UNIVERSITY
OF WOLLONGONG
IN DUBAI

Undergraduate Program Subject Outline

School of Engineering

SUBJECT NAME: ESSENTIALS OF ENGINEERING MATHEMATICS

Course code:	MATH142	Section:	Dubai
Credit Points:	6	Year	2024
Session	Winter	Duration:	11 weeks
Pre-requisite(s)	MATH141	Co-requisite(s)	None
Mode of Delivery:	F2F		
Passing Requirement:	$\begin{cases} 50\% \\ \text{and} \\ \frac{\text{Midterm} + \text{Final}}{2} \geq 40 \end{cases}$		

Timetabling Information can be found at MY|UOWD, https://my.uowdubai.ac.ae/

Educator's Name:	**Dr. Assane Lo**	**Mr. Mohamad Alrifai**	**Mr. Ziad Choucair**
Building & Office No:	School of Engineering, Third Floor		
E-mail Address:	AssaneLo@uowdubai.ac.ae	**MohamadAlrifai@uowdubai.ac.ae**	**ZiadChoucair@uowdubai.ac.ae**
Consultation:	See Moodle		

1   SUBJECT DESCRIPTION

The subject consists of two strands, Integral Calculus with applications and Series. The Integral Calculus strand presents a number of analytical and numerical integration techniques plus applications of integration to find areas, volumes of revolution and solve differential equations. The Series strand covers techniques for finding limits, determining the convergence of series and leads into Taylor series. All of these are presented with accompanying examples from various Engineering disciplines.

2   CONTRIBUTION TO PROGRAM LEARNING OUTCOMES (PLO)

The activities in this course contribute to achieving the following program learning outcomes:

Program: Engineering	
PLO1	Demonstrate professional knowledge with a strong grounding in engineering and awareness of current local and international trends and challenges.

PLO2	Navigate disciplinary literature with particular skills in gathering & synthesising information independently to support an argument or strategy.	
PLO3	Implement common research methods in the field of engineering, analyse data & evaluate the validity of findings and exercise critical judgement in determining new directions and strategies for carrying out further investigation.	
PLO4	Draw from established engineering concepts, methods and industry standards to develop innovative solutions to complex engineering problems by completing a research project relating to the respective engineering major.	
PLO5	Communicate clearly and coherently in writing to a range of audiences, with an ability to integrate knowledge, research, data, analysis and critical evaluation.	
PLO6	Communicate verbally to a range of audiences using appropriate language in presentations, consultation and negotiation.	
PLO7	Work productively as part of a team with the capacity for leadership, recognising the roles, responsibilities and accountabilities of team members.	
PLO8	Show respect for the views, values and culture of others in settings involving colleagues, clients, communities and end users, and consider alternate perspectives in design and project management.	
PLO9	Make complex considerations in regards to professional ethics and accountability, account for and mitigate risk, and operate with a commitment to professionalism in all work.	
PLO10	Appreciate the importance of sustainable engineering design, and seek to maximise positive social and environmental outcomes in engineering design, practice and development.	

Course MATH142: Upon successful completion of this subject, a student should be able to:		**PLO's**
LO1	Demonstrate a basic knowledge of the principles and techniques in Integral Calculus.	1
LO2	Apply principles and techniques of Integration to find areas, volumes of revolution and to solve Differential Equations.	1
LO3	Determine convergence and divergence of Numerical Series.	1
LO4	Apply principles and techniques from general Series to the context of Taylor Series.	1
LO5	Use mathematical skill in solving engineering problems.	1
LO6	Apply the tools of integration, differential equations and series to model and analyse of engineering problems.	1,2

3   SUBJECT SCHEDULE

Session	Lecture Topic(s)	Tutorial	Learning Outcomes
Weeks 1 & 2	➢ **Integration Techniques and Applications** • General Power, Exponential and Logarithmic Rules	Examples –Integral Calculus and Applications	LO1, LO2, LO5 and LO6

	• Evaluating definite integrals by substitutions (revisited) • Numerical integrations: The Simpson's rule • Area between two curves • Arc-length of plane curves • Area of surfaces of revolution • Calculus with parametrized and polar curves			
Weeks 3 & 4	➢ **Integration Techniques and Applications (continued)** • Volumes by slicing: Disk and Washer • Volumes by cylindrical shells • Integration by parts • Trigonometric integrals	Examples –Integral Calculus and Applications	LO1, LO2, LO5 and LO6	
Weeks 5 & 6	• Trigonometric substitutions • Integrating rational functions by partial fraction decomposition • Improper integrals ➢ **First Order Differential Equations** • Separable equations • Linear Equations	Examples – Integral Calculus, Separable and Linear Differential Equations	LO1, LO2, LO5 and LO6	
Weeks 7 & 8	➢ **First Order Differential Equations (Continued)** • Exact equations • Special Integrating Factors • Homogeneous Eq's and the Bernoulli Eq • Application of differential equations to model various phenomena in the physical, biological, and social sciences, including compound interest, radioactive decay, cooling, and exponential and logistic population growth. • Case study in applications of differential equations.	Examples- Solving First Order Differential Equations and Applications in Engineering	LO2, LO5 and LO6	
Weeks 9 & 10	➢ **Sequences and Infinite Series** • Sequences, monotone sequences. • Infinite series, • convergence tests (divergence and integral tests) • convergence tests (comparison, ratio, squeezing) • alternating series • Power Series • Definition of power series, radius and interval of convergence. • Representation of functions as power series • Maclaurin and Taylor Series. • Differentiation and integration of power series	Examples- Convergence of Sequences, Convergence of Series, Power Series, Representation of Functions as Power Series, Taylor and Maclaurin Series	LO3, LO4, LO5 and LO6	
Week 11	Revision			

4 SUPPORTING MATERIALS

Books, Articles, Videos, Podcasts, etc. will be available on our Learning Management System (LMS).

4.1 REQUIRED TEXTBOOK

No set textbook.

4.2 RECOMMENDED READINGS

- Early Transcendental, International Student Version, Combined 11th edition, Howard Anton, Irl C. Bivins and Stephen Davis. ISBN: 978-1-119-24491-2. Wiley (2019).
- James, Glyn, *Modern Engineering Mathematics*, 6th Edition, Pearson Education Australia 2020. ISBN-13: 978-1292253497, ISBN-10: 1292253495. Pearson (2020).
- Peter V. O'Neil, Advanced Engineering Mathematics, 8th edition. ISBN-13: 978- 1305635159 ISBN-10: 1305635159. Cengage Learning (2017).
- Thomas, G. and Finney, R., Calculus and Analytic Geometry Alternate Edition. ISBN- 13: 978-0321193636, ISBN-10: 0321193636. Addison-Wiley (2002).
- Margaret L. Lial, Raymond N. Greenwell, and Nathan P. Ritchey, *Calculus with Applications* 11th Edition. ISBN-13: 978-0321979421 ISBN-10: 0321979427. Pearson (2016).
- Jean Marie McDill and Agnes M. Rash, *Interactive Calculus with Applications (with CD- ROM)*. Brooks Cole (Paperback, 2005).
- Brannan/Boyce's Differential Equations: An Introduction to Modern Methods and Applications, 3rd Edition. ISBN-10: 9781118531778, ISBN-13: 978-1118531778. Wiley (2015).

4.3 ACCESS TO SUPPORTING MATERIALS

The University uses MOODLE as a Learning Management System (LMS) to support all coursework subjects. The subject site and supporting materials can be accessed via: https://moodle.uowplatform.edu.au And via UOWD Library.

5 ASSESSMENT

5.1 ASSESSMENT OF LEARNING OUTCOMES

Learning Outcome	Measures (Elements of Assessment)
LO1:	Homework Assignments, Quizzes, Midterm Exam
LO2:	Homework Assignments, Quizzes, Midterm Exam
LO3:	Homework Assignments, Quizzes, Final Exam
LO4:	Homework Assignments, Quizzes, Final Exam
LO5:	Homework Assignments
LO6:	Homework Assignments, Midterm Exam, Final Exam

5.2 ASSESSMENT TASKS

Learning Outcome	Assessment 1 In-class Quizzes 20%	Assessment 2 Midterm Exam 35%	Assessment 3 Final Exam 35%	Assessment 4 Homework Assignments 10%
LO 1	x	x		x

LO 2	x	x		x
LO 3	x		x	x
LO 4	x		x	x
LO 5				x
LO 6		x	x	x
Individual	x	x	x	x
Total Marks	40	100	100	40
Due Date	Week 5 and Week 10	Week 6	Final Exam Period	Throughout the semester

Assessment Task:	In-class quizzes
Type:	Individual
Learning Outcome Measured:	1,2,3,4
Total Marks:	40
Weighting:	20%
Date, Time and Location:	Week 5 and Week 10

OUTLINE AND REQUIREMENTS

There will be two in-class quizzes prior to the midterm and final exam. The first quiz is summative and weight 10%, while the second quiz is formative. The quizzes will cover the same materials as the major exams. The main purpose of the quizzes is to give the students feedbacks to help them prepare for the Major Exams.

MARKING CRITERIA

Marks will be based on the students' performance of the assigned quiz. Quiz results will be returned to students within a maximum period of <u>one week</u> following the test date. All results will be posted online. Students are responsible for verifying the accuracy of the posted results.

Assessment Task:	Midterm Exam
Type:	Individual
Description:	Written
Learning Outcome Measured:	1,2,6
Total Marks:	100
Weighting:	35%
Due Date:	Week 6
Hand in to:	Lecturer
TurnItIn submission required by:	NA

OUTLINE AND REQUIREMENTS

The midterm will cover subject materials up to the time of the test. It will be conducted in 'exam' conditions and students must strictly follow the examination rules. The midterm will be for two hours.

MARKING CRITERIA

Marks will be based on the students' performance of the assigned tests. Test results will be returned to students within a maximum period of one week following the test date. All results will be posted online. Students are responsible for verifying the accuracy of the posted results.

Assessment Task:	Homework Assignments
Type:	Individual
Learning Outcome Measured:	1,2,3,4,5,6
Total Marks:	40
Weighting:	10%
Date, Time and Location:	Online

OUTLINE AND REQUIREMENTS

You will be given online assignments Starting from week 2. The main purpose of each assignment is to give you feedback on your progress and understanding of the work during the tutorial sessions. Assignments are only part of the expected workload and is worth 10% of the final mark.

MARKING CRITERIA

The tutor will grade the homework and MATLAB-based assignments. The marks for the homework and Lab will be posted online and students are responsible for verifying the accuracy of the posted results.

Assessment Task:	Final Exam
Type:	Individual
Description:	Written
Learning Outcome Measured:	3,4,6
Total Marks:	100
Weighting:	35%
Date:	To be held during the official examination period. Please refer to the Exam Timetable available on the Student Online Resources website (https://moodle.uowplatform.edu.au/login/index.php) closer to the exam period.

LATE SUBMISSIONS:

Please note that late submissions will incur a penalty of 20% per day, including weekends.

5.3 GRADES AWARDED

The approved grades of performance and associated ranges of marks for undergraduate subjects are:

High Distinction (HD)	85 – 100%
Distinction (D)	75 – 84%
Credit (C)	65 – 74%
Pass (P)	50 – 64%
Pass Supplementary (PS)	50%
Fail (F)	0 – 49% (and not meeting the attendance requirements)
Technical Fail (TF)	Not meeting the final exam passing requirements – see the Assessment Policy PP-REG-DB-2.1

5.4 SATISFACTORY COMPLETION REQUIREMENTS

In order to be considered for a grade of Pass (P) or better in this subject, students must achieve the minimum required mark in the Final Examination (see page 1 for required score); students who obtain a composite mark greater than or equal to 50% but do not satisfy the Final Examination minimum pass requirements in the final examination will be awarded a "Technical Fail" grade.

Students must 'reasonably' complete all assessment tasks (including the required score for the Final Examination,) and submit these as specified in the subject outline. 'Reasonable' completion of an assessment task will be determined based on the instructions given to the student including: word length, demonstration of research and analysis where required, adherence to the Plagiarism Policy guidelines, and completion of each section/component of the assessment. Failure to submit all assessment tasks may result in a Fail grade awarded for the subject.

6 RELEVANT POLICIES AND DOCUMENTS

All students must read and be familiar with the following UOWD policies and documents, which are available on the Student Online Resources (my.uowdubai.ac.ae) website by following the Policies link:
- Academic Grievance Policy
- Academic Integrity Policy
- Campus Access and Order Rules
- Code of Conduct – Library Users
- Code of Practice – Students
- Copyright Policy
- Intellectual Property Policy
- Library Regulations
- Minimum Rate of Progress
- Music, Video and Software Piracy
- Non-Discriminatory Language and Practice & Presentation Policy and Guidelines
- Special Consideration Policy & Procedure
- Student Attendance Policy
- Student Conduct Rules
- Rules for use of UOWD ITTS Facilities
- Teaching and Assessment: Code of Practice – Teaching
- Teaching and Assessment: Assessment and Feedback Policy
- Teaching and Assessment: Subject Delivery Policy

7 SSP & STUDIOSITY

SSP (Student Support Program) is a program committed to assisting students in developing their academic skills and getting the most out of their studies. As part of their services, SSP provides Peer Tutoring Program and Academic Workshops (https://my.uowdubai.ac.ae/ssd/index.php).

Studiosity is an online study tool that students can access 24 hours, 7 days a week! Students can receive feedback on submitted writing in less than 24 hours and receive one-to-one, personal help in real time with a subject specialist. The service can be accessed through the subject's Moodle site.

For further information, please contact:
SSP Coordinator
ssp@uowdubai.ac.ae
Phone Number: +971 4 278 1756

8 ACADEMIC INTEGRITY

Plagiarism and cheating are serious offences that can lead to expulsion from the university. Students must be familiar with the *Academic Integrity* policy which outlines the procedure that will be followed in case of academic misconduct including cheating and plagiarism. Please refer to *How to Avoid Plagiarism* available on the Student Online Resources website (http://my.uowdubai.ac.ae).

8.1 TURNITIN

Students are required to submit all written assignments in soft copy through the TurnItIn system which is available online at www.turnitin.com. Every student must have a TurnItIn account. Failure to submit an assignment through TurnItIn will result in marks for that assignment being withheld. **Students do NOT need to hand in a printed copy of the TurnItIn Originality Report.** More information about TurnItIn (including how to create an account and add a class) will be provided in the first lecture. Students can download Frequently Asked Questions (FAQs) about TurnItIn from the SSP section of UOWD website (https://www.uowdubai.ac.ae/academic-resources/student-support-programs).

TurnItIn information required to add this subject:

Class ID:	Moodle Link
Password:	Moodle Link

8.2 REFERENCE & IN-TEXT CITATION

For information about referencing and in-text citation please review the *Academic Writing Presentation* available on the Student Online Resources website (http://my.uowdubai.ac.ae).

8.3 UOWD RULES & POLICIES

For information about UOWD Rules and Policies, please go to the Student Online Resources website (http://my.uowdubai.ac.ae) and click on the POLICIES link.

9 ATTENDANCE REQUIREMENTS

Attendance in this subject is compulsory. Failure to attend all tutorials and computer labs as per the Student Attendance Policy may result in a FAIL grade. Students are strongly encouraged to become familiar with this policy (which can be found on the Online Resources website at my.uowdubai.ac.ae).

10 TUTORIAL/COMPUTER LAB ENROLMENTS

All students must sign up for one tutorial and/or computer lab in Week 1. Admission to a tutorial/computer lab will <u>not</u> be possible unless the student's name is on the Attendance List for that class. No changes will be allowed once a student has enrolled in a tutorial/computer lab.

11 SUPPLEMENTARY ASSESSMENTS

A supplementary assessment may be offered to students whose performance in this subject is close (45-49 in the final examination and 48-49 in the composite score) to that required to pass the subject, and are otherwise identified as meriting an offer of a supplementary assessment. The precise form of a supplementary assessment will be determined at the time the offer of a supplementary is made.

12 LECTURE CAPTURE

UOWD supports the recording of lectures as a supplemental study tool, to provide students with equity of access, and as a technology-enriched learning strategy to enhance the student experience.

To make your own recording of a lecture you **must** receive the explicit permission of the Educator and those people who are also being recorded.

You may only use recorded lectures, whether they are your own or recorded by the university, for your own educational purposes. Recordings cannot be altered, shared or published on another platform, without permission of the University. UOWD's Lecture Capture policy is underdevelopment.

13 SUSTAINABILITY

UOWD encourages all students to act in a sustainable manner when planning and submitting assessments. If possible, students should not use plastic items, such as folders, covers, and bindings, and other synthetic materials, for presentations, workshops, and other activities. Students are also encouraged to avoid unnecessary printing; and if printing is required, please consider printing double-sided and only printing essential illustrations avoiding blocks of any colour as the use of ink is harmful to the environment. Always behave in a sustainable way.