THE UNIVERSITY OF SYDNEY

MATH1011: Applications of Calculus

Intensive January, 2020 (Int Jan) | 3 Credit points | Mode of delivery: Block mode | Unit type: Standard

Coordinator: Nathan David Brownlowe

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

Unit description

This unit is designed for science students who do not intend to undertake higher year mathematics and statistics. It establishes and reinforces the fundamentals of calculus, illustrated where possible with context and applications. Specifically, it demonstrates the use of (differential) calculus in solving optimisation problems and of (integral) calculus in measuring how a system accumulates over time. Topics studied include the fitting of data to various functions, the interpretation and manipulation of periodic functions and the evaluation of commonly occurring summations. Differential calculus is extended to functions of two variables and integration techniques include integration by substitution and the evaluation of integrals of infinite type.

Prohibitions: MATH1001 or MATH1901 or MATH1906 or BIOM1003 or ENVX1001 or MATH1021 or MATH1921 or MATH1931

Pre-requisites : NSW HSC 2 unit Mathematics or equivalent or a credit or above in MATH1111

Co-requisites : None

Assumed knowledge: HSC Mathematics. 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.

Learning outcomes

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

LO1. Analyse practical problems using techniques from differential and integral calculus;
LO2. Fit as appropriate a linear, exponential or a periodic function to a set of experimental data;
LO3. Sketch the generalised sinusoidal functions;
LO4. Use differential calculus to solve optimisation problems in one independent variable;
LO5. Calculate the partial derivatives of functions of two variables, and hence to solve optimisation problems in two independent variables;
LO6. Calculate finite sums and use the sigma notation where appropriate;
LO7. Evaluate definite integrals and use definite integrals in applications;
LO8. Determine when improper integrals of infinite type exist.

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 : Nathan David Brownlowe, nathan.brownlowe@sydney.edu.au

Teaching Staff :

Administrative and professional staff: MATH1011@sydney.edu.au

THE UNIVERSITY OF

SYDNEY

Learning activities schedule

Week	Topic	Learning activity type	Learning outcomes
Week 1	Sine and cosine functions.	Block teaching	LO1, LO3
Week 1	Logarithms and the exponential function.	Block teaching	LO1, LO2
Week 2	Scaling data: log-log and semi-log transformations.	Block teaching	LO1, LO2
Week 2	Applications of differentiation. (Optimisation, curve sketching)	Block teaching	LO1, LO4
Week 3	Applications of differentiation. (Optimisation, curve sketching.)	Block teaching	LO1, LO4
Week 3	Coordinate geometry in 3 dimensions. Functions of two variables.	Block teaching	LO1
Week 4	Partial derivatives.	Block teaching	LO5
Week 4	Maxima and minima of functions of two variables.	Block teaching	LO1, LO5
Week 4	Finite sums and the definite integral.	Block teaching	LO1, LO6
Week 5	Integration techniques.	Block teaching	LO7
Week 5	Applications of integration.	Block teaching	LO1, LO7
Week 5	Improper integrals.	Block teaching	LO8

Assessments

Assessment title	Assessment category	Assessment type	Assessment type description	Individual or group	Weight	Due date & time	Closing date	Length/duration	Learning outcomes
Final exam	Exam	Final exam	See Canvas for more details	Individual	50%	-		1.5 hours	LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8
Quizzes	In-class assessment	Tutorial quiz	Quizzes held Week 3 and Week 5	Individual	30%	-		40 minutes each	LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8
Assignments	Submitted work	Assignment	Assignments due Week 2 and Week 4	Individual	20%	Multiple weeks		One week each	LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8

Assessment summary

Below are brief assessment details. Further information can be found in the Canvas site for this unit.

- **Assessments:** There are two assignments, which must be submitted electronically, **as PDF files only**, in Canvas 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.

- **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.

- **Examination:** Further information about the exam will be made available at a later date on Canvas.

Prescribed readings

- Applications of Calculus (Course Notes for MATH1011) are available for purchase from Kop ystop, 55 Mountain St, Broadway.
- Reference book: James Stewart. Calculus. Cengage Learning. 8th Edition, Metric Version, 2015, ISBN 978-1-305-26672-8. Available from the Co-op Bookshop.

Late penalties

The Assessment Procedures 2011 provide that any written work submitted after 11:59pm on the due date will be penalised by 5% of the maximum awardable mark for each calendar day after the due date. If the assessment is submitted more than ten calendar days late, a mark of zero will be awarded.
However, a unit of study may prohibit late submission or waive late penalties only if expressly stated below.

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.

If you are eligible for special consideration, you must submit an online application and supporting documents within three working days of the assessment, unless exceptional circumstances apply.

THE UNIVERSITY OF SYDNEY

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	At HD level, a student demonstrates a flair for the subject as well as a detailed and comprehensive understanding of the unit material. A 'High Distinction' reflects exceptional achievement and is awarded to a student who demonstrates the ability to apply their subject knowledge and understanding to produce original solutions for novel or highly complex problems and/or comprehensive critical discussions of theoretical concepts.
Distinction	75 - 84	At DI level, a student demonstrates an aptitude for the subject and a well-developed understanding of the unit material. A 'Distinction' reflects excellent achievement and is awarded to a student who demonstrates an ability to apply their subject knowledge and understanding of the subject to produce good solutions for challenging problems and/or a reasonably well-developed critical analysis of theoretical concepts.
Credit	65 - 74	At CR level, a student demonstrates a good command and knowledge of the unit material. A 'Credit' reflects solid achievement and is awarded to a student who has a broad general understanding of the unit material and can solve routine problems and/or identify and superficially discuss theoretical concepts.
Pass	50 - 64	At PS level, a student demonstrates proficiency in the unit material. A 'Pass' reflects satisfactory achievement and is awarded to a student who has threshold knowledge.
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 detection software known as Turnitin. Turnitin searches for matches between text in your written assessment task and text sourced from the Internet, published works and assignments previously submitted to Turnitin. If such matches indicate evidence of plagiarism or other forms of dishonesty to your teacher, they are required to report your work for further investigation.

Further information on academic honesty, academic dishonesty, and the resources available to all students can be found on the academic integrity pages on the current students website: https://sydney.edu.au/students/academic-integrity.html

Work, health and safety requirements

Attendance and class requirements

Site visit guidelines

Additional costs

THE UNIVERSITY OF SYDNEY

Closing the loop

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

Links to important information and resources

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

Other relevant information

- Tutorials: Tutorials start in week 2. 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. If you are absent from a tutorial do not apply for Special Consideration or Special Arrangement, since there is no assessment associated with the missed tutorial.
- Tutorial and exercise sheets: The question sheets for a given week will be available on the MATH1011 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: https://edstem.org

Other links

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

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