



Unit outline

Name of unit

Calculus (BDS MAT 104)

Unit description

This introductory Calculus courses will examine four important mathematical concepts; equations, differentiation, integration and analytic geometry. The techniques are taught systematically, with an emphasis on their application in data science.

SECTION 1 – GENERAL INFORMATION (CORE)

1.1 Administrative details

Associated higher education awards (for example, Bachelor, Diploma)	Duration (for example, one semester, full year)	Level (for example, introductory, intermediate, advanced level, 1st year, 2nd year, 3rd year)	Unit coordinator
Bachelor of Data Science	3 years	1 st Year	To be confirmed

1.2 Core or elective unit

Indicate if the unit is a:

- ☒ core unit
- ☐ elective unit
- ☐ other (please specify below):

1.3 Unit weighting

Using the table below, indicate the credit point weighting of this unit and the credit point total for the course of study (for example, 10 credit points for the unit and 320 credit points for the course of study).

Unit credit points Example: 10 credit points	Total course credit points Example: 320 credit points
3 credit points	78 credit points

1.4 Student workload

Using the table below, indicate the expected student workload per week for this unit.

No. timetabled hours per week (1)	No. personal study hours per week (2)	Total workload hours per week (3)
3 hours	3 hours	6 hours

(1) Total time spent per week at lectures, tutorials, clinical and other placements, etc.

(2) Total time students are expected to spend per week in studying, completing assignments, etc.

(3) Sum of (1) and (2) equals workload hours.

For those students requiring additional English language support, how many additional hours per week is it expected that they will undertake?

Additional English language support: _____ hours per week

1.5 Delivery mode

Tick all applicable delivery modes for the unit and provide details in the following text box: If necessary or preferred, you may provide this information in a separate document, using the 'Attach evidence here' function of the online form.

- ☒ Face to face on site
- ☐ E-learning (online)
- ☐ Intensive/block mode (where the unit or a face to face component is delivered in a block)
- ☐ Mixed/blended
- ☐ Distance/independent learning (untimetabled)
- ☒ Full-time
- ☐ Part-time
- ☐ External
- ☐ Fast track
- ☐ Other (please specify)

1.6 Work-integrated learning activity

If the unit includes a work-integrated learning component (where completion of the unit requires students to undertake learning in a workplace outside of their higher education provider), provide details including the rationale, the specification and methods for assessing the learning outcomes, monitoring arrangements and whether the work integrated learning is required for professional accreditation. If necessary or preferred, you may provide this information in a separate document, using the 'Attach evidence here' function of the online form.

Also if available, upload copies or templates of the formal agreements with third parties for the work-integrated learning activity, using the 'Attach evidence here' function of the online form.

Refer to the TEQSA Guidance Note on Work-Integrated Learning as required (available on the TEQSA website).

1.7 Prerequisites and co-requisites

Are students required to have undertaken a prerequisite or co-requisite unit for this unit?

☐ Yes ☒ No

If YES, provide details of the prerequisite or co-requisite requirements below.

1.8 Other resource requirements

Do students require access to specialist facilities and/or equipment for this unit (for example, special computer access, physical education equipment)?

☐ Yes ☒ No

If YES, provide details of specialist facilities and/or equipment below.

SECTION 2 – ACADEMIC DETAILS (CORE)

Learning outcomes for the unit On successful completion of this unit students will be able to:
Demonstrate an essential knowledge of calculus [Knowledge of Data Science]
Use quantitative and computational skills to solve calculus problems [Problem Solving and Decision Making]
Categorize and solve different types of calculus problems [Creativity and Innovation]
Demonstrate teamwork skills by working in a group project [Teamwork]
Not addressed [Intercultural Competence / Communication]
Not addressed [Global Citizenship / Ethics]

Topics included in the unit
Week 01: Introduction to Calculus: <ul style="list-style-type: none">• Velocity and Distance, Calculus Without Limits, The Velocity at an Instant, Circular Motion, Computing in Calculus.
Week 02: Derivatives: <ul style="list-style-type: none">• The Derivative of a Function Powers and Polynomials• The Slope and the Tangent Line, Derivative of the Sine and Cosine
Week 03: Applications of the Derivative, Linear Approximation, <ul style="list-style-type: none">• Maximum and Minimum Problems, Second Derivatives: Minimum vs. Maximum, Ellipses, Parabolas, and Hyperbolas• The Mean Value Theorem
Week 04: The Chain Rule, <ul style="list-style-type: none">• Derivatives by the Chain Rule, Implicit Differentiation and• Inverse Functions and Their Derivatives
Week 05: Integrals: The Idea of an Integral, Anti-derivatives, Summation vs. Integration, Indefinite Integrals and Substitutions, The Definite Integral, Properties of the Integral and the Average Value, The Fundamental Theorem and Its Consequences.
Week 06: Continue: Integrals
Week 07: Exponentials and Logarithms, An Overview, The Exponential Growth and Decay in Economics, Logarithms, Separable Equations Including the Logistic Equation, Hyperbolic Functions.
Week 08: Techniques of Integration: Integration by Parts, Trigonometric Integrals, Trigonometric Substitutions, Partial Fractions, Improper Integrals.
Week 09: Quadratic Functions and Equations: Quadratic Graphs and Their Properties, Quadratic Functions, The Quadratic Formula and the Discriminant, Linear, Quadratic, and Exponential Models

Topics included in the unit
Week 10: Applications of the Integral, Areas and Volumes by Slices, Length of a Plane Curve, Area of a Surface of Revolution, Probability and Calculus, Masses and Moments.
Week 11: Rational Expressions and Functions: Simplifying Rational Expressions, Dividing Polynomials, Inverse Variation
Week 12: Polar Coordinates and Complex Numbers, Polar Coordinates, Polar Equations and Graphs, Slope, Length, and Area for Polar Curves, Complex Numbers.

Assessment tasks			
Type (1) (see examples noted below this table)	When assessed – year, session and week (for example, year 1, semester 1, week 1)	Weighting (% of total marks for unit)	Cross reference to learning outcomes
Individual Assignments	Sessions 1, 5 and 9	20%	SLO A
Group Project	Sessions 2, 7 and 9	30%	SLO D
Final Examination [3 hours]	Exam Week	50%	SLO B,C

(1) Examples of types of assessment tasks include: assignments; examinations; group projects; online quizzes/tests; presentations; work-based projects; and reflective journals. Ensure that details of the types of assessment tasks are included such as specific topics, duration/length/word limit of assessment and any specific formats.

2.1 Prescribed and recommended reading

Provide below, in formal reference format, a list of the prescribed and recommended reading for the unit.

<p>Prescribed Text</p> <ul style="list-style-type: none"> Stewart, J. (2015). Calculus, 8th edition. Cengage Learning.
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