

Tutorial letter 101/0/2025

NUMERICAL METHODS II APM3711

Year module

Department of Mathematical Sciences

IMPORTANT INFORMATION:

Please activate your *myUnisa* and *myLife* e-mail account and make sure that you have regular access to the *myUnisa* module website APM3711-25-Y, as well as your group website.

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

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1 INTRODUCTION AND WELCOME

Dear Student

Unisa is a comprehensive open distance e-learning (CODEL) higher education institution. Our comprehensive curricula encapsulate a range of offerings, from strictly vocational to strictly academic certificates, diplomas and degrees. Unisa's "openness" and its distance eLearning character result in many students who may not previously have had an opportunity to enrol in higher education registering at the university. 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 those who are sufficiently prepared. Teaching and learning in a CODEL context involves multiple modes of delivery, ranging from blended to fully online learning. As a default position, all post-graduate programmes are offered fully online with no printed study materials, while undergraduate programmes are offered using 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 serving humanity and shaping futures – combined with a clear appreciation of our location on the African continent – means that Unisa's graduates have distinctive graduate qualities, which include:

- being independent, resilient, responsible and caring citizens able to fulfil 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 and taking account of its histories, challenges and potential in relation to globally diverse contexts
- the ability to critically analyse and evaluate the credibility and usefulness of information and data from multiple sources in a globalised world with ever-increasing information and data flows and competing worldviews
- how to apply their discipline-specific knowledges competently, ethically and creatively to solve real-life problems
- an awareness of their own learning and developmental needs and future potential

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 your lecturer and fellow students to support your learning will also be communicated via various platforms.

You are encouraged to log into the module site, APM3711-25-Y on myUnisa regularly (that is, at least twice per week).

Because this is a fully online module, you will need to use myUnisa to study and complete the prescribed learning activities. Visit the website for APM3711-25-Y on myUnisa frequently.

1.1 Tutorial material

Tutorial Letter 101 contains important information about the scheme of work, resources and assignments for this module. We urge you to read it carefully and to keep it at hand when working through the study material, preparing the assignments, preparing for the examination and addressing questions to your lecturers.

In Tutorial Letter 101, you will find the assignments as well as instructions on the preparation and submission of the assignments. This tutorial letter also provides all the information you need with regard to the prescribed textbook and how to obtain this textbook. Please study this information carefully and make sure that you obtain the prescribed textbook as soon as possible.

We have also included certain general and administrative information about this module. Please study this section of the tutorial letter carefully.

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

If you have internet access, please visit our departmental website for information on the Department of Mathematical Sciences. To reach our website, follow the links on the main Unisa website, <http://www.unisa.ac.za>

I hope that you will enjoy this module and wish you all the best!

2 MODULE OVERVIEW

2.1 Purpose

The compulsory pre-requisite for this module is **APM2613** (Numerical Methods I).

The purpose of this module is to provide numerical techniques for the approximate solution of initial and boundary-value problems of ordinary differential equations as well as partial differential equations. A minimal prerequisite in differential and integral calculus, differential equation theory, basic analysis and linear algebra are assumed on addition to Numerical Methods I. The course focuses on mathematical theory and numerical analysis to ensure that students understand the concepts that underpin each algorithm that we consider. There will also be a significant component of programming in this course. Students can program in any language of their choice, but Matlab, Mathematica or Maple are recommended because they have plotting facility within the program.

2.2 Outcomes

By the end of this module, students should

2.2.1 be competent in using Taylor's method of order 2 and higher to approximate the solution of an initial-value problem.

2.2.2 be able to use Euler and modified Euler methods on initial-value problems.

- 2.2.3 demonstrate fluency in Runge-Kutta methods and their error control.
- 2.2.4 must know how multistep methods work and their relative merits.
- 2.2.5 when given a function, they should be able to find a Pade approximation.
- 2.2.6 be able to use the Chebyshev polynomials to find the Chebyshev series and estimate the maximum error of the Chebyshev series over the interval $[-1, 1]$.
- 2.2.7 be able to economise the given power series.
- 2.2.8 be able to apply Gerschgorin's circle theorems in finding eigenvalues and hence the corresponding eigenvectors.
- 2.2.9 be competent in calculating the dominant eigenvalue and the smallest absolute value using the power method.
- 2.2.10 be able to use the shooting method to solve a boundary-value problem both theoretically and numerically.
- 2.2.11 be competent in solving characteristic-value problem using finite difference method.
- 2.2.12 be able to model a steady-state heat by Laplace's equation and approximate it by the 5-point difference formula and hence obtain the solution numerically.
- 2.2.13 be able to apply the iteration formula for S.O.R. on Laplace equation and hence find numerical solution.
- 2.2.14 have a thorough grasp of the alternating-direction-implicit method (ADI) for solving Laplace/Poisson equation and do this numerically.

3 CURRICULUM TRANSFORMATION

Unisa has implemented a transformation charter that places curriculum transformation high on the teaching and learning agenda. Curriculum transformation includes student-centred 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 are being phased in at both programme and module levels. 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 conceptualised in your modules. We encourage you to embrace these changes during your studies at Unisa, responsively and within the framework of transformation

4 LECTURER(S) AND CONTACT DETAILS

4.1 Lecturer

The lecturer responsible for this module is:

Prof. A. Kubeka
 Tel: +2711 670 9157
 Room no: 647
 GJ Gerwel Building
 Florida Campus
 e-mail: kubekas@unisa.ac.za

All queries that are not of a purely administrative nature but are **about the content of this module** should be directed to your lecturer(s). Please have your study material with you when you contact your lecturer.

4.2 Department

You can contact the Department of Mathematical Sciences as follows:

Telephone number: 011 670 9147 (RSA) +27 11 670 9147 (International)

Email address: mathsciences@unisa.ac.za

4.3 University

Contact addresses of the various administrative departments appear on the Unisa website: <http://www.unisa.ac.za/sites/corporate/default/Contact-us/Student-enquiries>.

Please include your student number in all correspondence.

5 RESOURCES

5.1 The prescribed book

The prescribed textbooks are

Title:	Numerical Analysis	Applied Numerical Analysis
Author(s):	Richard L Burden & J. Douglas Faires	Gerald Wheatley
Publishers:	Cengage Learning	Pearson
Edition:	Tenth Edition	Seventh Edition
Year:	2016	2004
Print Book ISBN:	ISBN-13: 978-1-305-25366-7	ISBN-10: 0-538-73564-3

5.2 Recommended books

There are no recommended books for this module.

5.3 Electronic Reserves (e-Reserves)

There are no e-Reserves for this module.

5.4 Library services and resources

The Unisa Library offers a range of information services and resources and has made 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>
- For Frequently Asked Questions, go to <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, go to <http://www.unisa.ac.za/sites/corporate/default/Library/Library-services/Research-support>
- For library training for undergraduate students, go to <https://www.unisa.ac.za/sites/corporate/default/Library/Library-services/Training>
- For Lending Services, go to <https://www.unisa.ac.za/sites/corporate/default/Library/Library-services/Lending-services>
- For Services for Postgraduate students, go to <https://www.unisa.ac.za/sites/corporate/default/Library/Services-for-Postgraduates>
- For Support and Services for students with disabilities, go to <https://www.unisa.ac.za/sites/corporate/default/Library/Services-for-students-with-special-needs>
- For Library Technology Support, go to <https://libguides.unisa.ac.za/techsupport>
- For information on finding and using library resources and tools, go to http://libguides.unisa.ac.za/Research_skills
- For an A–Z list of library databases, go to <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-enquiriesunisa.ac.za
- Queries related to library fines and payments: Library-fines@unisa.ac.za
- Interlibrary loan service for postgraduate students: libr-illunisa.ac.za
- Literature Search Service: Lib-searchunisa.ac.za
- Social media channels: Facebook: UnisaLibrary and X Twitter: UnisaLibrary

6 STUDENT SUPPORT SYSTEM

The Study@Unisa brochure is available on myUnisa at www.unisa.ac.za/brochures/studies. This brochure contains important information and guidelines for successful studies through Unisa.

If you need assistance concerning 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: mymodule22@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 assessments and how to participate in forum activities by visiting <https://dtls-qa.unisa.ac.za/course/view.php?id=32130>

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 myUnisa.**
- **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, Discussions, 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.

7 STUDY PLAN

7.1 Suggested Study Programme

Content	Study plan
Outcomes 2.2.1 to 2.2.4 to be achieved by	01 April
Outcomes 2.2.5 to 2.2.7 to be achieved by	07 May
Outcomes 2.2.8 to 2.2.9 to be achieved by	14 June
Outcomes 2.2.10 to 2.2.14 to be achieved by	31 July

7.2 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 may 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 learning unit activities you might need to post something on 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 practise 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.

8 ASSESSMENT

8.1 Assignments and learning

Assignments are seen as part of the learning material for this module. As you do the assignments, discuss the work with fellow students or tutors, you are actively engaged in learning. It is therefore important that you complete all the assignments.

N.B. Please don't wait for Assignment 01 to be returned to you before starting to work on Assignment 02.

You should NEVER submit your assignment answers directly to a lecturer, no matter what the circumstances are! (For example, even if the myUnisa website is down, do NOT email your assignment answers to a lecturer!)

8.2 Assessment/assignment due dates

- There are no assessment/assignment due dates included in this tutorial letter.
- Assessment/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/assignments

Please note: Although students may work together when preparing assignments, each student must write and submit his or her own individual assignment. In other words, you must submit your own ideas in your own words. It is unacceptable for students to submit identical assignments on the basis that they worked together. That is copying (a form of plagiarism) and none of these assignments will be marked. Furthermore, you may be penalized or subjected to disciplinary proceedings by the University.

8.3 Submission of assessments/assignments

- Unisa, as a comprehensive open distance e-learning institution (CODeL), is moving towards becoming an online institution. You will see, therefore, that all your study material, assessments and engagements with your lecturer and fellow students will take place online. To facilitate this, we use myUnisa as our virtual campus.
- The myUnisa virtual campus offers students access to the myModules site, where learning material is available online and where assessments should be completed. Together, myUnisa and myModules form an online system that is used to administer, document, and deliver educational material to students and support engagement between those students and Unisa's academics.
- The myUnisa platform can be accessed via <https://my.unisa.ac.za>. Click on the myModules 2025 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 your 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, some may be tests and others may be written assessments/assignments, while some may be forum discussions and so on. All assessments must be completed on the assessment shells available on the respective module platforms.
- To complete quiz assessments, please log on to the module site where you need to complete the assessment. Click on the relevant assessment shell (Assessment 1, Assessment 2, etc.). There will be a date recorded there telling you when the assessment will open for you. When the assessment is open, access the quiz online and complete it within the time available to you. Quiz assessment questions are not included in this tutorial letter (Tutorial Letter 101) and are made available online only. You must therefore access and complete the quiz online where it has been created.
- It is not advisable to use a cellphone to complete quizzes and you should please use a desktop computer, tablet or laptop for this task. Students who use cellphones find it difficult to navigate the Online Assessment tool on the small screen and often struggle to navigate

between questions and successfully complete the quizzes. In addition, cellphones are more vulnerable to dropped internet connections than other devices. If at all possible, please do not use a cellphone for this assessment type.

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

9 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), as well as for communication from the University.

9.1 Invigilation/proctoring

Since 2020, Unisa has conducted all its assessments online. Given the stringent requirements imposed by professional bodies, as well as increased solicitation of Unisa's students by third parties to unlawfully assist them with the completion of assignments and examinations, the University is obliged to assure the integrity of its assessment integrity by using various proctoring tools: Turnitin, Moodle Proctoring, the Invigilator App and IRIS. These tools authenticate the student's identity and flag suspicious behaviour to assure the credibility of their 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 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 when using the Turnitin software.

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

The **Invigilator App** is a mobile application-based service that verifies the identity of an assessment participant. The Invigilator app detects student dishonesty-by-proxy and ensures that the assessment participant is the student registered for the module concerned. This invigilation tool requires students to download the app from the Google Play Store (Android devices), the Huawei AppGallery (Huawei devices) or the Apple App Store (Apple devices) on their **camera-enabled** mobile devices prior to their assessment.

The **IRIS Invigilation** software verifies the identity of a student during assessment and provides for both manual and automated facial verification. It can record and review a student's assessment

session and it flags suspicious behaviour by the student for review by an academic administrator. The IRIS software requires installation on students' **webcam-enabled laptop** devices. IRIS invigilation software is used for all CSET online examinations/tests. It is the responsibility of students to ensure the software is working properly before the examination session, and attendance of training.

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

Please note:

Students must refer to their module assessment information on their myModule sites to determine which proctoring or invigilation tool will be used 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 that source.
- Not including references or deliberately inserting incorrect bibliographic information.
- Paraphrasing without acknowledging the 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 matter is addressed in the examination guidelines.)
- Buying completed answers from so-called "tutors" or internet sites (contract cheating).

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 if you need additional time for assignments/assessments, you are invited to contact Prof A Kubeka at e-mail address kubekas@unisa.ac.za to discuss the assistance that you need.

12 FREQUENTLY ASKED QUESTIONS

Calculation of Final Mark

Your final mark will be composed of 80% of your exam mark and 20% of your year mark.

13 IN CLOSING

We wish you every success with your studies!