Tutorial letter 101/0/2024

REAL ANALYSIS
MAT2613

Year module

Department of Mathematical Sciences

IMPORTANT INFORMATION:

Please activate your *my*Unisa and myLife e-mail account and make sure that you have regular access to the *my*Unisa module website MAT2613-24-Y1, as well as your group website.

Note: This is a fully online module. It is therefore, only available on *my*Unisa.

Define tomorrow.

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1   INTRODUCTION

Dear Students

Unisa is a comprehensive open distance e-learning (CODeL) higher education institution. The comprehensiveness of our curricula encapsulates a range of offerings, from strictly vocational to strictly academic certificates, diplomas and degrees. Unisa's "openness" and its distance e-Learning character result in many students registering at Unisa who may not have had an opportunity to enrol in higher education. Our CODeL character implies that our programmes are carefully planned and structured to ensure success for students ranging from the under-prepared but with potential to the sufficiently prepared.

Teaching and learning in a CODeL context involves multiple modes of delivery ranging from blended learning to fully online. As a default position, all post graduate programmes are offered fully online with no printed study materials, while undergraduate programmes are offered in a blended mode of delivery where printed study materials are augmented with online teaching and learning via the learner management system - myUnisa. In some instances, undergraduate programmes are offered fully online as well.

Furthermore, our programmes are aligned with the vision, mission and values of the University. Unisa's commitment to serve humanity and shape futures combined with a clear appreciation of our location on the African continent, Unisa's graduates have distinctive graduate qualities which include

- independent, resilient, responsible and caring citizens who are able to fulfill and serve in multiple roles in their immediate and future local, national and global communities

- having a critical understanding of their location on the African continent with its histories, challenges and potential in relation to globally diverse contexts

- the ability to critically analyze and evaluate the credibility and usefulness of information and data from multiple sources in a globalized world with its ever-increasing information and data flows and competing worldviews

- how to apply their discipline-specific knowledge competently, ethically and creatively to solve real-life problems

- an awareness of their own learning and developmental needs and future potential

The module MAT2613 is offered online, meaning that all information is available via the internet, we use *myUnisa* platform as our virtual campus. This is an online system that is used to administer, document and deliver educational material to you and support engagement with you. Look out for information from your lecturer as well as other Unisa platforms to determine how to access the virtual *myUnisa* module site. Information on the tools that will be available to engage with the lecturer and fellow students to support your learning will also be communicated via various platforms.

You are encouraged to log into the module site (MAT2613-24-Y) on *my*Unisaregularly (that is, at least twice per week).

Because this is a fully online module, you will need to use *my*Unisato study and complete the learning activities for this module. Visit the website for MAT2613 on *my*Unisafrequently.

Welcome to the module MAT2613. We trust that you will find it both interesting and rewarding. This module is offered as a year module. You will be well on your way to success if you start studying early in the year and resolve to do the assignments properly.

We hope you will enjoy this module, and wish you success with your studies.

This tutorial letter contains important information about the scheme of work, resources and assignments for this module as well as exam admission. We urge you to read it carefully and to keep it at hand when working through the study material, preparing the assignment, preparing for the examination and addressing questions to your lecturers.

In this tutorial letter, you might find the instructions on the preparation and submission of the assignments.

This tutorial letter also provides all the information you need with regard to the prescribed study material and other resources.

Please study this information carefully and make sure that you obtain the prescribed material as soon as possible.

You will access all files online, a number of tutorial letters for example, solutions to assignments (feedback to assignments can also be discussed on MS Teams), during the year. These tutorial letters will be uploaded on myUnisa, under **Offical Study materials** or **Additional Resources** and **Lessons** tools on myUnisa platform. A tutorial letter is our way of communicating with you about teaching, learning and assessment.

Right from the start we would like to point out that **you must read all the tutorial letters** you access from the module site **immediately and carefully**, as they always contain important and, sometimes urgent information.

Because this is a fully online module, you will need to use *my*Unisa to study and complete the learning activities for this course. Please visit the website for MAT2613 on *my*Unisa frequently.

We wish you every success with your studies!

2 MODULE OVERVIEW

2.1 Purpose

The study guide is directly linked to your prescribed book and must be used in conjunction with it. We emphasize that the study guide cannot be used in place of the prescribed book. the numbering of the sections in the study guide follows that in the prescribed book.

The study guide contains information concerning the nature and aims of the module and should be read carefully. You will, for example, discover that the material is within your grasp even though it is a little more abstract than what you have encountered thus far. The contents of the module consists of the whole prescribed book except §6.4 ("Alternative forms of Taylor's theorem"), which you need not study.

We recommend that you read the "Prologue" at the start of your study and once again after you have worked through the module. You will not be examined on it.

The "appendix" at the end of the book (p. 255) relates to §4.3 (Power series) and should be read after chapter 7. You should know the results of Theorems A.1 and A.2 (p. 255 and 256), though not the proofs.

Note that the book has worked examples in the text; then exercises, which you should try on your own before turning to the solutions at the end of the book; and further Problems, the answers only to some of which appear at the end of the book.

For examination purposes you should study everything in the book (except §6.4) but you will not be expected to reproduce the proofs of some of theorems (please see §5.4 below). you need to know and understand the statements of all theorems. We nevertheless recommend that you read all proofs and try to understand them, because this gives invaluable experience of how a mathematician argues and formulates an argument.

2.2 Outcomes

Outcome 1:
Demonstrate understanding of the fundamental concept of mathematics, namely the element of mathematical "proof".

1.1 The concepts of converse and negation of a statement are established.

1.2 Logical reasoning is used to decide whether the converse or negation of a statement is true or false.

1.3 Statements and/or equations are proved or disproved using the following kinds of proof:

   a) the direct method.

   b) the indirect method.

   c) proof by contradiction.

1.4 Deductive reasoning is used in the methods of proof.

Outcome 2:
Demonstrate understanding of the formal definition of the limit of a sequence.

2.1 Formal definitions with the correct mathematical notation is given for:

   a) converging sequences.

   b) sequences tending to infinity.

   c) subsequences.

   d) Cauchy sequences.

2.2 Rules governing convergent sequences, null sequences, and sequences tending to infinity are stated and used to determine and evaluate limits (if they exist).

2.3 The principle of monotone sequences is used to establish convergence.

2.4 The Bolzano-Weierstrass theorem is used to formulate another definition of convergence of a sequence.

2.5 Limits of subsequences are evaluated.

2.6 The Sandwich rule is applied to find the limit of a sequence.

Outcome 3:
Apply the correct series test to establish convergence, absolute convergence, conditional convergence or divergence of a series.

3.1 The interaction of an infinite series with the sequence of nth partial sums is established.

3.2 The contrapositive of the varnishing condition is used to establish divergence of series.

3.3 Laws governing converging series are applied to determine convergence of a series. This applies to geometric series, the p-series, the sum rule, and the scalar product rule.

3.4 The series tests (such as first comparison test, second comparison test, D'Alembert's ratio test, integral test or root test) are used to decide if a series of positive terms is convergent or divergent.

3.5 The alternating series test is used to decide if an alternating series is conditionally convergent.

3.6 The radius (interval) of convergence of a power series is calculated using the ratio test.

Outcome 4:
Apply the concept of limit to continuous functions.

4.1 Formal definitions of the limit L of a function f as the variable x approaches infinity and the limit of a function as x approaches a point c are given.

4.2 Laws governing limits (namely the sum, product, quotient, composite, and sandwich rules) are stated and proved and used to determine and evaluate limits of functions with limit value L.

4.3 A formal definition of the continuity of a function f at a given point c is given as well as the notions of left continuity and right continuity at a point.

4.4 Laws governing continuity (namely the sum, product, reciprocal, composite, and sandwich rules) are stated and used to determine if a function is continuous at a point.

4.5 First principles (that is, an $\epsilon - \delta$ approach) is used to determine whether a function is continuous or discontinuous at a point.

4.6 The boundedness property is proved and used to show that a function f attains a maximum value and a minimum value on a bounded interval.

4.7 The intermediate value property is proved and used, for instance, to prove that every real number has a positive n^{th} root.

4.8 The interval theorem is proved and used to find $f(I)$ of a continuous function f on a closed interval I.

4.9 A fixed point theorem is proved and used.

Outcome 5:
Demonstrate understanding of the formal definition of the derivative of a function and the notion of differentiability.

5.1 The formal definition of differentiability of a function f at a point c as well as the notion of the left-hand and the right-hand derivative are given and applied to determine if a function f is differentiable at a point c.

5.2 The connection between a function f being differentiable at a point c and f being continuous at a point c is given and applied.

5.3 All the basic rules of differentiation are recalled, proved using first principles (that is, the correct limit concept) and applied.

5.4 L'Hôpital's rule is recalled, proved, and applied.

5.5 Minimum and maximum values of a function are determined using the derivative.

5.6 Rolle's theorem, the mean value theorem, and the increasing, decreasing theorem are proved and applied.

Outcome 6:
A function is approximated by a Taylor polynomial at a given point and the error term is determined.

6.1 The Taylor polynomial of degree n of a function f at a point a is computed.

6.2 The Taylor series of a function f at a point a is calculated and the values for which the power series converges is determined, that is, the remainder (in the Lagrange form) is used to establish where the remainder $R_{n,a}f(x) \to 0$ as $n \to \infty$.

6.3 The Taylor polynomial and remainder is used to estimate functions to a certain number of decimal places.

Outcome 7:
Demonstrate an understanding of the Riemann integral.

7.1 A partition P of an interval is used and the upper and lower sums of a function f relative to the partition P is defined and calculated.

7.2 The Riemann integrability of a function f, defined and bounded on $[a, b]$, is defined and interpreted by any of the following:

    a) using the supremum of the lower sums and infimum of the upper sums.

    b) using the fact that f is monotone on $[a, b]$.

    c) using the fact that f is continuous on $[a, b]$.

7.3 Properties of the Riemann integral are used to calculate the integral values.

7.4 A function F is defined as an anti-derivative (indefinite integral) of a function f if the derivative of F is equal to f. Anti-derivative is recognized as the inverse of the differentiation process.

7.5 The Fundamental Theorem of Calculus is reproduced and used to:

    a) explain the way in which differentiation and integration are related.

    b) evaluate given integrals.

7.6 All integral techniques are revised and applied.

Outcome 8:
Test improper integrals for convergence and divergence and evaluate the integral, if it is convergent. Improper integrals of the following types are considered.

- Integrals in which the interval is unbounded (first kind).

- Integrals in which the integrand is unbounded over the integration interval (second kind).

- Integrals in which the integrand is unbounded and the integration interval is unbounded.

8.1 The given improper integral is compared with the three types to determine which type it is.

8.2 The improper integral is evaluated using the techniques of integration.

8.3 Appropriate limit(s) is/are used at the point(s) where the function becomes unbounded or where the interval is unbounded.

8.4 The limiting value of the improper integral is calculated as the integration interval approaches that of of the given improper integral.

8.5 It is decided whether the improper integral is convergent or divergent and if convergent, the value is written down.

8.6 The comparison test for integrals is used to compare an improper integral with a simpler improper integral.

3   CURRICULUM TRANSFORMATION

Unisa has implemented a transformation charter, in terms of which the university has placed curriculum transformation high on the teaching and learning agenda. Curriculum transformation includes student-centered scholarship, the pedagogical renewal of teaching and assessment practices, the scholarship of teaching and learning, and the infusion of African epistemologies and philosophies. All of these will be phased in at both programme and module levels, and as a result of this you will notice a marked change in the teaching and learning strategy implemented by Unisa, together with the way in which the content is conceptualized in your modules. We encourage you to embrace these changes during your studies at Unisa in a responsive way within the framework of transformation

4 LECTURER(S) AND CONTACT DETAILS

4.1 Lecturer(s)

The primary lecturer for this module is:

Dr CA Agyingi
Department: Mathematical Sciences
Telephone: 011 471 2916
E-mail: agyinca@unisa.ac.za

A notice will be posted on *myUnisa* if there are any changes and/or an additional lecturer is appointed to this module.

Please do not hesitate to consult your lecturer whenever you experience difficulties with your studies. You may contact your lecturer by phone or through correspondence or by making a personal visit to his/her office. **Please arrange an appointment in advance (by telephone or by e-mail) to ensure that your lecturer will be available when you arrive.** Please come to these appointments well prepared with specific questions that indicate your own efforts to have understood the basic concepts involved. If these difficulties concern exercises which you are unable to solve, you must send us your attempts so that we can see where you are going wrong.

If you should experience any problems with the exercises in the study guide or prescribed book, your lecturer will gladly help you with them, provided that you send in your bonafide attempts. **When sending in any queries or problems, please do so separately from your assignments and address them directly to your lecturer.**

4.2 Department

You can contact the Department of Mathematical Sciences as follows:

Department of Mathematical Sciences
Departmental Secretary: 011 670 9147 (RSA)   +27 11 670 9147 (International)
e-mails: mathsciences@unisa.ac.za   or   swanem@unisa.ac.za

4.3 University

To contact the University, follow the instructions on the Contact us page on the Unisa website.

Contact addresses of the various administrative departments appear on the Unisa website:
http://www.unisa.ac.za/sites/corporate/default/Contact-us/Student-inquiries
Please include the student number in all correspondence.
Whenever you contact a lecturer via e-mail, please include your student number in the subject line to enable the lecturer to help you more effectively.

5   RESOURCES

5.1   Prescribed book(s)

The prescribed book for this module is

Title:	**Fundamentals of Mathematical Analysis**
Author:	Rod Haggarty
Publishers:	**Addison-Wesley**
Edition:	**Second Edition**
Year:	1992
ISBN:	0 201 63197 0

Please buy the textbook as soon as possible since you have to study from it directly – you cannot do this module without the prescribed textbook.
Please refer to the list of official booksellers and their addresses in the *Study @ Unisa* brochure. Prescribed books can be obtained from the University's official booksellers. If you have difficulty in locating your book(s) at these booksellers, please contact the Prescribed Book Section at Tel: 012 429-4152 or e-mail vospresc@unisa.ac.za.

5.2   Recommended book(s)

There are no recommended books for this module.
However any book on Real Analysis I (introduction) which contains the relevant study topics can be used.
Nevertheless, here is a list of some of the texts available in the Unisa main library. There are a limited number of copies of these books. Be warned that some of these books contain topics which are beyond the scope of this module and the presentation may not follow the convention adopted by Haggarty.

1. Real Analysis, a constructive approach by Mark Bridge.

2. Elements of Real Analysis by M.A. Al-Gwaiz and S.A. Elsanousi.

3. An Introduction to Analysis, fourth edition by William R. wade.

Many texts in advanced calculus contain informative sections on sequences, series, limits, continuity, and the Riemann Integral.

5.3   Electronic reserves (e-reserves)

E-reserves can be downloaded from the Library catalog. More information is available at:
http://oasis.unisa.ac.za/search/r

5.4   Library services and resources

The Unisa Library offers a range of information services and resources. The library has created numerous library guides, available at http://libguides.unisa.ac.za
Recommended guides:

- For brief information on the library, go to https://www.unisa.ac.za/library/libatglance

- For more detailed library information, go to

  http://www.unisa.ac.za/sites/corporate/default/Library

- Frequently Asked Questions,
  visit https://www.unisa.ac.za/sites/corporate/default/Library/Frequently-Asked-Questions

- For research support and services such as the Personal Librarian service and the Information Search Librarian's Literature
  Search Request (on your research topic) service,
  visit http://www.unisa.ac.za/sites/corporate/default/Library/Library-services/Research-support.

- For library training for undergraduate students,
  visit https://www.unisa.ac.za/sites/corporate/default/Library/Library-services/Training

- Lending Services
  https://www.unisa.ac.za/sites/corporate/default/Library/Library-services/Lending-services

- Services for Postgraduate students -
  https://www.unisa.ac.za/sites/corporate/default/Library/Services-for-Postgraduates

- Support and Services for students with disabilities -
  https://www.unisa.ac.za/sites/corporate/default/Library/Services-for-students-with-special-needs

- Library Technology Support - https://libguides.unisa.ac.za/techsupport

- Finding and using library resources and tools -
  http://libguides.unisa.ac.za/Research skills
- A-Z list of library databases - https://libguides.unisa.ac.za/az.php

Important contact information:

- Technical problems encountered in accessing library online services: Lib-help@unisa.ac.za

- General library-related queries: Library-enquiries@unisa.ac.za

- Queries related to library fines and payments: Library-fines@unisa.ac.za

- Interlibrary loan service for postgraduate students: libr-ill@unisa.ac.za

- Literature Search Service: Lib-search@unisa.ac.za

- Social media channels: Facebook: UnisaLibrary and Twitter: @UnisaLibrary

6   STUDENT SUPPORT SERVICES

The *Study @ Unisa* brochure is available on *my*Unisa: www.unisa.ac.za/brochures/studies

This brochure contains important information and guidelines for successful studies through Unisa.

If you need assistance with regard to the myModules system, you are welcome to use the following contact details:

- Toll-free landline: 0800 00 1870 (Select option 07 for myModules)

- E-mail: mymodules22@unisa.ac.za or myUnisaHelp@unisa.ac.za

You can access and view short videos on topics such as how to view your calendar, how to access module content, how to view announcements for modules, how to submit assessment and how to participate in forum activities via the following link: https://dtls-qa.unisa.ac.za/course/view.php?id=32130

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Registered Unisa students get a free myLife e-mail account. Important information, notices and updates are sent exclusively to this account. Please note that it can take up to 24 hours for your account to be activated after you have claimed it. Please do this immediately after registering at Unisa, by following this link: myLifeHelp@unisa.ac.za

Your myLife account is the **only** e-mail account recognized by Unisa for official correspondence with the university, and will remain the official primary e-mail address on record at Unisa. You remain responsible for the management of this e-mail account.

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6.1 First-Year Experience Programme

Many students find the transition from school education to tertiary education stressful. This is also true in the case of students enrolling at Unisa for the first time. Unisa is a dedicated open distance and e-learning institution, and it is very different from face-to-face/contact institutions. It is a mega university, and all our programmes are offered through either blended learning or fully online learning. It is for this reason that we thought it necessary to offer first-time students additional/extended support to help them seamlessly navigate the Unisa teaching and learning journey with little difficulty and few barriers. We therefore offer a specialized student support programme to students enrolling at Unisa for the first time - this is Unisa's First-Year Experience (FYE) Programme, designed to provide you with prompt and helpful information about services that the institution offers and how you can access information.

7 STUDY PLAN

Your study plan of the module is outlined below. Please refer to the general management and planning skills guidelines in the Studies @ Unisa Brochure for further details.

The study plan below shows the content to be covered during specific periods of the year in terms of the broad concepts or topics, the study guide units and the prescribed book chapters. Your studies will be largely guided by the tutorial discussions and learning activities, and the assignments, which are all based on the same study plan. You should therefore participate as much as possible in the tutorial discussions and complete assignments and the learning or self-assessment activities linked to each topic in order to do well in the assignments, and for you to be well prepared for the final examination.

Definitions are extremely important and you must know them by heart. A definition is best remembered if you clearly understand the words used. Definitions generate concepts which are linked by means of theorems. Typically a theorem states, "If A is true, then B is true." One then engages in a process whereby the truth of A is assumed and through a sequence of logical deductions one arrives at the truth of B. Such a process is called a proof of a theorem. This is really the essence of mathematics and it is extremely important that you follow and understand the proofs of theorems. not all theorems are examinable.

Here then is a list of PROOFS YOU NEED NOT BE ABLE TO REPRODUCE:

- Chapters 1 & 2: all proofs.

- Chapter 3, p. 73, 3.1.2: proofs of the product rule, quotient rule, and scalar product rule (but note the result in the first bit of the proof of the product rule: every convergent sequence is bounded).

- Chapter 3, p. 77, 3.1.4: composite rule (proof on p. 152).

- Chapter 3, p. 80, 3.2.2: basic null sequences (*a*) to (*e*).

- Chapter 4, p. 109, 4.2.2: second comparison test.

- Chapter 4, p. 111, 4.2.3: D'Alembert's ratio test.

- Chapter 4, p. 112, 4.2.4: alternating (note spelling mistake) series test.

- Chapter 4, p. 113, 4.2.5: integral test (proof on p. 233).

- Chapter 4, p. 115, 4.2.7: theorem.

- Chapter 4, p. 116, 4.2.8: the rearrangement rule.

- Chapter 4, p. 118, 4.2.9: Cauchy product of series.

- Chapter 4, p. 123, 4.3.2: arithmetic of power series.

- Chapter 5, p. 138, 5.1.3: quotient rule (proof on p. 289 no. 3).

- Chapter 5, p. 140, 5.1.4: sandwich rule.

- Chapter 5, p. 141, 5.1.5: composite rule (proof on p. 151).

- Chapter 5, p. 151, 5.2.7: inverse rule (proof on p. 161).

8   HOW TO STUDY ONLINE?

8.1   What does it mean to study fully online?

Studying fully online modules differs completely from studying some of your other modules at Unisa.

- **All your study material and learning activities for online modules are designed to be delivered online on *my*Unisa.**

- **All your assignments (assessments) must be submitted online**. This means that you will do all your activities and submit all your assignments on myUnisa. In other words, you do **NOT** post your assignments to Unisa using the South African Post Office. You do **NOT** send assignments by email as such will not be considered for marking or a zero mark will be awarded.

- **All communication between you and the University happens online.** Lecturers will communicate with you via e-mail and **Chats**, **Blogs**, and use the **Announcements**, the **FAQs**, the **Discussion Forums** and the **Questions and Answers** tools. You can also use all of these platforms to ask questions and contact your lecturers.

8.2   myUnisa tools

The main tool that we will use is the **Lessons tool**. This tool will provide the content of and the assessments for your module. At times you will be directed to join discussions with fellow students and complete activities and assessments before you can continue with the module.

It is very important that you log in to myUnisa regularly. We recommend that you log in at least once a week to do the following:

- **Check for new announcements**. You can also set your myLife e-mail account so that you receive the announcement e-mails on your cellphone.

- **Check for new Chats**. You can also set your myLife e-mail account so that you receive the chats on your cellphone.

- **Do the Discussion Forum activities**. When you do the activities for each learning unit, we want you to share your answers with the other students in your group. You can read the instructions and even prepare your answers offline, but you will need to go online to post your messages.

- **Do other online activities**. For some of the Lessons activities you might need to post something on the **Forums** or the **Blog tool**, take a quiz or complete a survey under the **Self-Assessment** tool. Do not skip these activities because they will help you complete the assignments and the activities for the module.

We hope that by giving you extra ways to study the material and practice all the activities, this will help you succeed in the online module. To get the most out of the online module, you **MUST** go online regularly to complete the activities and assignments on time.

9 ASSESSMENT

9.1 Assessment criteria

There are two assignments and one examination for this module.
Examination admission.
Please note that lecturers are not responsible for examination admission, and ALL inquiries about examination admission should be directed by e-mail to exams@unisa.ac.za

> **You will be admitted to the examination if and only if at least one assignment reaches the Assignment Section before the exam admission date**
> **and also obtain a minimum of** 40**% in the assignments combined**

Note that your marks for the assignments contribute 20**% to your final mark (the remaining** 80**% is contributed by the final examinations).**

Both assignments count towards your year mark.

9.2 Assessment plan

- To complete this module, you will be required to submit 3 assessments.

- All information about when and where to submit your assessments will be made available to you via the myModules site for your module.

- Due dates for assessments, as well as the actual assessments are available on the myModules site for this module.

- To gain admission to the examination, you will be required to submit at least one assignment.

- To gain admission to the examination, you also need to obtain a year mark average of 40% for the assignments.

- You will receive examination information via the myModules sites. Please watch out for announcements on how examinations for the modules for which you are registered will be conducted.

- The examination will count 80% towards the final module mark.

The questions for the assignments are given online on the module site. For each assignment there is a **FIXED CLOSING DATE**; the date by which the assignment **must reach** the university (the student must submit the assignment online). Solutions for each assignment will be uploaded on *myUnisa* under Additional Resources.
Late assignments will be marked, but will be awarded 0%.

*Because this is an online module, the assignments are not provided in this tutorial letter. Instead, the assignments are provided online as they become due. You will see and access them when you go online.

9.3 Assessments due dates

- There are no assignment **due dates** included in this tutorial letter.

- Assignment due dates will be made available to you on the myUnisa landing page for this module. We envisage that the due dates will be available to you upon registration.

- Please start working on your assessments as soon as you register for the module.

- Log on to the myUnisa site for this module to obtain more information on the due dates for the submission of the assessments.

9.4 Submission of assessments

- Unisa, as a comprehensive open distance e-learning institution (CODeL), is moving towards becoming an online institution. You will therefore see that all your study material, assessments and engagements with your lecturer and fellow students will take place online. We use *my*Unisaas our virtual campus.

- The *my*Unisa virtual campus will offer students access to the myModules site, where learning material will be available online and where assessments should be completed. This is an online system that is used to administer, document, and deliver educational material to students and support engagement between academics and students.

- The myUnisa platform can be accessed via https://my.unisa.ac.za. Click on the myModules 2024 button to access the online sites for the modules that you are registered for.

- The university undertakes to communicate clearly and as frequently as is necessary to ensure that you obtain the greatest benefit from the use of the myModules learning management system. Please access the announcements on your myModules site regularly, as this is where your lecturer will post important information to be shared with you.

- When you access your myModules site for the module/s you are registered for, you will see a welcome message posted by your lecturer. Below the welcome message you will see the assessment shells for the assessments that you need to complete. Some assessments may be multiple choice (Quiz), some tests, others written assessments, some forum discussions, and so on. All assessments must be completed on the assessment shells available on the respective module platforms.

- For written assessments, please note the due date by which the assessment must be submitted. Ensure that you follow the guidelines given by your lecturer to complete the assessment. Click on the submission button on the relevant assessment shell on myModules. You will then be able to upload your written assessment on the myModules site of the modules that you are registered for. Before you finalize the upload, double check that you have selected the correct file for upload. Remember, no marks can be allocated for incorrectly submitted assessments.

You only submit your assignments electronically via *myUnisa*. Assignments can **not** be submitted by fax or e–mail nor by post as such will not be considered for marking.

9.4.1 Types of assignments and descriptions

All assignments are defined as either optional, mandatory, compulsory, or elective.

- **Elective assignments**

  - If not submitted, the student gets no mark for this item.
  - The best of the required submissions will count.

- **Mandatory assignments**

  - If not submitted, the student gets no mark for this item.

- **Compulsory assignments**

- If not submitted, the result on the student's academic record will be *absent*.

• **Optional assignments**

- You are encouraged as a student to do optional assignment so that it may benefit your learning.

I. Elective assignments

a. the student is given a choice of which assignments within an identified group to submit, only the best result(s), the number of which is specified in advance, will contribute towards the year mark.

b. elective assignments must also be grouped into an elective group.

c. for the student to select which assignment to submit, the elective assignments must be grouped together. For such an elective group, relevant information must be provided to the student, such as how many of the assignments must be submitted and how many of the assignment marks should be combined into the year mark.

d. The selection criteria define how marks received for assignments in an elective group are to be combined into the year mark. Three different criteria may be used for calculating the year mark:

   – The best mark should be used, or
   – If the student submits fewer than the required number of assignments per group or no assignment in a group, a mark of 0% will be used.
   – 0% is awarded to all non-submitted or unmarked assessments. A best mark is then calculated from all items.

II. Mandatory assignments

a. contribute to the year mark.

b. If a student fails to submit a mandatory assignment, no mark is awarded and the year mark is calculated accordingly. The student will therefore forfeit the marks attached to this assignment when the final mark for the module is calculated.

III. Compulsory Assessment

a. when not submitted, the student will fail a Continuous Assessment module but will be shown as absent from the examination in the case of other modules.

IV. Optional assignments - You are encouraged as a student to do optional assignment so that it may benefit your learning.

9.5   The assessments

As indicated in section 9.2, you need to complete 3 assignments.

There are no assignments included in this tutorial letter. Assignments and due dates will be made available to you on myModules for this module. We envisage that the due dates will be available to you upon registration.

Make sure that you do the correct assignments.
Solutions will be available on *myUnisa* under Additional Resources before the examination date.

9.6   Other assessment methods

There are no other assessment methods for this module.

9.7   The examination

Examination information and details on the format of the examination will be made available to you online via the myUnisa site. Look out for information that will be shared with you by your lecturer and e-tutors (where relevant) and for communication from the university.

If you are registered for this module in 2024 then you will write the examination in **October/November** 2025.

Please note:

- The exam is a two hour examination.

- The use of a pocket calculator is not permitted during examination. You are **NOT** allowed to use a calculator during the exam.

The examination questions will be similar to the questions asked in the study guide and in the assignments.

9.8   Supplementary

If you are registered for this module in 2024 then you will write the supplementary examination in **January/February 2025** if necessary.
During the course of the year, the Examination Section will provide you with information regarding the examination in general, examination websites, examination dates and examination times and that including the supplementary examination.

9.8.1 Invigilation/proctoring

Since 2020 Unisa conducts all its assessments online. Given stringent requirements from professional bodies and increased solicitations of Unisa's students by third parties to unlawfully assist them with the completion of assignments and examinations, the University is obliged to assure its assessment integrity through the utilization of various proctoring tools: Turnitin, Moodle Proctoring,

the Invigilator App and **Intelligent Remote Invigilation System (IRIS)**. These tools will authenticate the student's identity and flag suspicious behaviour to assure credibility of students' responses during assessments. The description below is for your benefit as you may encounter any or all of these in your registered modules:

Turnitin is a plagiarism software that facilitates checks for originality in students' submissions against internal and external sources. Turnitin assists in identifying academic fraud and ghost writing. Students are expected to submit **typed** responses for utilization of the Turnitin software.

The **Moodle Proctoring** tool is a facial recognition software that authenticates students' identity during their Quiz assessments. This tool requires access to a student's **mobile or laptop camera**. Students must ensure their camera is activated in their browser settings prior to their assessments.

The Invigilator "mobile application-based service does verification" of the identity of an assessment participant. The Invigilator Mobile Application detects student dishonesty-by-proxy and ensures that the assessment participant is the registered student. This invigilation tool requires students to download the app from their Play Store (Google, Huawei and Apple) on their mobile devices (camera enabled) prior to their assessment.

IRIS Invigilation software verifies the identity of a student during assessment and provides for both manual and automated facial verification. It has the ability to record and review a student's assessment session. It flags suspicious behaviour by the students for review by an academic administrator. IRIS software requires installation on students' laptop devices that are enabled with a webcam.

Students who are identified and flagged for suspicious dishonest behaviour arising from the invigilation and proctoring reports are referred to the disciplinary office for formal proceeding.

Please note:

Students must refer to their module assessment information on their myModule sites to determine which proctoring or invigilation tool will be utilized for their formative and summative assessments.

10 ACADEMIC DISHONESTY

10.1 Plagiarism

Plagiarism is the act of taking the words, ideas and thoughts of others and presenting them as your own. It is a form of theft. Plagiarism includes the following forms of academic dishonesty:

- Copying and pasting from any source without acknowledging the source.

- Not including references or deliberately inserting incorrect bibliographic information.

- Paraphrasing without acknowledging the original source of the information.

10.2 Cheating

Cheating includes, but is not limited to, the following:

- Completing assessments on behalf of another student, copying the work of another student during an assessment, or allowing another student to copy your work.

- Using social media (e.g. WhatsApp, Telegram) or other platforms to disseminate assessment information.

- Submitting corrupt or irrelevant files, this forms part of examination guidelines

- Buying completed answers from so-called "tutors" or internet sites (contract cheating).

10.3 For more information about plagiarism, follow the link below:

https://www.unisa.ac.za/sites/myunisa/default/Study-@-Unisa/Student-values-and-rules

11   STUDENTS LIVING WITH DISABILITIES

The Advocacy and Resource Centre for Students with Disabilities (ARCSWiD) provides an opportunity for staff to interact with first-time and returning students with disabilities.

If you are a student with a disability and would like additional support or need additional time for assessments, you are invited to contact (name and e-mail address of the lecturer must be inserted) to discuss the assistance that you need.

12   FREQUENTLY ASKED QUESTIONS

The *Study @ Unisa* brochure contains an A-Z guide of the most relevant study information.

13   SOURCES CONSULTED

The Study Guide and the prescribed textbook were consulted in preparing this tutorial letter.

14   IN CLOSING

Do not hesitate to contact us by e-mail if you are experiencing problems with the content of this tutorial letter or with any academic aspect of the module.

We wish you a fascinating and satisfying journey through the learning material, and trust that you will complete the module successfully.

Enjoy the journey!

Dr CA Agyingi – lecturer for MAT2613
Department of Mathematical Sciences

study in detail the relevant chapter of the publication My Studies @ Unisa.

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