so do not submit an application for Special Consideration or Special Arrangements if you miss a quiz. The better mark principle means that for each quiz, the quiz counts if and only if it is better than or equal to your exam mark. If your quiz mark is less than your exam mark, the exam mark will be used for that portion of your assessment instead.
- **Assignments:** There are two assignments, which must be submitted electronically, as PDF files only, in Turnitin (an internet-based plagiarism-prevention service), via the Learning Management System (Canvas) website by the deadline. Note that your assignment will not be marked if it is illegible or if it is submitted sideways or upside down. It is your responsibility to check that your assignment has been submitted correctly (check that you can view each page). Late submissions will receive a penalty.

Detailed information for each assessment can be found on Canvas.

Prescribed readings

- **Recommended text:** A First Course in Linear Algebra, 3rd edition, by David Easdown.

Other resources

- **Tutorial and exercise sheets:** The question sheets for a given week will be available on the MATH1014 webpage. Solutions to tutorial exercises for week n will usually be posted on the web by the afternoon of the Friday of week n.
- **Ed Discussion forum:** <http://edstem.org>

Late penalties

All assessments must be submitted by the due date. Students are expected to manage their time and to prioritise tasks to meet deadlines. Assessment items submitted after the due date without an approved extension using a [special consideration or special arrangement form](#) will incur penalties.

Late penalties will apply once the due date and time has passed. The closing date (if specified) is the final date for late submissions; after this date no submissions will be accepted.

Special consideration

A [special consideration application](#) can be made for short-term circumstances beyond your control, such as illness, injury or misadventure, which affect your preparation or performance in an assessment.

Assessment grading

The University awards common result grades, set out in the [Coursework Policy 2014](#) (Schedule 1).

As a general guide, a high distinction indicates work of an exceptional standard, a distinction a very high standard, a credit a good standard, and a pass an acceptable standard.

Result name	Mark range	Description
High distinction	85 - 100	Representing complete or close to complete mastery of the material.
Distinction	75 - 84	Representing excellence, but substantially less than complete mastery.
Credit	65 - 74	Representing a creditable performance that goes beyond routine knowledge and understanding, but less than excellence.
Pass	50 - 64	Representing at least routine knowledge and understanding over a spectrum of topics and important ideas and concepts in the course.
Fail	0 - 49	When you don't meet the learning outcomes of the unit to a satisfactory standard.

For more information see sydney.edu.au/students/guide-to-grades.

Educational integrity

While the University is aware that the vast majority of students and staff act ethically and honestly, it is opposed to and will not tolerate academic dishonesty or plagiarism and will treat all allegations of dishonesty seriously.

All written assignments submitted in this unit of study will be submitted to the similarity detecting software program known as Turnitin. Turnitin searches for matches between text in your written assessment task and text sourced from the Internet, published works and assignments that have previously been submitted to Turnitin. If such matches indicate evidence of plagiarism to your teacher, they are required to report your work for further investigation.

Further information on academic honesty and the resources available to all students can be found on the Academic Integrity page of the current students website: <https://sydney.edu.au/students/academic-integrity.html>

Work, health and safety requirements

We are governed by the Work Health and Safety Act 2011, Work Health and Safety Regulation 2011 and Codes of Practice. Penalties for non-compliance have increased. Everyone has a responsibility for health and safety at work. The University's [Work Health and Safety policy](#) explains the responsibilities and expectations of workers and others, and the procedures for managing WHS risks associated with University activities.

Other requirements

- **Attendance:** Unless otherwise indicated, students are expected to attend a minimum of 80% of timetabled activities for a unit of study, unless granted exemption by the Associate Dean. For some units of study the minimum attendance requirement, as specified in the relevant table of units or the unit of study outline, may be greater than 80%. The Associate Dean may determine that a student has failed a unit of study because of inadequate attendance.
- **Tutorial attendance:** Tutorials (one per week) start in Week 1. You should attend the tutorial given on your personal timetable. Attendance at tutorials will be recorded. Your attendance will not be recorded unless you attend the tutorial in which you are enrolled. While there is no penalty if 80% attendance is not met we strongly recommend you attend tutorials regularly to keep up with the material and to engage with the tutorial questions.

Site visit guidelines

There are no site visit guidelines for this unit.

Additional costs

There are no additional costs for this unit.

Closing the loop

No changes have been made since this unit was last offered.

Links to policies and other information for students

The following information and services are available to all students:

- Student administration: sydney.edu.au/study/student-administration.html
- Wellbeing and support: sydney.edu.au/students/health-wellbeing.html
- Study resources: sydney.edu.au/students/learning-services.html
- Expectations of student conduct: sydney.edu.au/students/student-responsibilities.html
- Learning and Teaching Policy: sydney.edu.au/policies/
- Academic appeals: sydney.edu.au/students/academic-appeals.html
- Libraries: sydney.edu.au/students/libraries.html
- Financial support: sydney.edu.au/students/financial-support.html

Other relevant information

More information can be found on Canvas.

Other links

Science student portal (canvas.sydney.edu.au/courses/7114)

Mathematics and Statistics student portal (canvas.sydney.edu.au/courses/7913)