

Undergraduate Program Subject Outline

Faculty of Engineering and Information Sciences

<http://my.uowdubai.ac.ae>

SUBJECT NAME: FOUNDATIONS OF ENGINEERING MATHEMATICS

| | | | |
|--|---|------------------------|----------|
| Course code: | MATH141 | Section: | Dubai |
| Credit Points: | 6 | Year | 2023 |
| Session | Autumn | Duration: | 11 Weeks |
| Pre-requisite(s) | MATH042 or Challenge Test | Co-requisite(s) | NONE |
| Mode of Delivery: | F2F | | |
| Final Exam Passing Requirement: | Average of Midterm and Final at least 40% | | |

LECTURE INFORMATION

| Section 1 by Dr. Assane Lo | | | |
|------------------------------|-------------------------------|-----|-------------------------------|
| Day: | Wednesday | and | Thursday |
| Time: | 10:30 - 12:30 | | 08:30 – 10:30 |
| Location: | 5.134-Classroom A 5.13 & 5.14 | | 4.467-Classroom A 4.46 & 4.47 |
| Or | | | |
| Section 2 by Dr. Malek Fareq | | | |
| Day: | Wednesday | and | Thursday |
| Time: | 13:30 - 15:30 | | 10:30 – 12:30 |
| Location: | 3.44-Classroom B | | 4.467-Classroom A 4.46 & 4.47 |



TUTORIAL INFORMATION

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|-----------|------------------------------------|----|-----------------------------------|----|----------------------------------|
| Day: | Wednesday | or | Thursday | or | Thursday |
| Time: | 13:30 – 15:30 | | 11:30 – 13:30 | | 11:30 – 13:30 |
| Location: | 6.39- Classroom A (Z. Choucair) | | 4.48-Classroom B (Z. Choucair) | | 3.48 Classroom B (M. Alrifai) |
| or | | | | | |
| Day: | Thursday | or | Thursday | or | Thursday |
| Time: | 13:30 – 15:30 | | 13:30 – 15:30 | | 13:30 – 15:30 |
| Location: | 4.45-Classroom B (Z. Choucair | | 4.52 Classroom B (M. Alrifai) | | 3.48 Classroom B (A. Lo) |

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| Educator's Name: | Assane Lo, Mohd Fareq Abd Malek, Ziad Choucair and AlRifai, M |
| Building & Office No: | FEIS Third Floor |
| E-mail Address: | ASSANELO@UOWDUBAI.AC.AE , mohamedfareqmalek@uowdubai.ac.ae ziadchoucair@uowdubai.ac.ae MOHAMADALRIFAI@UOWDUBAI.AC.AE |

| Consultations | | | |
|---|--|---|---|
| Lo, A. | Malek, M. | Choucair, Z. | Alrifai, M. |
| Wednesday 8:30 – 10:30 Thursday 10:30 – 13:30 And by appointment. ASSANELO@UOWDUBAI.AC.AE | Tuesday 09:30 - 13:30 and by appointment. mohamedfareqmalek@uowdubai.ac.ae | Monday 10:30-12:30 and by appointment. ziadchoucair@uowdubai.ac.ae | Wednesday 11:00-13:00 And by appointment MOHAMADALRIFAI@UOWDUBAI.AC.AE |

1 SUBJECT DESCRIPTION

The subject consists of two strands, Calculus and Linear Algebra. The Calculus strand covers differential calculus and provides an introduction to integral calculus. The Linear Algebra strand covers matrices, determinants and applications of these in the sub-topic of vector geometry. 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 MATH141 | | PLOs |
|--|---|-------------|
| Upon successful completion of this subject, a student should be able to: | | |
| LO1 | Select and apply differentiation and integration techniques to analyse functions and applications such as area and total changes. | 1,2 |
| LO2 | Solve linear systems and carry out basic computations such as matrix operations, row reduction, Determinant calculation by hand or using MATLAB | 1,2 |
| LO3 | Apply principles and techniques from Linear Algebra in the context of three-dimensional Vector Geometry. | 1,2 |
| LO4 | Use Mathematical skills to estimate and validate solutions | 1,2 |
| LO5 | Apply the tools of differential calculus and linear algebra to model and analyse basic engineering problems | 1,2 |



3. SUBJECT SCHEDULE

| Week | Lecture Topic(s) | Learning Outcomes | Session Type | Delivery format | Related supporting materials |
|------|--|-------------------|----------------------------|-----------------|--|
| 1 | Limit and Continuity: Use a table of values to estimate the limit of a function. Determine the limits of functions using the limit laws and algebraic methods. Evaluate infinite limits in order to determine vertical asymptotes of a function. Determine the continuity of functions at points or on intervals. Determine points where a function is discontinuous, and identify the types of discontinuity. Apply definitions of continuity and continuity theorems to determine limits of functions at specified points or at infinity. | 1,4,5 | Lecture (L) / Tutorial (T) | F2F | Lecture 1 A, Sections 1.2 (p48), 1.3 (p. 59), Lecture 1B, Sections 1.4 (p. 70) and 1.5 (infinite limits p.83) |
| 2 | Differentiation: Tangent Lines, Derivative Function, Techniques of differentiation Trigonometric Functions | 1,4,5 | L/T | F2F | Sections 2.1, 2.2 |
| 3 | Differentiation (continued): Chain Rule, Implicit Differentiation Rates of change, Related Rates | 1,4,5 | L/T | F2F | Sections 2.3 2.4 |
| 4 | Applications of Differentiation: L'Hospital's Rule, Increase, Decrease, Concavity Maximum and Minimum Values | 1,4,5 | L/T | F2F | Sections 4.1 p.204, Section 4.3 (p.219), Section 4.4 (p.230) |
| 5 | Curve sketching, Analysis of functions Optimization Problems Integration: Areas, Definite Integrals, | 1,4,5 | L/T | F2F | Lecture 5 A, Sections 3.6, 3.7 Lecture 5 B, Sections 4.1(p.248), 4.2 (area p.259), 4.3 (p. 271) |
| 6 | Fundamental Theorem of Calculus Integration (continued): Basic integration rules, Indefinite Integrals Substitution Rule | 1,4,5 | L/T | F2F | Review material Sections 4.4 (F.T.C p.282), 4.5 (substitution, p.297) |

End of the materials of the midterm (Midterm in week 6)

Complex Numbers and Linear Algebra, Vector Geometry

| | | | | | |
|---|---|-----|-----|-----|-----------|
| 7 | Complex numbers Complex numbers: $z \in \mathbb{C}$, $z = x + yi$, | 3,4 | L/T | F2F | Chapter 5 |
|---|---|-----|-----|-----|-----------|

| | | | | | |
|-----------|---|-------|-----|-----|--|
| | Arithmetical operations with complex numbers, The conjugate number and the properties of the conjugation, representation of complex numbers. | | | | |
| 8 | Vectors in \mathbb{R}^2 and \mathbb{R}^3 Geometric of vectors, Dot Product, Vector arithmetic | 2,3 | L/T | F2F | Chapter 11, Sections 11.1 (p. 762); 11.2 (p. 773); 11.3 (p.781) |
| 9 | Vectors in \mathbb{R}^2 and \mathbb{R}^3 (continued), Cross Product, Lines and planes in \mathbb{R}^2 and \mathbb{R}^3 | 3,4,5 | L/T | F2F | Chapter 11, Sections 11.4 (p. 79); 11.5 (p. 798) |
| 10 | Linear Equations and Matrices, Introduction to Linear Systems Algebra of matrices, Determinant, Cramer's Rule, Eigenvalues and eigenvectors, Applications of Matrices. | 3,4,5 | L/T | F2F | Notes |
| 11 | Revision | | L/T | F2F | |

4. SUPPORTING MATERIALS

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

4.1 REQUIRED TEXTBOOK

No required textbooks. Notes extracted from Calculus of a Single Variable, 12th Edition, Ron Larson and Bruce H. Edwards, ISBN 780357749135, Published February 2022.

4.2 RECOMMENDED READINGS

- Calculus:
 - Early Transcendental, International Student Version, 11th edition, Howard Anton, Irl C. Bivins and Stephen Davis, 2019. ISBN: 978-1-119-24491-2.
 - Calculus: Early Transcendental, James Stewart, Daniel K. Clegg, Saleem Watson 9th edition. ISBN-13: 978-1337613927, ISBN-10: 1337613924.
 - Margaret L. Lial, Raymond N. Greenwell, and Nathan P. Ritchey, Calculus with Application 11th Edition. ISBN-13: 978-0133886832, ISBN-10: 0133886832.
 - Brief Calculus: An applied approach 10e international metric edition. Ron Larson. 2016. ISBN- 9781337290579.
- Linear Algebra and Vector Geometry:
 - Elementary linear algebra with supplemental applications (11th edition) by Howard Anton and Chris Rorres" 2014. ISBN: 978-1-118-67745-2.
 - Thomas, G. and Finney, R., Calculus and Analytic Geometry – Alternate edition. ISBN-13: 978-0321193636 ISBN-10: 0321193636.
 - Peter V. O'Neil, Advanced Engineering Mathematics, 8th edition. ISBN-13: 978-1305635159 ISBN-10: 1305635159.
 - Jean Marie McDill and Agnes M. Rash, Interactive Calculus with Applications (with CDROM). ISBN-13: 978-0495014737 ISBN-10: 0495014737

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 Outcomes | Measures (Elements of Assessment) |
|--|------------------------------------|
| LO1: Select and apply differentiation and integration techniques to analyse functions and applications such as area and total changes. | Midterm, Quizzes, Tutorials |
| LO2: Solve linear systems and carry out basic computations such as matrix operations, row reduction, Determinant calculation by hand or using MATLAB | Final, Tutorials |
| LO3: Apply principles and techniques from Linear Algebra in the context of three-dimensional Vector Geometry. | Final, Tutorials |
| LO4: Use Mathematical skills to estimate and validate solutions | Midterm, Final, Quizzes, Tutorials |
| LO5: Apply the tools of differential calculus and linear algebra to model and analyse basic engineering problems | Midterm, Final, Quizzes, Tutorials |

5.2 ASSESSMENT TASKS

| Learning Outcome | Assessment 1 Quizzes 20% | Assessment 2 Midterm Exam 30% | Assessment 3 Final Exam 35% | Assessment 4 Tutorial Work 15% |
|------------------------------|--------------------------------|-------------------------------------|-----------------------------------|--------------------------------------|
| LO 1 | x | x | | x |
| LO 2 | x | | x | x |
| LO 3 | x | | x | x |
| LO 4 | x | x | x | x |
| LO 5 | x | x | x | x |
| Group (G)/ Individual (I) | I | I | I | I |
| Total Marks | 40 | 100 | 100 | 15 |
| Due Date | Week 5 & Week 10 | End Week 6 | During the final exam period | Throughout the semester |

| | |
|-------------------------------------|---------------------------------|
| Assessment Task: | Midterm Exam |
| Type: | Individual |
| Description: | Written and MCQ's (potentially) |
| Learning Outcome Measured: | 1,4,5 |
| Total Marks: | 100 |
| Weighting: | 30% |
| Due Date: | End of week 6 |
| Word Length (if applicable): | NA |

| | |
|---|---------------------|
| Hand in to: | Lecturer/Instructor |
| TurnItIn submission required by: | No |

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 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: | Quizzes |
| Type: | Individual |
| Learning Outcome Measured: | 1,2,3,4,5 |
| Description: | In-class quizzes |
| Total Marks: | 40 |
| Weighting: | 20% |
| Due Date: | Week 5 & Week 10. |
| Word Length (if applicable): | NA |
| Hand in to: | Lecturer/Instructor |
| TurnItIn submission required by: | NA |

OUTLINE AND REQUIREMENTS

There will be a number of in-class quizzes prior to the midterms. The quizzes will cover the same materials as the major exams. The Quizzes may be conducted during the lectures/tutorials or both. The main purpose of the quizzes is to give the students feedback to help them prepare for the major exams and also to have a continuous learning process.

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 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: | Tutorial Work including assignments |
| Type: | Individual |
| Learning Outcome Measured: | 1,2,3,4,5 |
| Description: | Written |
| Total Marks: | 15 |
| Weighting: | 15% |

| | |
|---|-------------------------|
| Due Date: | Throughout the semester |
| Word Length (if applicable): | NA |
| Hand in to: | Lecturer / Instructor |
| TurnItIn submission required by: | NA |

OUTLINE AND REQUIREMENTS

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.

MARKING CRITERIA

The marks for the homework and will be posted online and students are responsible for verifying the accuracy of the posted results.

| | |
|----------------------------------|--|
| Assessment Task: | Final Exam |
| Learning Outcome Measured | 2,3,4,5 |
| 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 (http://my.uowdubai.ac.ae) closer to the exam period. |

OUTLINE AND REQUIREMENTS

The final exam will be during the final examination period, as announced by the university. The exam will cover weeks 7 – 10.

MARKING CRITERIA

The exam will be marked based on the correctness of the answers.

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 & STUDIOSTY

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 not 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.