

# MTH302 Applied Mathematics

School: School of Science, Technology and Engineering

2024 | Semester 2

UniSC Sunshine Coast  
UniSC Moreton Bay

**BLENDED  
LEARNING**

Most of your course is on campus but you may be able to do some components of this course online.

*Please go to [usc.edu.au](http://usc.edu.au) for up to date information on the teaching sessions and campuses where this course is usually offered.*

## 1. What is this course about?

### 1.1. Description

In this course you will be introduced to differential equations and other mathematical methods which can be used to explore and model situations in the physical, biological and engineering sciences. The course includes derivation, application, solution techniques, and evaluation of mathematical models using first order, second order, and nth order ordinary and partial differential equations that you will be able to apply in a range of contexts.

### 1.2. How will this course be delivered?

| ACTIVITY  | HOURS | BEGINNING WEEK | FREQUENCY |
|---|-------|----------------|-----------|
| <b>BLENDED LEARNING</b>   |       |                |           |
| <b>Learning materials</b> – You are required to engage and interact with asynchronous materials and activities accessed through Canvas modules, course readings and textbook activities.  | 1hr   | Week 1         | 12 times  |
| <b>Tutorial/Workshop 1</b> – A blended learning approach is used to deliver the tutorial/workshop component of this course. The tutorial/workshop is synchronous with on-campus engagement and application of learning materials. | 2hrs  | Week 1         | 13 times  |

### 1.3. Course Topics

Classification and solution methods for, and applications of first order differential equations  
 Classification and solution methods for, and applications of second order differential equations  
 An introduction to applications and solutions of partial differential  
 The Laplace Transform and its uses  
 Interpreting differential equations in the literature

## 2. What level is this course?

300 Level (Graduate)

Demonstrating coherence and breadth or depth of knowledge and skills. Independent application of knowledge and skills in unfamiliar contexts. Meeting professional requirements and AQF descriptors for the degree. May require pre-requisites where discipline specific introductory or developing knowledge or skills is necessary. Normally undertaken in the third or fourth full-time study year of an undergraduate program.

### 3. What is the unit value of this course?

12 units

### 4. How does this course contribute to my learning?

| COURSE LEARNING OUTCOMES   | GRADUATE QUALITIES   |
|--|--|
| On successful completion of this course, you should be able to...  | Completing these tasks successfully will contribute to you becoming... |
| 1 Recall, explain and apply the theory, tools and techniques of topics related to differential equations.  | Knowledgeable<br>Empowered   |
| 2 Select and combine mathematical tools and techniques to solve mathematical problems in mathematics and science.  | Creative and critical thinker<br>Empowered                             |
| 3 Communicate concepts and techniques relevant to the use of applied mathematics, using both written English and mathematical notations, as appropriate. | Knowledgeable<br>Empowered   |
| 4 Interpret mathematics in the literature.   | Creative and critical thinker<br>Empowered                             |

### 5. Am I eligible to enrol in this course?

Refer to the [UniSC Glossary of terms](#) for definitions of “pre-requisites, co-requisites and anti-requisites”.

#### 5.1. Pre-requisites

MTH202 or MTH104

#### 5.2. Co-requisites

Not applicable

#### 5.3. Anti-requisites

MTH522

#### 5.4. Specific assumed prior knowledge and skills (where applicable)

Not applicable

### 6. How am I going to be assessed?

#### 6.1. Grading Scale

Standard Grading (GRD)

High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL).

#### 6.2. Details of early feedback on progress

Early feedback on progress will be provided in tutorial time in the first 3 weeks.

### 6.3. Assessment tasks

| DELIVERY MODE | TASK NO. | ASSESSMENT PRODUCT                | INDIVIDUAL OR GROUP | WEIGHTING % | WHAT IS THE DURATION / LENGTH? | WHEN SHOULD I SUBMIT? | WHERE SHOULD I SUBMIT IT?                          |
|---------------|----------|-----------------------------------|---------------------|-------------|--------------------------------|-----------------------|--|
| All           | 1a       | Oral                              | Individual          | 20%         | 10 minutes                     | Week 4                | In Class   |
| All           | 1b       | Written Piece                     | Individual          | 20%         | 10 x set problems              | Week 8                | Online Submission                                  |
| All           | 2        | Written Piece                     | Group               | 20%         | 1000 words                     | Week 11               | Online Assignment Submission with plagiarism check |
| All           | 3        | Examination - Centrally Scheduled | Individual          | 40%         | 2 hours                        | Exam Period           | Exam Venue   |

#### All - Assessment Task 1a: Assignment

|                  |   |  |
|------------------|---|--|
| <b>GOAL:</b>     | Students successfully completing this task will have demonstrated an understanding of the modelling process with differential equations and applied this knowledge to a real world problem. |  |
| <b>PRODUCT:</b>  | Oral  |  |
| <b>FORMAT:</b>   | Students will negotiate a problem to present to the tutorial group with the tutor. Each student will have 10 minutes to present their solution to the class.                                |  |
| <b>CRITERIA:</b> | <b>No.</b>  | <b>Learning Outcome assessed</b>   |
|                  | 1   | Correctness of calculations <span style="float: right;">1</span>                             |
|                  | 2   | Clarity of mathematical reasoning <span style="float: right;">2</span>                       |
|                  | 3   | Mathematical communication skills both oral and written <span style="float: right;">3</span> |

#### All - Assessment Task 1b: Assignment Worked examples

|                  |  |   |
|------------------|--|---|
| <b>GOAL:</b>     | Students successfully completing this task will have demonstrated an understanding of the modelling process with differential equations and applied this knowledge to real-world problems. |   |
| <b>PRODUCT:</b>  | Written Piece  |   |
| <b>FORMAT:</b>   | Solutions to selected skill and application-based problems. Questions will be given in week 5. To be submitted during the scheduled tutorial class and/or uploaded to Canvas.              |   |
| <b>CRITERIA:</b> | <b>No.</b>   | <b>Learning Outcome assessed</b>  |
|                  | 1  | application and explanation of appropriate theory, tools, and techniques to solve selected first order ordinary differential equations <span style="float: right;">1</span> |
|                  | 2  | solution of selected mathematical problems <span style="float: right;">2</span>   |
|                  | 3  | communication of the methods, reasoning and working of the solutions <span style="float: right;">3</span>   |

### All - Assessment Task 2: Written report

| <b>GOAL:</b>     | Students successfully completing this task will write an interpretation of an article including differential equations as a solution to a real-world problem  |                           |  |                           |   |   |   |   |  |   |   |  |   |
|------------------|---|---------------------------|--|---------------------------|---|---|---|---|--|---|---|--|---|
| <b>PRODUCT:</b>  | Written Piece   |                           |  |                           |   |   |   |   |  |   |   |  |   |
| <b>FORMAT:</b>   | A written report submitted to Canvas. In groups of 2 or 3 students you will choose an article from Nature from those provided on Canvas and write an article for an undergraduate magazine that explains the mathematics used.  |                           |  |                           |   |   |   |   |  |   |   |  |   |
| <b>CRITERIA:</b> | <table border="1"><thead><tr><th>No.</th><th></th><th>Learning Outcome assessed</th></tr></thead><tbody><tr><td>1</td><td>Knowledge and understanding of the mathematics in the article</td><td>1</td></tr><tr><td>2</td><td>Interpretation of the chosen article in response to the stimulus question given via Canvas</td><td>4</td></tr><tr><td>3</td><td>Written communication and mathematical and academic literacies including English expression, grammar, spelling, punctuation, and referencing conventions</td><td>3</td></tr></tbody></table> | No.                       |  | Learning Outcome assessed | 1 | Knowledge and understanding of the mathematics in the article | 1 | 2 | Interpretation of the chosen article in response to the stimulus question given via Canvas | 4 | 3 | Written communication and mathematical and academic literacies including English expression, grammar, spelling, punctuation, and referencing conventions | 3 |
| No.              |   | Learning Outcome assessed |  |                           |   |   |   |   |  |   |   |  |   |
| 1                | Knowledge and understanding of the mathematics in the article   | 1                         |  |                           |   |   |   |   |  |   |   |  |   |
| 2                | Interpretation of the chosen article in response to the stimulus question given via Canvas  | 4                         |  |                           |   |   |   |   |  |   |   |  |   |
| 3                | Written communication and mathematical and academic literacies including English expression, grammar, spelling, punctuation, and referencing conventions  | 3                         |  |                           |   |   |   |   |  |   |   |  |   |

### All - Assessment Task 3: End of semester exam

| <b>GOAL:</b>     | The end of semester examination gives you an opportunity to demonstrate your knowledge, understanding and skills associated with the learning outcomes of the course.  |                           |  |                           |   |  |   |   |   |   |   |   |   |
|------------------|--|---------------------------|--|---------------------------|---|--|---|---|---|---|---|---|---|
| <b>PRODUCT:</b>  | Examination - Centrally Scheduled  |                           |  |                           |   |  |   |   |   |   |   |   |   |
| <b>FORMAT:</b>   | Individual Solutions to selected skill and application based problems.   |                           |  |                           |   |  |   |   |   |   |   |   |   |
| <b>CRITERIA:</b> | <table border="1"><thead><tr><th>No.</th><th></th><th>Learning Outcome assessed</th></tr></thead><tbody><tr><td>1</td><td>application of appropriate methods to solve selected first, second and particular higher order ordinary and partial differential equations</td><td>1</td></tr><tr><td>2</td><td>derivation of solutions for particular applications</td><td>2</td></tr><tr><td>3</td><td>correct mathematical communication of the methods, reasoning and working by which solutions were calculated</td><td>3</td></tr></tbody></table> | No.                       |  | Learning Outcome assessed | 1 | application of appropriate methods to solve selected first, second and particular higher order ordinary and partial differential equations | 1 | 2 | derivation of solutions for particular applications | 2 | 3 | correct mathematical communication of the methods, reasoning and working by which solutions were calculated | 3 |
| No.              |  | Learning Outcome assessed |  |                           |   |  |   |   |   |   |   |   |   |
| 1                | application of appropriate methods to solve selected first, second and particular higher order ordinary and partial differential equations   | 1                         |  |                           |   |  |   |   |   |   |   |   |   |
| 2                | derivation of solutions for particular applications  | 2                         |  |                           |   |  |   |   |   |   |   |   |   |
| 3                | correct mathematical communication of the methods, reasoning and working by which solutions were calculated  | 3                         |  |                           |   |  |   |   |   |   |   |   |   |

## 7. Directed study hours

A 12-unit course will have total of 150 learning hours which will include directed study hours (including online if required), self-directed learning and completion of assessable tasks. Student workload is calculated at 12.5 learning hours per one unit.

## 8. What resources do I need to undertake this course?

Please note: Course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Canvas site– Please log in as soon as possible.

### 8.1. Prescribed text(s) or course reader

Please note that you need to have regular access to the resource(s) listed below. Resources may be required or recommended.

| REQUIRED? | AUTHOR                     | YEAR | TITLE                                      | EDITION | PUBLISHER             |
|-----------|----------------------------|------|--|---------|-----------------------|
| Required  | Bronson, R. and Costa, G.B | 2014 | Schaum's Outline of Differential Equations | 4th     | McGraw-Hill Education |

### 8.2. Specific requirements

Not applicable

## 9. How are risks managed in this course?

Health and safety risks for this course have been assessed as low. It is your responsibility to review course material, search online, discuss with lecturers and peers and understand the health and safety risks associated with your specific course of study and to familiarise yourself with the University's general health and safety principles by reviewing the [online induction training for students](#), and following the instructions of the University staff.

## 10. What administrative information is relevant to this course?

### 10.1. Assessment: Academic Integrity

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Canvas, are electronically checked through Turnitin. This software allows for text comparisons to be made between your submitted assessment item and all other work to which Turnitin has access.

### 10.2. Assessment: Additional Requirements

Your eligibility for supplementary assessment in a course is dependent of the following conditions applying:

The final mark is in the percentage range 47% to 49.4%

The course is graded using the Standard Grading scale

You have not failed an assessment task in the course due to academic misconduct

### 10.3. Assessment: Submission penalties

Late submission of assessment tasks may be penalised at the following maximum rate:

- 5% (of the assessment task's identified value) per day for the first two days from the date identified as the due date for the assessment task.

- 10% (of the assessment task's identified value) for the third day - 20% (of the assessment task's identified value) for the fourth day and subsequent days up to and including seven days from the date identified as the due date for the assessment task.

- A result of zero is awarded for an assessment task submitted after seven days from the date identified as the due date for the assessment task. Weekdays and weekends are included in the calculation of days late. To request an extension you must contact your course coordinator to negotiate an outcome.

### 10.4. SafeUniSC

UniSC is committed to a culture of respect and providing a safe and supportive environment for all members of our community. For immediate assistance on campus contact SafeUniSC by phone: [07 5430 1168](tel:0754301168) or using the [SafeZone](#) app. For general enquires contact the SafeUniSC team by phone [07 5456 3864](tel:0754563864) or email [safe@usc.edu.au](mailto:safe@usc.edu.au).

The SafeUniSC Specialist Service is a Student Wellbeing service that provides free and confidential support to students who may have experienced or observed behaviour that could cause fear, offence or trauma. To contact the service call [07 5430 1226](tel:0754301226) or email [studentwellbeing@usc.edu.au](mailto:studentwellbeing@usc.edu.au).

### 10.5. Study help

For help with course-specific advice, for example what information to include in your assessment, you should first contact your tutor, then your course coordinator, if needed.

If you require additional assistance, the Learning Advisers are trained professionals who are ready to help you develop a wide range of academic skills. Visit the [Learning Advisers](#) web page for more information, or contact Student Central for further assistance: +61 7 5430 2890 or [studentcentral@usc.edu.au](mailto:studentcentral@usc.edu.au).

### 10.6. Wellbeing Services

Student Wellbeing provide free and confidential counselling on a wide range of personal, academic, social and psychological matters, to foster positive mental health and wellbeing for your academic success.

To book a confidential appointment go to [Student Hub](#), email [studentwellbeing@usc.edu.au](mailto:studentwellbeing@usc.edu.au) or call 07 5430 1226.

## 10.7. AccessAbility Services

Ability Advisers ensure equal access to all aspects of university life. If your studies are affected by a disability, learning disorder mental health issue, injury or illness, or you are a primary carer for someone with a disability or who is considered frail and aged, [AccessAbility Services](#) can provide access to appropriate reasonable adjustments and practical advice about the support and facilities available to you throughout the University.

To book a confidential appointment go to [Student Hub](#), email [AccessAbility@usc.edu.au](mailto:AccessAbility@usc.edu.au) or call 07 5430 2890.

## 10.8. Links to relevant University policy and procedures

For more information on Academic Learning & Teaching categories including:

- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Central Examinations
- Deferred Examinations
- Student Conduct
- Students with a Disability

For more information, visit <https://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching>

## 10.9. Student Charter

UniSC is committed to excellence in teaching, research and engagement in an environment that is inclusive, inspiring, safe and respectful. The [Student Charter](#) sets out what students can expect from the University, and what in turn is expected of students, to achieve these outcomes.

## 10.10. General Enquiries

### In person:

- **UniSC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **UniSC Moreton Bay** - Service Centre, Ground Floor, Foundation Building, Gympie Road, Petrie
- **UniSC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **UniSC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **UniSC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- **UniSC Caboolture** - Student Central, Level 1 Building J, Cnr Manley and Tallon Street, Caboolture

**Tel:** +61 7 5430 2890

**Email:** [studentcentral@usc.edu.au](mailto:studentcentral@usc.edu.au)