USC

COURSE OUTLINE

MTH203 Numerical Analysis

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2021 | Semester 2

USC Sunshine Coast
USC Moreton Bay

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

Please go to the USC website 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 the mathematical analysis of numerical problems such as those that are encountered in many disciplines, including the physical sciences and engineering. You will learn to select, configure and use suitable computational tools with appropriate numerical methods for integration and optimization, simulation techniques, applications of differential equations and presentation of data. You will also learn to use MATLAB in order to explore and apply the mathematical techniques taught in the lectures.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
ON CAMPUS			
Tutorial/Workshop 1	2hrs	Week 1	13 times
Lecture	2hrs	Week 1	13 times

1.3. Course Topics

Introduction. History. The need for numerical computation. N-digit arithmetic. Numerical error. Introduction to MATLAB. Taylor series. Errors of computation. Solving nonlinear equations: - Bisection - Fixed-point iteration - Newton's method. Solving systems of linear equations: - Gaussian elimination with Partial pivoting - Decomposition methods (Matrix factorisation) (Doolittle, Choleski). Function approximation with Taylor polynomials. Interpolation: - Lagrange Polynomial - Divided differences - Finite differences. Numerical Differentiation. Numerical Integration: - Trapezoidal - Simpsons - Romberg. Solving ODEs - Euler - Modified Euler - Runge-Kutte.

2. What level is this course?

200 Level (Developing)

Building on and expanding the scope of introductory knowledge and skills, developing breadth or depth and applying knowledge and skills in a new context. May require pre-requisites where discipline specific introductory knowledge or skills is necessary. Normally, undertaken in the second or third full-time year of an undergraduate programs.

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 numerical methods of analysis.	Knowledgeable Empowered
2 Select and combine tools and techniques in numerical analysis to solve mathematical problems in mathematics and science.	Creative and critical thinker Empowered
3 Comprehend and communicate concepts and techniques relevant to numerical analysis, using either written English or mathematical notations, as appropriate.	Knowledgeable Empowered
4 Calculate and record results accurately and precisely.	Knowledgeable Empowered

5. Am I eligible to enrol in this course?

Refer to the USC Glossary of terms for definitions of "pre-requisites, co-requisites and anti-requisites".

5.1. Pre-requisites

MTH202 or (MTH103 and MTH104)

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

MTH532 or MTH312

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

Matrix operations, Differential Calculus, Integral Calculus. Students entering MTH203 must have a strong knowledge and capability with arithmetic, exponents, logarithms, algebra and trigonometry. If students are uncertain in these topics, they are advised to undertake some self-directed study prior to the start of semester.

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

Online problems will be set for students to work on during the first few weeks, which will provide the students with early feedback regarding their preparedness for the course. Students will attend weekly workshops, in which relevant problems are processed and solved step-by-step, under the guidance of the tutor. There is opportunity for questions and assistance. Students will also be provided with homework questions, which will allow them to practice and to determine for themselves if they fully understand that week's material.

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	1	Quiz/zes	Individual	10%	Approx. 10 hours	Refer to Format	Online Assignment Submission
All	2	Quiz/zes	Individual	50%	0.5 hours each	Throughout teaching period (refer to Format)	In Class
All	3	Artefact - Technical and Scientific	Individual	40%	20 hours	Week 12	Online Assignment Submission

All - Assessment Task 1: On-line Exercises

GOAL:	These exercises will address the essential, foundation knowledge and skills which form the pre-requisite foundation for Numerical Analysis.These exercises will help you recall and practice using your foundation mathematical knowledge and techniques until you are fluent and accurate and provide immediate feedback regarding your general ability with many of the relevant mathematical techniques.
PRODUCT:	Quiz/zes
FORMAT:	Submit: Weeks 1-4. As often as you like until the specified closing date. Individual students log into the online system and receive a unique set of questions. The exercise-sets will be composed of a range of questions or tasks that relate to the content that is foundational to Numerical Analysis.You will calculate the answers and submit these directly back into the web page. The submitted answers are marked immediately and the correct answers are shown.During the time over which the exercise-sets are available as assessment, you may submit as many attempts at each exercise-set as you wish. Some of the very basic exercise sets are time-limited.

CRITERIA:	**No.**		**Learning Outcome assessed**
	1	Marks for the online exercises are awarded entirely on the basis of the answers that you type into the computer and submit to the server.	② ④
	2	Achieving correct answers requires the careful selection and application of relevant mathematical technique so, indirectly, you are also assessed on your ability to: think analytically; select and apply the relevant mathematical tools for the various	② ④

All - Assessment Task 2: Module Tests

GOAL:	The course is identified as being composed of several "modules". The module tests encourage you to revise the course material on an on-going basis and gives you an opportunity to assess your learning progress against the learning outcomes of this course. These tests also give you valuable practice in learning to solve problems independently, and to communicate your reasoning and methods.
PRODUCT:	Quiz/zes
FORMAT:	Individual. Mixed practical and theoretical written questions.To be run in your scheduled tutorial class (workshop)(weeks 5,7,9,11,13).

CRITERIA:	**No.**		**Learning Outcome assessed**
	1	You will be assessed on your ability to: recall the theoretical and practical components of the course materials covered in the lectures, tutorials and readings for that module.	①
	2	apply the theory and derive solutions to particular examples	① ②
	3	decide which is the most appropriate method to solve a particular problem	① ②
	4	communicate the methods, reasoning and working by which solutions may be calculated	③ ④

All - Assessment Task 3: Assignment

GOAL:	This assessment task is designed to encourage you to revisit material from through the semester and to apply it to new sets of problems. This assignment will bring together many of the concepts and techniques in a single body of work, thus forming a "capstone" assessment piece of the course's content.
PRODUCT:	Artefact - Technical and Scientific
FORMAT:	Individual assignment. Hand-written mathematical working for solutions to problems are to be scanned to pdf, which must also include any relevant graphs and MATLAB programs which must be presented in Courier New (size 10). Standard FoSHEE assignment coversheet, signed by the student.The pdf must be uploaded to the Blackboard submission area before the deadline. As there will be ample time to work on the assignment, and fully-worked examples of similar problems will have been seen through the semester, only the final answers will be rewarded with marks; however, all evidence of working and methods used must also be provided in the format specified, or a mark will not be awarded. Any evidence of collusion or plagiarism will result in heavy penalties and/or misconduct procedures. A comprehensive description of the requirements and criteria, against which the assignment will be assessed, will be provided at the time that this assessment item is issued.

CRITERIA:	No.		Learning Outcome assessed
	1	Correct answers to problems, with correct numerical formatting and evidence of mathematical working.	① ② ③ ④

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. Directed study hours may vary by location. 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 Blackboard site– Please log in as soon as possible.

8.1. Prescribed text(s) or course reader

> There are no required/recommended resources for this course.

8.2. Specific requirements

In order to practice many of the exercises, you will need to have access to a computer with reasonable internet access. You will also have to download and install MATLAB (at no cost to you, instructions will be provided), or use MATLAB via USCanywhere.

You will need to have capability of digitising (scanning) your written work to a pdf document, for submission of the assignment (information regarding this will be provided).

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 Blackboard, are electronically checked through SafeAssign. This software allows for text comparisons to be made between your submitted assessment item and all other work that SafeAssign has access to.

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. 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.

10.5. 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 or call 07 5430 1226.

10.6. 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 or call 07 5430 2890.

10.7. 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
- Administration of Central Examinations
- Deferred Examinations
- Student Academic Misconduct
- Students with a Disability

Visit the USC website: http://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching

10.8. General Enquiries

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

Tel: +61 7 5430 2890
Email: studentcentral@usc.edu.au